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**

SUBMISSION OF REVISED INDEPENDENT EVALUATION, VERIFICATION AND MEASUREMENT REPORTS- COMMERCIAL AND INDUSTRIAL

Indiana Michigan Power Company (I&M) respectfully submits revised 2015 evaluation, verification and measurement (EM&V) reports for Commercial and Industrial programs in accordance with the Commission's December 3, 2014 Order in this Cause. The revised report includes inadvertently omitted portfolio level costs (indirect programs) allocated to each program in the benefit cost score section and tables of the report. The revisions include the benefit cost scores, associated tables, and benefit cost section of the reports to reflect the inclusion of these costs at program level scoring. No other changes were made to the report.

Respectively submitted,

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Evaluation of Commercial and Industrial Program Portfolio

January 2015 through December 2015

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EM&V Report: June 2016

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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 five (PY6) which occurred from January 1, 2015 through December 31, 2015.

During program year six, the I&M Commercial & Industrial Portfolio achieved program activity in the following five commercial and industrial (C&I) programs currently offered:

- Commercial and Industrial Custom Program;
- Commercial and Industrial Prescriptive Program; and the
- Commercial and Industrial Small Business Direct Install (SBDI) Program;

In previous program years, I&M offered a program specifically for retro-commissioning projects. Beginning in 2015, incentives for retro-commissioning measures are offered under the C&I Custom Program.

During PY6, projects were completed through the C&I Custom, C&I Prescriptive, the Prescriptive Refrigeration component of C&I Audit, and C&I Small Business Direct Install programs and therefore received both process and impact evaluations.

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). In some cases, site contacts were able to provide facility-specific data.
- Customer surveys provided information for the net-to-gross analyses and process evaluations for programs with completed projects in PY6. I&M and implementation contractor staff members were interviewed to provide information for the process evaluation.

Summary of Findings

The PY6 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 PY6. 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

Program	*PY6 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*
C&I Custom	31,363,636	37,072,689	37,072,689	37,067,927	38,521,581	35,711,646
C&I Prescriptive	29,000,000	25,386,828	25,386,828	25,071,645	23,189,931	20,715,700
Small Business Direct Install	3,067,134	2,573,902	2,573,902	2,490,985	2,271,702	2,242,749

Table ES-2 Peak Demand Savings Impact Summary

Program	*Ex Post Gross Peak kW Savings*	*Ex Post Net Peak kW Savings*
C&I Custom	9,578	8,661
C&I Prescriptive	3,811	3,407
Small Business Direct Install	314	312

ADM estimated the cost-effectiveness of the PY6 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.

Table ES-3 Cost Effectiveness Testing by Program

Program	*UCT*	*TRC*	*RIM*	*SCT*	*PCT*
C&I Custom	12.28	4.46	0.93	5.13	3.90
C&I Prescriptive	7.21	2.04	.71	2.31	2.31
C&I Small Business Direct Install	3.03	1.86	.60	2.09	3.22

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 2015 through December 2015. The C&I Program Portfolio is comprised of the C&I Custom, C&I Prescriptive, and C&I Small Business Direct Install programs.

1.1 Commercial and Industrial Custom Program

The Commercial and Industrial Custom 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.

In past years, retro-commissioning incentives were offered through a separate program. For the 2015 program year, incentives for retro-commissioning projects were offered through the C&I Custom Program.

Incentives are contingent on I&M's review and acceptance of savings claims. Incentives are based on the project expected kWh savings. Incentive rates and program requirements are detailed below:

- $0.06/kWh of energy savings
- The incentive cap for this program is $150,000 per site and $300,000 per company.
- Projects must be completed within 90 days of invoice date to qualify for incentives.
- Projects savings more than 500,000 kWh may require pre- and post-monitoring to verify energy savings.

There were 202 completed projects in the C&I Custom Program during the period January 2015 through December 2015, which were expected to provide savings of 37,072,689 kWh.

1.2 Commercial and Industrial Prescriptive Program

The Commercial and Industrial Prescriptive Program was designed to help businesses identify and implement custom energy saving projects. The program targets commercial, industrial, and institutional accounts and aims to make it easy for customers to complete an energy savings project and calculate incentive amounts based on existing and new equipment types. Projects must be new improvements in existing facilities.

Incentives are based on the efficient and inefficient equipment types. Incentive rates and program requirements are detailed below:

- The incentive cap for this program is $150,000 per site and $300,000 per company.

- Projects with an estimate rebate of $10,000 require pre-approval prior to starting any work.
- Lighting measures must be a one for one replacement and fixtures must be on the qualified products list.
- Qualifying products can be found on the Electricideas.com website and on the program application.
- Projects must be completed within 90 days of invoice date to qualify for incentives.

There were 429 completed projects in the C&I Prescriptive Program during the period January 2015 through December 2015, which were expected to provide savings of 25,386,828 kWh.

1.3 Commercial and Industrial Small Business Direct Install Program

The Commercial and Industrial Small Business Direct Install Program targets small businesses within the Indiana Michigan Power territory; specifically, customers with demand less than 150 kW. Participants must use an approved trade ally to assist with their project. SBDI incentives are capped at $3,000 per site or $21,000 per company across multiple locations.

There were 164 projects completed under the C&I SBDI program during the period January 2015 through December 2015, which were expected to provide savings of 2,573,902 kWh.

1.4 Organization of Report

This report on the impact and process evaluation of the C&I Program Portfolio for the period January 2015 through December 2015 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 Custom 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 Prescriptive Program,
- Chapter 4 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 Small Business Direct Install Program.
- Chapter 5 presents the results of PY6 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 Custom and Prescriptive Programs.
- Appendix B provides a copy of the questionnaire used for the survey of decision makers who participated in the C&I Custom and/or Prescriptive Programs.
- Appendix C presents the results from a survey of decision makers that received incentives under the C&I Custom Program.

- Appendix D presents the results from a survey of decision makers that received incentives under the C&I Prescriptive Program.
- Appendix E provides the project-level measurement and verification reports for each project for which data were collected on site for the C&I Small Business Direct Install Program.
- Appendix F provides a copy of the questionnaire used for the survey of the decision maker who received incentives under the C&I Small Business Direct Install Program.
- Appendix G presents the results from the survey of the decision maker who received incentives under the C&I Small Business Direct Install Program.

2. Commercial and Industrial Custom 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 Custom Program during the period January 2015 through December 2015. 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 Custom Program were collected for samples of projects completed during the period January 2015 through December 2015. Data provided by the implementation contractor and utility showed that during PY6, there were 202 projects completed, which were expected to provide savings of 37,072,689 kWh annually.

Inspection of data on kWh savings for individual projects provided by 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 ±9.6%.

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 2-1 Population Statistics Used for C&I Custom Sample Design

	Stratum 1	*Stratum 2*	*Stratum 3*	*Stratum 4*	*Stratum 5*	*Totals*
Strata boundaries (kWh)	< 80,000	80,000 – 299,999	300,000 – 799,999	800,000 – 2,499,999	>2,500,000	
Number of projects	128	46	20	7	1	202
Total kWh savings	3,511,783	7,030,516	8,998,404	8,470,449	9,061,537	37,072,689
Average kWh Savings	27,436	152,837	449,920	1,210,064	9,061,537	183,528
Std. dev. of kWh savings	20,504	59,602	125,803	553,588	N/A	680,684
Coefficient of variation	0.75	0.39	0.28	0.46	N/A	3.71
Final design sample	12	5	4	4	1	26

The sampled projects account for approximately 47% 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	9,061,537	9,061,537
4	5,943,981	8,470,449
3	1,664,116	8,998,404
2	485,317	7,030,516
1	392,683	3,511,783
Total	17,547,634	37,072,689

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 Custom 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
- Compressed Air
- Process Improvements
- HVAC / Building Optimization

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
Motors and VFDs	Measurements of power and run-time obtained through monitoring
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
HVAC (including packaged units, chillers, cooling towers, controls/EMS) and Building Optimization	eQuest simulations using DOE-2.2 as its analytical engine for estimating HVAC loads and facility energy consumption

Two estimates of gross savings are summarized each project: an ex ante gross savings estimate, as provided from the implementation contractor, and an ex post gross savings estimate. The savings realization rate for a project is calculated as the ratio of the 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 each measure category. 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 Motors and VFDs: A variable-frequency drive (VFD) is an electronic device that controls the speed of a motor by varying the magnitude of the voltage, current, or frequency of the electric power supplied to the motor. The factors that make a motor load a suitable application for a VFD are (1) variable speed requirements and (2) high annual operating hours. The interplay of these two factors can be summarized by information on the motor's duty cycle, which essentially shows the percentage of time during the year that the motor operates at different speeds. The duty cycle should show good variability in speed requirements, with the motor operating at reduced speed a high percentage of the time.

Potential energy savings from the use of VFDs are usually most significant with variable-torque loads, which have been estimated to account for 50% to 60% of total motor energy use in the non-residential sectors. Energy saving VFDs may be found on fans, centrifugal pumps, centrifugal blowers, and other centrifugal loads, most usually where the duty cycle of the process provided a wide range of speeds of operation.

ADM's approach to determining savings from installation of VFDs involves (1) making one-time measurements of voltage, current, and power factor of the VFD/motor and (2) conducting continuous measurements of amperage over a period of time in order to obtain the data needed to develop VFD load profiles and calculate energy savings. VFDs are generally used in applications where motor loading changes when motor speed changes. Consequently the true power drawn by a VFD is recorded in order to develop VFD load shapes. One-time measurements of power are made for different percent speed settings. Power and percent speed or frequency (depending on VFD display options) are recorded for as wide a range of speeds as the customer allows the process to be controlled; field staff attempt to obtain readings from 40 to 100% speed in 10 to 15% increments.

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.

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 26 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 Custom Program during the period January 2015 through December 2015 are summarized in Table 2-4. The achieved gross savings of 38,521,581 kWh are equal to 104% of the ex ante savings.

Table 2-4 Gross kWh Savings for C&I Custom Program

Ex Ante Gross kWh Savings	*Gross Audited kWh Savings*	*Gross Verified kWh Savings*	*Ex Post Gross kWh Savings*	*Gross Realization Rate*
37,072,689	37,072,689	37,067,927	38,521,581	104%

Gross kWh savings are summarized by sampling stratum in Table 2-5. For PY6, audited savings were equal to ex ante savings, as there were no issues found with the tracking data. Ex ante, verified and ex post kWh savings are shown in Table 2-6 for each project sampled in PY6.

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	9,061,537	9,061,537	13,087,010	144%
4	8,470,449	8,470,449	8,456,864	100%
3	8,998,404	8,998,404	7,002,044	78%
2	7,030,516	7,030,516	6,521,187	93%
1	3,511,783	3,507,021	3,454,476	98%
Total	37,072,689	37,067,927	38,521,581	104%

Table 2-6 Gross kWh Savings for C&I Custom Program by Sampled Project

Project ID	*Ex Ante kWh Savings*	*Verified kWh Savings*	*Ex Post Gross kWh Savings*	*Project Gross Realization Rate*
718	1,094,558	1,094,558	487,108	45%
792	585,309	585,309	400,304	68%
1001	110,700	110,700	115,871	105%
1015	5,181	6,950	6,950	134%
1059	97,505	97,505	93,289	96%
1063	9,061,537	9,061,537	5,506,914	61%
1064	1,584,684	1,584,684	1,578,335	100%
1088	82,760	82,760	97,840	118%
1089	33,372	31,070	34,718	104%
1096	99,572	99,572	96,113	97%
1104	24,577	24,577	11,359	46%
1109	53,668	53,668	63,874	119%
1111	37,041	37,041	45,680	123%
1133	26,235	26,235	29,774	113%
1134	23,159	23,159	26,602	115%
1186	3,523	3,523	1,674	48%
1210	328,880	328,880	307,317	93%
1260	31,843	31,843	22,495	71%
1264	14,233	14,233	16,588	117%
1268	2,311,390	2,311,390	3,018,423	131%
1271	94,780	94,780	47,045	50%
1275	62,100	62,100	52,080	84%

1377	432,137	432,137	311,077	72%
1382	317,790	317,790	276,222	87%
1398	77,751	77,751	74,481	96%
1413	953,349	953,349	850,582.00	89%
All Non-Sample Projects	19,525,055	19,520,825	24,948,866	128%
Total	37,072,689	37,067,927	38,521,581	104%

2.2.2 Gross Peak kW Savings

The achieved gross peak demand kW reductions of the C&I Custom Program during the period January 2015 through December 2015 are 9,578 kW.

2.3 Methodology for Estimating Net Savings

To estimate net impacts for the program, data were collected and analyzed for sixteen 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 Custom and Prescriptive Programs, 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 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 Custom 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 Custom Program?"
- The respondent answered "definitely would have installed" to the following question: "If the financial incentive from the C&I Custom 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

Custom 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 Custom 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 Custom 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 Custom 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 Custom 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 Custom 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 Custom 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 Custom 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 Custom 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 Custom Program in making your decision to install [Equipment/Measure]?
- The respondent answered "yes" to the following question: "Did a representative of the C&I Custom Program recommend that you install [Equipment/Measure]?" and "probably would not have" or "definitely would not have" to the question: "If the C&I Custom 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 Custom 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 Custom 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 Custom Program the period January 2015 through December 2015.

2.4.1 Ex Post Net kWh Savings

The data used to assign free ridership scores were collected through a customer survey of 18 customer decision makers for projects completed during the period January 2015 through December 2015. However, responses from two respondents were removed from the analysis because they did not provide answers to key questions used in the determination of free ridership.

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 Custom Program?” a free ridership score of 0 was assigned to the project. That is, if a participant required financial assistance from the C&I Custom 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 Custom

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*
34%	6%	0%	8%	3%

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. Eleven 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 Custom Program

Had Plans and Intentions to Install Measure without Program? (Definition 1)	*Had Plans and Intentions to Install Measure without SBDI 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	N	N	N	17%	0%
N	N	Y	N	8%	0%
Y	N/A	N	N	6%	100%
N	N	N	Y	3%	33%
Required program incentive to implement measures.				66%	0%
Total				34%	7%

None of the survey respondents reported that additional measures that qualified for 2015 spillover savings were installed.

The ex post energy savings of the C&I Custom Program during the period January 2015 through December 2015 are summarized in Table 2-10. During this period, ex post net energy savings for the program totaled 35,711,646 kWh. The net-to-gross ratio for the C&I Custom Program is 93%.

Table 2-10 Summary of kWh Savings from C&I Custom Program

Ex Ante kWh Savings	*Ex Post Gross kWh Savings*	*Free Ridership*	*Spillover*	*Ex Post Net kWh Savings*	*Net to Gross Ratio*
37,072,689	38,521,581	2,809,935	0	35,711,646	93%

2.4.2 Ex Post Net Peak kW Savings

The ex post net peak kW reductions of the C&I Custom Program during the period January 2015 through December 2015 are summarized in Table 2-11. The ex post net peak demand reductions for the program total 8,661 kW.

Table 2-11 Summary of Peak kW Savings from C&I Custom Program

Ex Post Gross Peak kW Savings	*Free Ridership*	*Spillover*	*Ex Post Net Peak kW Savings*	*Net to Gross Ratio*
9,578	916	0	8,661	90%

2.5 Process Evaluation

This section presents the results of the process evaluation for Indiana Michigan Power's (I&M) C&I Custom Program during PY6. The purpose of the process evaluation is to assess aspects of the program design, delivery, and impact to determine how effectively it is achieving its intended outcomes. Process evaluation activities included a review of program documentation, a survey of program participants, and interviews with program staff. 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 performance.

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 PY6 activity include:

Did the C&I Custom Program achieve its energy savings goal?

Was the C&I Custom Program delivery effective and efficient?

Were participants satisfied with the program and the equipment they installed?

What changes will occur in PY7?

During the evaluation, data and information from multiple sources were analyzed to achieve the stated research objectives. Insight into the customer experience with the C&I Custom Program was developed from a survey of program participants. 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 were the primary data source for several components of this process evaluation, and serve as the foundation for understanding the customer perspective. The participant surveys provided customer feedback and insight regarding customer experiences with the C&I Custom Program. Respondents reported 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. Eighteen decision makers with contact information completed the survey.

- **Interviews with I&M Staff Members:** Interviews with I&M staff members 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.

- **Interviews with Lockheed Martin Staff:** Lockheed Martin took over the implementation of the C&I Custom Program in 2015 (PY6). Interviews were completed with four Lockheed Martin staff to better understand how the program will evolve in 2015 and learn about future plans to improve the program’s operational efficiency.

2.5.3 C&I Custom Program Activity

The evaluation team reviewed program tracking data to assess the range of measure types implemented in PY6.

Table 2-12 displays a summary of PY6 Custom Program ex ante kWh savings by measure category. Compressed air and lighting measures accounted for the majority of kWh savings during 2015, 39% and 38% respectively. Variable frequency drives (VFDs) accounted for 11% of program savings, followed by HVAC measures that accounted for 6% of savings.

Table 2-12 Custom Program Activity by Measure Category

Measure Category	*Total Ex Ante Savings*	*Total Incentive Dollars*	*Percent of Savings*
Lighting	14,187,384	$849,806	38%
Compressed Air	14,616,418	$473,954	39%
VFD	4,019,945	$241,197	11%
HVAC	2,306,677	$137,196	6%
Envelope	44,056	$2,643	<1%
Building Optimization	751,695	$55,264	2%
Refrigeration	4,090	$245	<1%
Compressed Air Optimization	1,094,558	$65,673	3%
Process	47,866	$2,872	<1%
Total	37,072,689	$1,828,851	100%

Ex ante kWh savings by business type is shown in Table 2-13. Industrial businesses accounted for the majority of Custom Program ex ante kWh savings (57%) in PY6, contrasting with PY5 when retail businesses accounted for a much higher percentage (37%) of Custom Program ex ante kWh savings.

Table 2-13 Project Savings by Business Type

Building Type	*kWh Savings*	*Percent of Savings*
Industrial	21,086,655	57%
Warehouse	3,443,666	9%
Office	2,924,194	8%
Education	2,557,583	7%
Retail	2,130,166	6%
Healthcare	2,060,906	6%
Government	844,703	2%
Automotive Services	790,004	2%
Entertainment/Recreation	446,895	1%
Grocery and Convenience	306,255	1%
Food & Beverage Service	244,562	1%
Faith-Based	110,696	0%
Lodging	79,200	0%
Gas Station	47,204	0%
Total	37,072,689	100%

Figure 2-1 displays the cumulative and monthly ex ante kWh savings associated with application submission dates. The figure shows that monthly savings associated with initial applications were generally consistent during the program year. In February there was a spike in kWh savings due to one large project with expected savings of approximately 10,000,000 kWh. Similarly, in August and September there were several medium size projects, the average savings for those projects was close to 200,000 kWh.

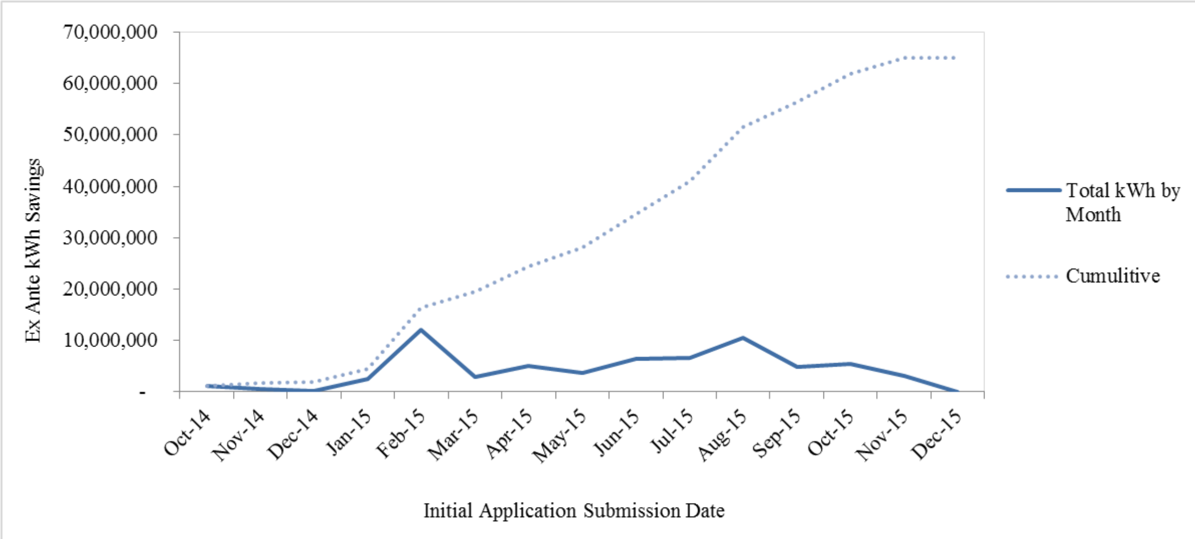


Figure 2-1 Monthly and Cumulative Ex Ante Savings by Initial Application Submission Date

Figure 2-2 displays the cumulative and monthly ex ante kWh savings associated with project end dates. The difference in the distribution of savings from savings associated with the initial application reflects the time typically required to complete custom projects. While submissions may occur throughout the year, project completions tend to cluster at the end of the program year.

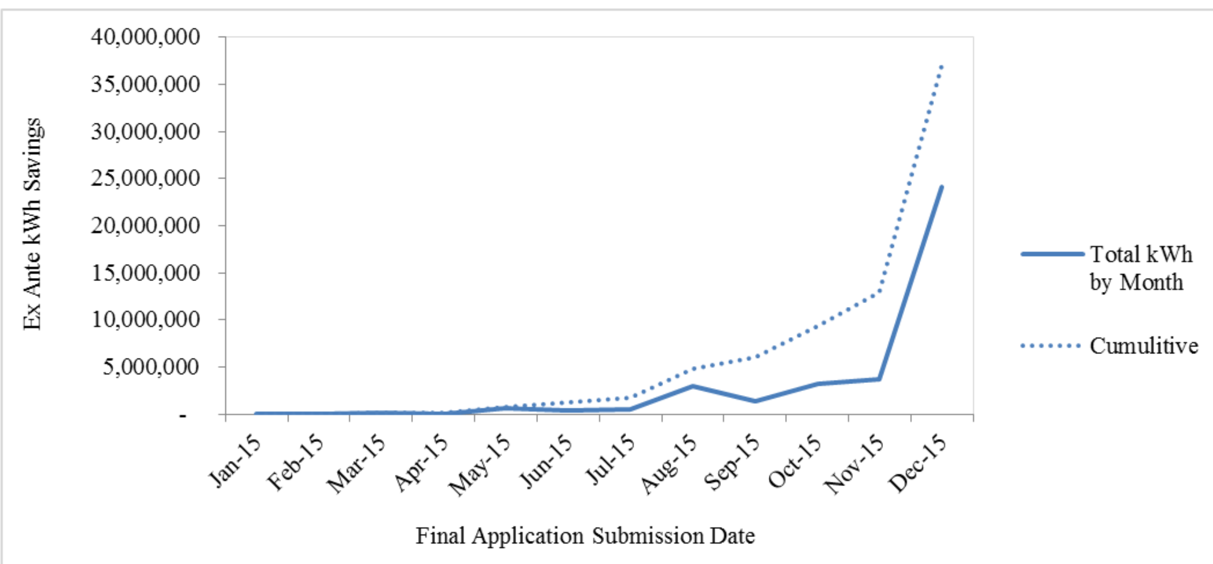


Figure 2-2 Monthly and Cumulative Ex Ante Savings by Project End Date

Table 2-13 provides a summary of projects by size as defined by ex ante kWh savings. Thirty-eight percent of ex ante savings was generated by four projects that exceeded 1,000,000 kWh of expected savings, while approximately 19% of savings was generated by projects that were less than 100,000 kWh but greater than 500,000 kWh in ex ante savings. Medium size projects between the size of 100,000 kWh and 500,000 kWh in ex ante savings accounted for 31% of PY6 Custom Program activity. Projects that were less than 100,000 kWh in ex ante savings accounted for 12% of overall program savings.

Table 2-14 Program Activity by Project Size

Project Size	*Count*	*Ex Ante kWh Savings*	*% of Ex Ante kWh Savings*
<100,000 kWh	138	4,325,487	12%
>100,000 kWh < 500,000 kWh	51	11,636,604	31%
>500,000 kWh < 1M kWh	10	7,058,429	19%
> 1,000,000 kWh	4	14,052,169	38%
Total	203	37,072,689	100%

2.5.4 Customer Outcomes

Telephone surveys were used to collect data on customer decision-making, preferences, and opinions of the C&I Custom Program. In total, 18 out of 95 participating customers responded to the survey, which represents a 19% response rate.

A large number of projects for which the primary contact was the same individual as the trade ally contact was found during the process of preparing the project tracking data for use in administering the participant survey. Specifically, for the custom program, 30% of projects listed the trade ally contact as the primary contact. To survey participating customers for the purpose of estimating net savings and garnering program feedback, it is important the program tracking data include customer-decision maker contact information.

2.5.4.1. Customers’ Business Sector and Program Awareness

Customers provided responses to several questions about their professional role, participating business sector, and I&M program awareness. One-third of decision makers surveyed identified themselves as engineers, one third identified themselves as a manager or facilities manager, and the remaining respondents identified themselves as business owners or maintenance personnel.

Survey respondents represent a variety of business sectors, as displayed in Figure 2-3. The industrial sector (39%) followed by business offices (17%) and higher education (11%) were the largest groups represented in the customer survey.

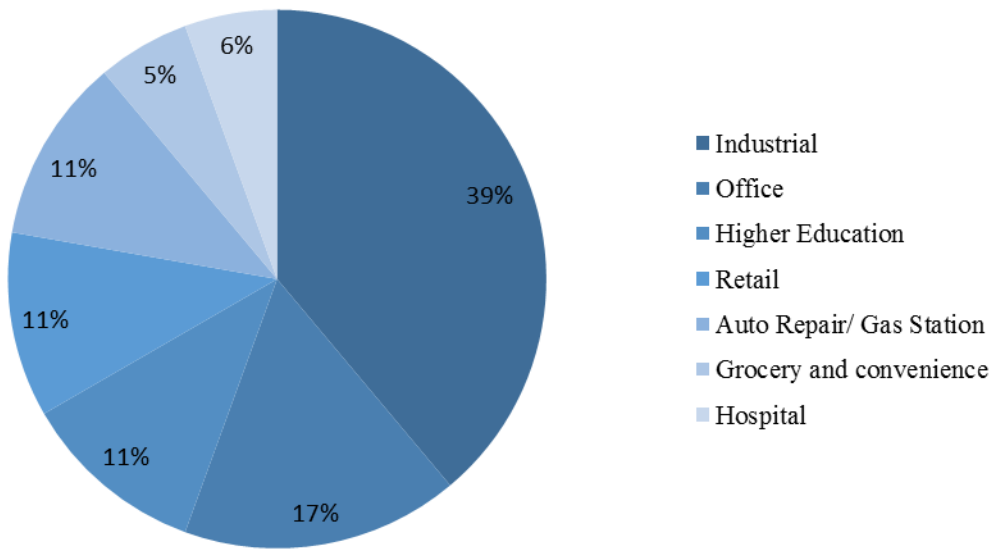


Figure 2-3 Customers' Business Sector

Respondents were asked how they first learned of I&M's Custom Program. Figure 2-4 displays these responses. Utility account representatives (28%) and friends or colleagues (22%) were the most frequent sources of awareness mentioned by respondents. Additionally, seventeen percent of respondents mentioned the I&M website, and 11% indicated they attended a public event or learned about the program from a program trade ally or contractor.

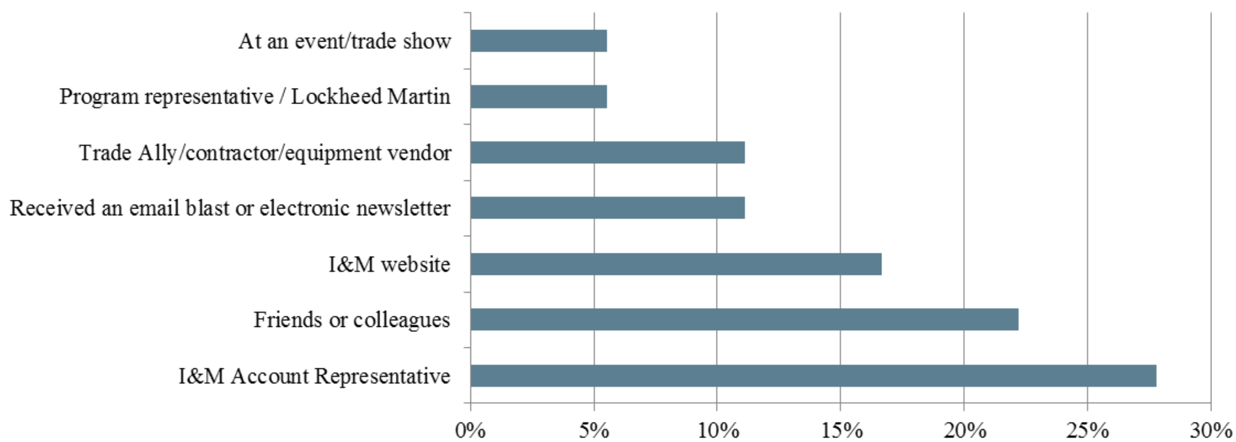


Figure 2-4 How Customers Learned about the Custom Program

Decision makers were asked who initiated the discussion about the program incentive opportunities. The responses were almost evenly split with 50% of respondents indicating they initiated the discussion, and 44% indicating the vendor or contractor initiated it.

These responses suggest that direct program outreach and word of mouth were important means by which customers learned of the programs. In comparison, contractor outreach and other forms of marketing were less influential for increasing program awareness. As such, the results indicate that there is an opportunity to grow the extent to which trade allies and other tradespeople promote the program incentives.

2.5.4.2. Organizational Policies and Decision Making

Custom Program participants were asked several questions about their organizations' internal energy efficiency policies, and other influences on their decision to install energy efficient equipment. The majority of respondents (67%) indicated their organization has a specific policy requiring that energy efficient options be considered when purchasing equipment, while just over half of the customers interviewed (10) stated their organization has a person responsible for managing the facility's energy use. Fewer indicated that their organization has either energy savings (44%) or carbon reduction goals (33%). These results indicate that the majority of project decision makers' energy efficiency decisions may be guided by internal purchasing requirements. However, these responses should not be interpreted as indicating low levels of program influence. While participants may have policies that guide them toward efficient equipment options, these organizations may also not have the funds to make those investments or access to information to inform efficient purchases, in the absence of program incentives.

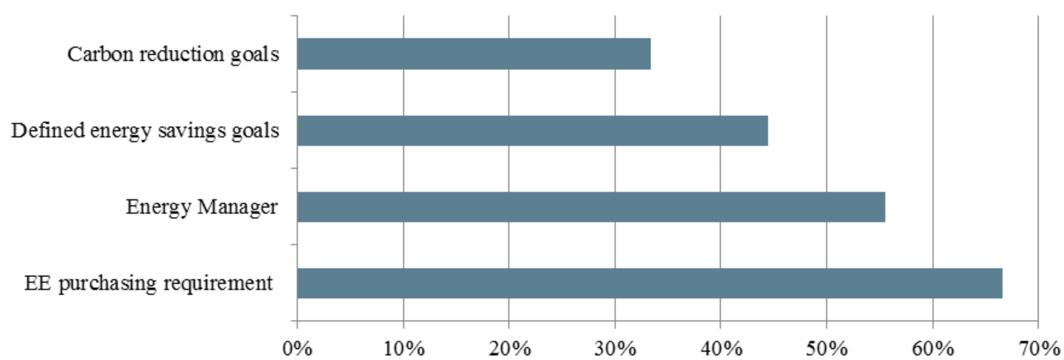


Figure 2-5: Internal Policies for Making Decisions about Energy Efficiency

Participants rated how various people affected their decision to install the energy efficient equipment on a scale of one to five where one meant the person had provided no input, and five meant the person provided critical input to their decision. Figure 2-6 below provides a summary of the results. Respondents most commonly rated vendors (29%) or utility staff or program representatives (27% for each) as providing critical input into their decision to install energy efficient equipment. The majority of program participants rated other market actors, contractors, architects and utility staff as a three or less, indicating they provided little to no input in their decision to install energy efficient equipment.

Only one Custom Program participant installed retro-commissioning measures. This participant indicted that only the contractor provided any input into their decision to install energy efficient equipment, and rated the contractor as providing critical input. The retro-commissioning sample size was not large enough to draw conclusive findings in this area.

Overall, customer feedback on who affected their decision to install energy efficient equipment indicates that program staff were successful at reaching customers and providing critical input for decision making.

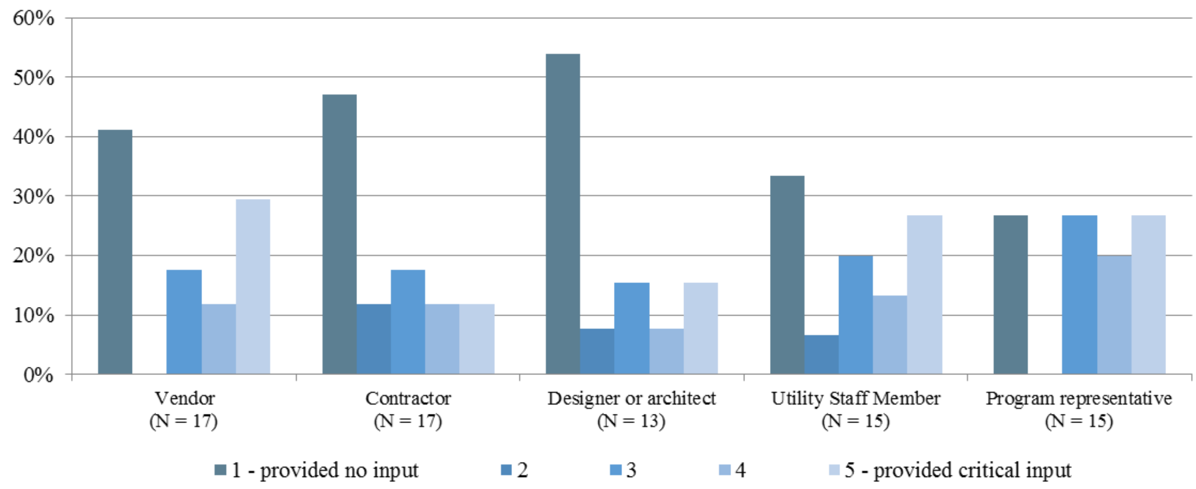


Figure 2-6 How Various People Affected the Decision to Install

2.5.4.3. Customers' Experience with the Custom Program Participation Process

Participants were asked a series of questions regarding their experiences with the application and participation process.

When asked who worked on completing the program application and collecting the required documentation, approximately 90% of respondents indicated a contractor or equipment vendor worked on the application with them. Eight-eight percent of decision makers that took the survey (14) submitted the application via email, while the other 13% indicted that the contractor submitted the application on their behalf. The feedback suggests that the respondents are well-positioned to comment on the participation process and application tool. The following section summarizes their feedback.

Participants were asked if they were required to resubmit or provide additional documentation after initial submission of the application before the application was approved. Eighty-three percent of respondents (15) stated no, and one stated yes. This finding suggests that application requirements were clear, and customers were aware of what supporting documentation to include as part of the application.

Respondents were asked to rate several factors about the application process on a five-point scale where a score of one meant completely unacceptable, and five meant completely acceptable. Figure 2-7 below summarizes these responses. When asked about the ease of finding forms on the I&M website, the majority of respondents (71%) rated it as either a 4 or 5. Four respondents provided a rating of 3, which indicates there may have been some level difficulty locating the forms for approximately 22% of respondents. Additionally, 93% of respondents rated the ease of using the electronic worksheets as acceptable or completely acceptable. This indicates that respondents are generally satisfied with the process of finding and using the application.

Most respondents (81%) stated that the time it took to complete the application was acceptable or completely acceptable. Similarly, most (75%) respondents rated the effort it took to provide supporting documentation as acceptable or completely acceptable. Although a majority of respondents stated the time and effort it took to complete the application was acceptable or completely acceptable, these two elements received more ratings of unacceptable than the other application aspects, suggesting that respondents found these elements of the application process to be less acceptable. Finally, 88% of respondents rated the overall application process was acceptable or completely acceptable. These results suggest that program participants find these program elements acceptable.

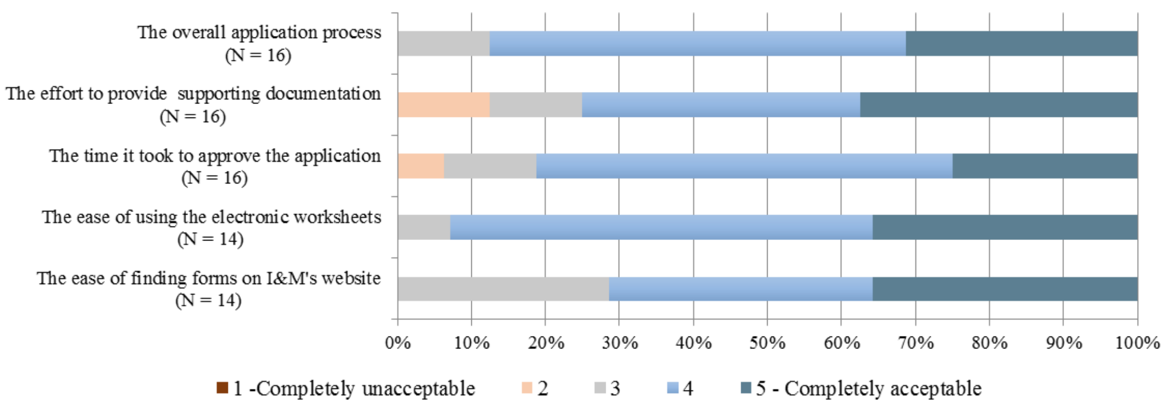


Figure 2-7 Customers' Experience with Application Process

Customers were asked to provide feedback regarding their experience with program staff. Of the 18 surveyed respondents, eleven (61%) indicated that the project was inspected by a program representative. These respondents were asked to rate the degree to which they agree with two statements regarding their experience with the inspector. Figure Table 2-15 provides a summary of the results. Ten of the eleven customers (91%) completely agreed that the inspector was courteous, and ten of eleven (91%) completely agreed the inspector was efficient.

Table 2-15 Customers' Experience with Inspector

Using the scale where 1 means you do not agree at all and 5 means you completely agree, please rate your agreement with the following statements:	*1 - do not agree at all*	*2*	*3*	*4*	*5 - completely agree*
The inspector was courteous	9%	0%	0%	0%	91%
The inspector was efficient	0%	0%	0%	9%	91%

Customers were then asked to rate their level of satisfaction with a series of program factors on a one to five scale where one meant completely dissatisfied and five meant completely satisfied.

Of the twelve respondents that had direct interactions with program staff, all indicated they were either satisfied or very satisfied with both how long it took program staff to address their questions, and how thoroughly program staff addressed their questions and concerns.

All respondents stated they were satisfied or very satisfied with the equipment that was installed, and the quality of the installation. Respondents were less satisfied with the steps to get through the program, and the amount of time to receive the rebate, both with 6% of respondents rating these factors as dissatisfying.

Respondents were least satisfied with the range of equipment that qualifies for the incentives, with 24% of respondents rating this factor as dissatisfying.

Eighty-three percent of respondents indicated they were either satisfied or very satisfied with the program overall. These results indicate that participants are satisfied with elements of the Custom Program.

Table 2-16 Customers' Satisfaction with the Custom Program

Program aspect	*1 - Very dissatisfied*	*2*	*3 - Neither satisfied nor dissatisfied*	*4*	*5 - Very satisfied*	*N*
How long it took program staff to address your questions or concerns	0%	0%	0%	50%	50%	12
How thoroughly [program staff] addressed your questions or concerns	0%	0%	0%	33%	67%	12
The equipment that was installed	0%	0%	0%	22%	78%	18
The quality of the installation	0%	0%	0%	38%	62%	13
The steps you had to take to get through the program	0%	6%	17%	28%	50%	18
The amount of time it took to get your rebate or incentive	0%	6%	24%	35%	35%	17
The range of equipment that qualifies for incentives	0%	24%	6%	29%	41%	17
The program overall	0%	6%	11%	44%	39%	18

2.5.4.4. Key Findings from Customer Survey

The following section summarizes key findings from the participant survey data collection and analysis effort.

- **Direct program outreach was the most common source by which customers learned about the Custom Program.** Respondents also indicated that program representatives and equipment vendors were influential in their decision to install energy efficient equipment.

- **Customers are generally very satisfied with the Custom Program**. This includes the application process, program staff interactions, the installed equipment, the participation process, and program offerings. Respondents were less enthusiastic about the time it took to receive the incentive payment.

2.5.5 Trade Ally Perspectives

Interviews were completed with twelve trade allies that completed incentive projects through both the Custom and Prescriptive Programs. To avoid redundancy, the findings of those interviews are summarized in the Prescriptive Program chapter.

2.5.6 Program Operations Perspective

The following section provides a detailed overview of the Custom Program operations developed from interviews with staff and reviews of program documentation. This section summarizes the roles and responsibilities of the staff responsible for managing program operations; the program design and any changes that have occurred; implementation procedures; communication between the utility and the implementation team; marketing and outreach; and successes and challenges from PY6. In closing, key findings will highlight the most salient themes from the program areas and research activities described above.

2.5.6.1. Staff Roles and Responsibilities

The evaluation team interviewed four key program personnel; three Lockheed Martin and one I&M staff member. The interviewees were asked to identify their roles and responsibilities with the I&M energy efficiency programs. The interviewees included one C&I DSM Programs Supervisor, one Marketing Manager, and two DSM Coordinators.

The C&I DSM Programs Supervisor oversees the implementation contractor, serves as the primary point of contact for approved contractors, and is responsible for customer outreach in I&M’s southern territory. The Marketing Manager fulfills a marketing oversight role for both the Residential and the C&I Programs. The two DSM Coordinators are responsible for customer outreach in the South Bend and Fort Wayne regions.

The implementation contractor took over as the single implementer for I&M’s portfolio of C&I Programs during PY6 (2015). Several changes in organizational structure took place as a result. The Lockheed Martin Program Manager from previous years is now the Sr. Program Manager, responsible for providing guidance related to program design and regulatory oversight. The new Program & Operations Manager handles the day to day operations and coordination of program delivery and also takes the lead on maintaining communication and collaboration with I&M. The Lockheed team also consists of one Marketing & Trade Ally Coordinator, two Project Coordinators, one full-time engineer and three field staff who reside in the I&M territory and work closely with the I&M DSM Coordinators.

During PY6, the marketing and outreach function was led by I&M and supported by the implementation contractor's Marketing & Trade Ally Coordinator. The implementation contractor is responsible for drafting, designing, and printing marketing collateral. I&M's marketing manager is responsible for approving those materials. Email campaigns, analytic tracking, website updates, and trade ally coordination are also handled by Lockheed Martin. Marketing materials, outreach events, and trade ally communication is discussed in greater detail in Section

2.5.6.2. PY6 Program Goals

Table 2-17 summarizes the goals and expected year-end savings for each of the three C&I programs. As shown, the plan filing goals split expected savings between the custom and standard programs such that approximately 75% of the savings would come from prescriptive projects and 25% from custom projects. The implementation contractor noted that their preferred design is a 60/40 custom/prescriptive split of the savings goals. However, the filed goals were revised midyear to roughly split the savings expectations equally between the custom and prescriptive programs. The revision was based on initial program activity and some of the changes made to the programs discussed below.

Table 2-17 PY6 C&I Program Energy Savings Goals

C&I Program	*2015 kWh Goals (Plan Filing)*	*2015 kWh Goals (Revised)*	*Gross Ex Ante kWh Savings*
C&I Custom	12,000,000	31,363,636	37,072,689
C&I Prescriptive	35,000,000	29,000,000	25,386,828
C&I SBDI	3,000,000	3,067,134	2,573,902

To accommodate these revisions to the goals, program budget funds were revised as well. I&M's policy regarding funds transfer within the C&I portfolio provides for movement of up to 25% of program funds to another program. This flexibility was particularly valuable during PY6 with the change in implementation contractor and program design that made forecasting program activity difficult. Implementation staff indicated that 2016 goals should be more aligned with expected savings for next year.

2.5.6.3. PY6 Program Changes

Multiple changes were made to the program design and materials. A key change was the removal of the $20,000 incentive limit, above which projects required approval from an oversight board. This change may assist with the recruitment of large custom projects. The current incentive caps are $150,000 per site, per year and $300,000 per company, per year.

Additionally, the program no longer tiered incentives based on project size and instead offered one flat incentive rate of $0.06 per kWh saved.

Prior to PY6, I&M offered a separate retro-commissioning program for these building optimization projects. In PY6, retro-commissioning projects were incentivized through the custom program. The program rules allow for the cost of the study to be included as part of the project cost. Counting study costs as part of the project cost is an important inclusion because the measures implemented as part of retro-commissioning costs are typically lower cost, while the cost of identifying the measures can be higher.

During PY6 a new application tool was implemented by Lockheed Martin. It is an Excel based tool that consolidates Custom, RCx, and Prescriptive measures into one workbook. Each worksheet tab collects information specific to the customer's project. The applicant inputs the parameters that define the pre- and post-installation operating conditions, the efficient equipment to be installed, and the project costs. Based on these inputs the application tool calculates the incentive amount, kWh savings and project payback for the customer. The proposed measure(s) will not receive an incentive if the minimum payback threshold of 12 months or a benefit/cost ratio of 1 is not met.

Implementation staff indicated they received positive feedback from trade allies about the new application. Staff believe the positive feedback is mostly related to the Excel platform because it is software that end-users and tradespeople are familiar with. Additionally, the application does not contain macros, enabling users to operate it without security concerns and to submit it by email, although, if desired, the application can also be printed and mailed or faxed to the implementation contractor. Utility staff also provided positive feedback about the new application, emphasizing that more information is now available to the customer so they can make decisions based on the initial investment and the long-term energy savings. Overall there was consensus among staff that the new application was a key success during PY6.

2.5.6.4. Quality Control and Quality Assurance Procedures

A customer interested in participating in the Custom Program was required to receive pre-approval prior to project start, regardless of the incentive level. Consistent with industry best practices, the rigor of the verification process varies as a function of project size and measure type. The following summarizes the level of rigor applied to reviewing and verifying projects of various sizes and types.

- If the incentive is less than $10,000 an engineering review is performed prior to the incentive offer and pre-inspections are not required. A random 10% of projects receive a post-inspection.
- If the incentive is more than $10,000 staff complete an onsite visual pre- and post-inspection.
- All non-lighting projects with savings of more than 500,000 kWh receive pre- and post-monitoring.
- Lighting projects with savings of more than 500,000 kWh receive pre- and post-monitoring on an as needed basis.

Figure 2-8 below depicts the process diagram for various stages of the Custom Program application and project review process provide by Lockheed Martin.[1]

Figure 2-8 Custom Program Application and Project Review Process

Inspections are guided by a form. The form is populated with specific project and contact information, and includes checklists for inspection staff to ensure appropriate documents are reviewed during the pre-inspection, and the database is updated during post-inspection. The inspection form also contains fields for staff to collect data regarding baseline equipment and equipment operating hours. Figure 2-9 below provides a screenshot of the bottom half of the inspection document where the technical information is recorded.

[1] Lockheed Martin, *AEP Indiana Michigan Power Program Abstract: Custom Program*, (2015).

CHECKLIST

Items to review prior to site inspection:

- ☐ Project Measures (submitted, approved, installed)
- ☐ Supporting documentation (Specs, Invoices...)
- ☐ Record Wall, Activities, and Closed Activities
- ☐ Coordinate with involved parties

Items to update after site inspection:

- ☐ LM-Captures Milestone Actual End Dates
- ☐ LM-Captures Record Wall Post - Summary
- ☐ LM-Captures Inspection Fields (Random Insp)
- ☐ Record/ Track Follow Up Requirements

RESULTS

Inspection Items

- ☐ *Baseline Equipment (Confirm type and consumption on application with installed equipment)*
- ☐ *Baseline Equipment Useful Life (Confirm remaining useful life of equipment - name plate information)*
- ☐ *Baseline Equipment Quantities Installed (Compare submitted quanities on project with installed equipment)*
- ☐ *Operating Hours (Confirm site operating hours align with application operating hours at the measure level)*
- ☐ *Efficient Equipment (Manufacture and model number on invoice/ specification sheets)*

Figure 2-9 PY6 C&I Inspection Form

As part of the gross savings analysis, the evaluation team performed desk reviews of all sampled projects. Most documentation was directly accessible through the program tracking system. However, larger files cannot be uploaded to the data tracking system and instead reside on the implementation contractor's servers. These documents were provided to the evaluators upon request.

A second documentation issue identified was that some of the project invoicing did not provide clear information on the quantities of lamps or fixtures for each specific measure type.

Lastly, evaluation staff indicated that project monitoring was not included with the documentation for which that data was collected. ADM recommends including monitoring data with the documentation package if it is collected.

2.5.6.5. Communication

The program team has a weekly scheduled conference call to discuss program activity, the status of savings and spending, as any issues pertaining to specific projects. The Program Manger provides the following reports for I&M's review: weekly program tracking data from the Lockheed Martin Captures, weekly summary of implementations activities and forecasts, and monthly scorecards. I&M staff indicated that generally the level and quality of communication between parties is sufficient, and the reporting protocols are well organized. The well-organized reporting facilitates higher levels of program oversight than what existed in previous years.

One area where the potential to improve coordination and communication may exist is in the execution of the program marketing function. Staff indicated that the I&M Marketing Manager provides marketing oversight for both the C&I and Residential Energy Efficiency Portfolios, totaling 11 programs. The Lockheed Martin Marketing Manager is responsible for reviewing, editing and approving all marketing collateral drafted by Lockheed Martin. However, the I&M Marketing Manager does not currently participant in the weekly calls with the implementation team. Lockheed Martin staff indicated there were multiple instances during PY6 when direct communication between I&M and Lockheed Martin Marketing staff would have been beneficial. Staff suggested that having direct access to the I&M Marketing department could help improve the cohesion of messaging, facilitate expansion of the marketing effort and speed up the approval process.

2.5.6.6. Marketing / Outreach

The marketing and outreach functions were shared between I&M and Lockheed Martin staff during PY6. Staff from both organizations indicated the level of collaboration among the groups was a major success. Lockheed Martin indicated their role is more administrative in nature in supporting the C&I programs.

Below is a summary of primary marketing and outreach activities Lockheed Martin is responsible for as part of implementing the Custom Program:

- Marketing collateral: Lockheed Martin marketing staff is responsible for designing and printing all approved newsletters, postcards and mailers.
- Managing email campaigns: Lockheed Martin designs all news blasts that inform customers and trade allies about the program offerings and changes throughout the year. Email campaign analytics are reported to I&M on an ad-hoc basis.
- Web messaging: Lockheed Martin contractor is responsible for copywriting all website material. This task involves coordinating with I&M web developers to design and implement the website messaging.
- Attending industry specific events: Lockheed Martin teamed up with several organizations throughout the year in an effort to deliver a more targeted message to specific sectors.

Table 2-18 provides a summary of the outreach events hosted by program staff during PY6, followed by a summary of email campaigns in Table 2-19.

Table 2-18 PY6 In-Person Events Hosted by Program Staff

Program	*Date*	*Title/Description*	*Location(s)/Purpose*
Custom/Prescriptive	3/25 - 3/26	M-Pact	Targeted custom and prescriptive customers in the gas station and convenience store sectors
Custom/Prescriptive	5/21	IN Association of School Business Officials Annual Meeting	Exhibited and had a speaking role. Targeted to the education sector.
Custom/Prescriptive	9/24	Facilities Maintenance Expo	Exhibited and had 2 speaking roles. Specially targeted to building operation staff, building owners/managers and contractors.
Custom/Prescriptive	November	Tri-State Compressed Air Events	Elkhart, South Bend- Invited by trade ally to speak to customers about program.
Custom/Prescriptive	NA	Graybar Event	Invited by trade ally to speak to customers about program.

Table 2-19: PY6 Email Campaigns

Program	*Date*	*Purpose*
All Programs	12/23/14	Initial Kick Off Invitation for 2015 TA Network
All Programs	1/10/15	TA Recruitment
All Programs	1/29/15	TA Winter Newsletter
All Programs	2/10/15	TA Recruitment
All Programs	3/19/15	Update to Measure List
All Programs	5/29/15	Update to Measure List
Prescriptive	6/17/15	Incentive Bonus
All Programs	7/6/15	TA Recruitment
All Programs	8/10/15	TA Summer Newsletter
All Programs	8/27/15	Increase to Incentive Cap
All Programs	10/7/15	Communicate upcoming deadlines
All Programs	10/12/15	End of push to have projects complete

In addition to these outreach events, the program engaged in direct customer outreach as well. A key component of the direct customer outreach was the program's strategy of targeting higher energy use customers. Implementation contractor staff used data provided by I&M to identify customers for targeted outreach.

I&M was responsible for most of the customer facing marketing and outreach during PY6. An important marketing channel utilized by I&M to communicate with C&I customers is the monthly Questline email newsletter. The newsletter provides (1) information and resources for customers to better understand facility energy usage, (2) conservation techniques, (3) routine maintenance advice and (3) information on how to take advantage of program incentives. I&M staff indicated that the newsletter is opened approximately 20% of the time.

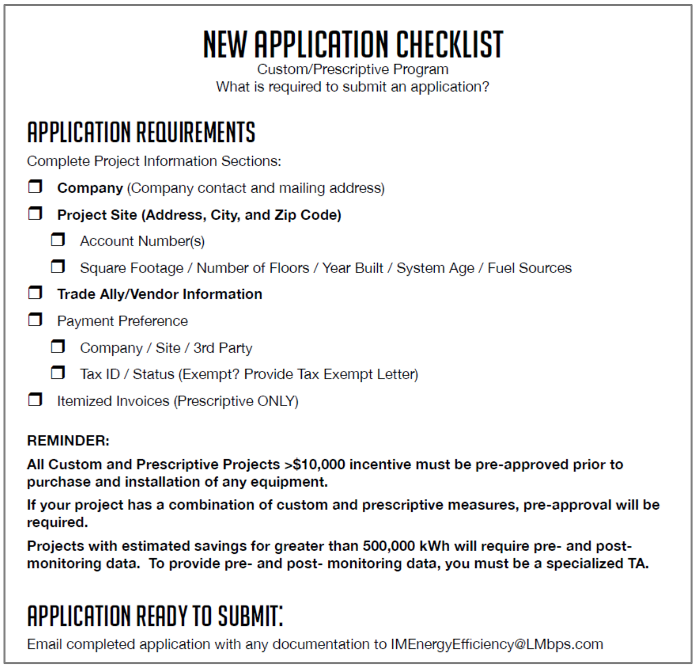
Program staff were also asked to provide suggestions on how the program could better reach non-residential customers through enhanced outreach, marketing, or through strategies to support trade ally efforts. Staff indicated that during 2016 the implementation team drafted a proposal that included expanding the current co-branding strategy to include apparel for trade allies; currently the only approved co-branding is digital. Program staff said the proposal was currently under review.

2.5.6.7. Trade Allies

An effort was made to increase the number of trade allies that are registered as part of the trade ally network. However, tradespeople do not need to be registered to submit projects for incentives.

To register as a trade ally, interested tradespeople complete a program application and are invited to attend a program sponsored event such as the kick-off meeting or a Trade Ally Breakfast. At these events contractors are provided instruction on the program participation process, energy efficiency equipment qualifications, and the value of collaborating with other contractors in the area. Registered trade allies can have their company information listed on the program website. All trade allies receive the monthly trade ally email newsletter and ad hoc emails regarding changes to the list of eligible measures, other program changes, and approaching deadlines.

Additionally, to support the administrative project enrollment and approval process, trade allies are provided a checklist that details all documents and customer data requirements that must be collected and submitted during the application, offer acceptance and completion. Figure 2-10 below provides a screenshot of the Custom and Prescriptive Program Application Checklist.



NEW APPLICATION CHECKLIST

Custom/Prescriptive Program
What is required to submit an application?

APPLICATION REQUIREMENTS

Complete Project Information Sections:

- ❒ **Company** (Company contact and mailing address)
- ❒ **Project Site (Address, City, and Zip Code)**
  - ❒ Account Number(s)
  - ❒ Square Footage / Number of Floors / Year Built / System Age / Fuel Sources
- ❒ **Trade Ally/Vendor Information**
- ❒ Payment Preference
  - ❒ Company / Site / 3rd Party
  - ❒ Tax ID / Status (Exempt? Provide Tax Exempt Letter)
- ❒ Itemized Invoices (Prescriptive ONLY)

REMINDER:

All Custom and Prescriptive Projects >$10,000 incentive must be pre-approved prior to purchase and installation of any equipment.

If your project has a combination of custom and prescriptive measures, pre-approval will be required.

Projects with estimated savings for greater than 500,000 kWh will require pre- and post-monitoring data. To provide pre- and post- monitoring data, you must be a specialized TA.

APPLICATION READY TO SUBMIT:

Email completed application with any documentation to IMEnergyEfficiency@LMbps.com

Figure 2-10: Customer & Prescriptive Program New Application Checklist

Overall, the program has sufficient resources for managing and engaging trade allies with the Custom Program. However, relatively little of the resources or information about the trade ally network are provide on the program website. Staff should consider offering a section for trade allies that includes the trade ally network application and participation requirements. The website can also be used to provide other resources such as copies of the trade ally newsletter and the application checklist.

2.5.6.8. Success and Challenges

One of the key successes noted by program staff was the collaboration on program outreach. Both the implementation contractor and I&M employ field staff to perform outreach in the service territory. Together they were able to target large usage customers and cover more geographic area than what could have been accomplished by any one team working independently. As a result, the program has increased expected energy savings and C&I customer awareness. Staff also indicated the 2016 pipeline already has several large projects, totaling approximately 8 GWh in expected savings.

The implementation contractor indicated that there they were allowed additional flexibility with program budgets, which allowed funds to be shifted between programs in response to program activity. Additionally, staff indicated greater flexibility to work with customers on adjusting incentive levels as project scopes changed. The flexibility allowed for investing staff time and resources in reviewing projects, supporting customers, and getting incentives paid.

All program staff interviewed thought the new application tool was one of the factors contributing to the success of the Custom and Prescriptive programs during PY6. Staff indicated they received positive feedback from contractors regarding the application.

The growth in the Trade Ally Network was also noted as a program success. The list of approved contractors grew to 75 by the end of the program year. Most participating contractors specialize in lighting, although there is a significant share of companies that offer HVAC and Refrigeration services as well. The trade allies are dispersed throughout the I&M service territory and are a mix of small local companies and firms that operate nationwide. The challenge moving forward will be to motivate trade allies to promote the program and get projects completed. Although new contractors are joining the trade ally, most have yet to produce a project.

Program staff was asked to comment on the challenges the program may face in 2016. Staff noted that the success of achieving significant momentum creates the difficulty of managing program budget funds throughout the program year. If funds are fully reserved, the program may have to advance year-end deadlines and bring the activity to a stop. There is concern that slowing momentum would create uncertainty in the market and would hamper the continuation of the program's success in 2017.

Another factor that may create a challenge noted by staff was competition from programs in adjacent service territories where incentives are slightly higher. Staff indicated that higher incentives in other territories may induce contractors to more heavily promote incentives in those locations and keep program success dependent on staffs' outreach efforts.

2.5.7 Summary of Conclusions and Recommendations

The following presents a selection of key conclusions from PY6:

- **The program exceeded its expected savings goal:** The expected electricity savings of the Custom Program equaled 37,072,689 kWh hours and exceeded the program goal of 31,363,636 kWh (118% of goal). Additionally, project savings were achieved from a diverse variety of project types. Sixty-two percent of program expected savings coming from a variety of non-lighting measures. In particular, compressed air projects accounted for a significant share of program savings (38%).
- **Multiple program changes:** In addition to the change in implementation contractor, the program changed multiple program aspects including discontinuing tiered incentives based on project size in favor of a flat incentive rate, a revised application form, and no longer requiring special approvals for projects with incentives that exceed $20,000.
- **Verification requirements and procedure are sufficient:** The verification processes and procedures in place are sufficient to reduce the risk of poor energy saving realization rates. Larger projects and those with more variable projects energy savings requiring higher levels of rigor such as pre-inspection and post-inspection and collection of monitoring data for all large non-lighting projects.
- **Program awareness driven by staff outreach efforts:** Two-thirds of survey respondents reported that they learned of the program from I&M account representatives, the program website, program representatives, and program marketing activities. By comparison, only 11% learned of the program through a trade ally or other tradesperson. This finding is consistent with program staff's characterization that trade

allies are not bringing a large share of the projects into the program and underscores the current importance of the program's efforts to promote the program with customers.

- **Utility and implementation staff working effectively together:** Discussions with program staff indicate that the implementation contractor and utility staff are effectively working together and collaborating on multiple aspects of delivering the program. One potential area for improvement is enhanced collaboration between the parties marketing teams. Direct communication between the marketing managers at I&M and Lockheed Martin may enable more efficient program delivery.
- **Program participants are satisfied with all elements of the program:** Customers are generally very satisfied with the Custom Program, which includes the application process, program staff interactions, the installed equipment, the participation process, and program offerings. Respondents were less enthusiastic about the time it took to receive the incentive payment.
- **Few problems with the application and project completion process:** The incidence of customers identifying aspects of the application process that were not acceptable was low. Customers were most likely to indicate that the time required for application approval and the effort to provide supporting documentation were most likely to be unacceptable, but the incidence of these reports were low and do not indicate a systematic program issue.
- **New application was well received:** Ninety-three percent of respondents rated the ease of completing the electronic worksheets as acceptable or completely acceptable. Interviewed trade allies also provided positive feedback on the application, noting that it is easy to use, convenient in that it combines all programs, provides useful financial information to discuss with clients, and provides an application completion checklist.
- **Robust resources for engaging trade allies and keeping them informed of the program:** The program hosts a number of outreach events and provides an email newsletter to keep trade allies informed about the program. Additionally, the program provides trade allies with marketing materials for use. However, the evaluators noted that little information on how to become a trade ally or available resources is provided through the program website. Additionally, multiple trade allies, including registered trade allies, reported that they were not receiving the newsletter. It is possible that emails are being blocked by network filters.
- **Trade Allies are generally satisfied with all elements of the program:** When asked about their satisfaction with elements of the program, trade allies were generally satisfied with all elements of the program.
- **Evaluation staff identified a few documentation issues:** During the course of completing the gross savings analysis, ADM encountered a few documentation issues including invoicing that did not have clear counts of specific measures installed and projects for which collected monitoring data was not included with the initial project documentation.

ADM offers the following recommendations for consideration:

- **Consider adding a statement to the application form that states that invoicing needs to clearly state quantities of specific measures.**
- **Consider including any collected monitoring data in the project documentation file.**
- **Consider adding a section to the program website that provides information and resources to trade allies including the trade ally registration application form, copies of past newsletters, and other documents provided to assist trade allies.**
- **Consider advising registered trade allies to add the program email newsletter email address to the safe sender list.**
- **Consider enhanced collaboration between utility and implementer marketing teams to the extent feasible.**
- **Ensure that customer decision-maker contact information is collected and provided to the evaluator.** Review of the program tracking data indicated that a significant share of projects that listed the trade ally as the primary contact.

3. Commercial and Industrial Prescriptive 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 Prescriptive Program during the period January 2015 through December 2015. Appendix A contains specific methodologies for estimating gross savings and savings estimation results for each project.

3.1 Methodology for Estimating Gross Savings

The methodology used for estimating gross savings is described in this section.

3.1.1 Sampling Plan

Data used to estimate the gross savings achieved through the C&I Prescriptive Program were collected for samples of projects completed during the period January 2015 through December 2015. Data provided by the implementation contractor and utility showed that during PY6, there were 429 projects completed, which were expected to provide savings of 25,386,828 kWh annually.

Inspection of data on kWh savings for individual projects provided by 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 ±9.5%.

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 3-1 Population Statistics Used for C&I Prescriptive Sample Design

	Stratum 1	*Stratum 2*	*Stratum 3*	*Stratum 4*	*Stratum 5*	*Totals*
Strata boundaries (kWh)	< 33,000	30,000 – 104,999	105,000 – 299,999	300,000 – 799,999	>800,000	
Number of projects	281	98	40	8	2	429
Total kWh savings	3,596,866	5,587,844	6,557,993	4,052,220	5,591,905	25,386,828
Average kWh Savings	12,800	57,019	163,950	506,528	2,795,953	59,177
Std. dev. of kWh savings	8,897	19,425	42,755	210,200	2,187,742	231,060
Coefficient of variation	0.70	0.34	0.26	0.41	0.78	3.90
Final design sample	10	6	5	5	2	28

The sampled projects account for approximately 37% of total expected kWh savings. Total and sample ex ante savings are summarized by stratum in Table 2-2.

Table 3-2 Expected Savings Sampled Projects by Stratum

Stratum	*Sample Ex Ante Savings*	*Total Ex Ante Savings*
5	5,591,905	5,591,905
4	2,566,305	4,052,220
3	762,451	6,557,993
2	403,610	5,587,844
1	132,945	3,596,866
Total	9,457,216	25,386,828

3.1.2 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.

3.1.3 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.

3.1.4 Procedures for Estimating Savings from Measures Installed through C&I Prescriptive 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
- Refrigeration and Controls

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 3-3 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
Motors and VFDs	Measurements of power and run-time obtained through monitoring
Refrigeration	Indiana TRM; doors, controls and operating parameters verified on-site. Simulation utilizing DEER prototypical models used for refrigerated case door retrofits.

Two estimates of gross savings are summarized each project: an ex ante gross savings estimate, as provided from the implementation contractor, and an ex post gross savings estimate. The savings realization rate for a project is calculated as the ratio of the 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 each measure category. 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:

$$\text{Peak Demand Savings} = \sum \left(kW_{before} - kW_{after}\right) / 14$$

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 Motors and VFDs: A variable-frequency drive (VFD) is an electronic device that controls the speed of a motor by varying the magnitude of the voltage, current, or frequency of the electric power supplied to the motor. The factors that make a motor load a suitable application for a VFD are (1) variable speed requirements and (2) high annual operating hours. The interplay of these two factors can be summarized by information on the motor's duty cycle, which essentially shows the percentage of time during the year that the motor operates at different speeds. The duty cycle should show good variability in speed requirements, with the motor operating at reduced speed a high percentage of the time.

Potential energy savings from the use of VFDs are usually most significant with variable-torque loads, which have been estimated to account for 50% to 60% of total motor energy use in the non-residential sectors. Energy saving VFDs may be found on fans, centrifugal pumps, centrifugal blowers, and other centrifugal loads, most usually where the duty cycle of the process provided a wide range of speeds of operation.

ADM's approach to determining savings from installation of VFDs involves (1) making one-time measurements of voltage, current, and power factor of the VFD/motor and (2) conducting continuous measurements of amperage over a period of time in order to obtain the data needed to develop VFD load profiles and calculate energy savings. VFDs are generally used in applications where motor loading changes when motor speed changes. Consequently the true power drawn by a VFD is recorded in order to develop VFD load shapes. One-time measurements of power are made for different percent speed settings. Power and percent speed or frequency (depending on VFD display options) are recorded for as wide a range of speeds as the customer allows the process to be controlled; field staff attempt to obtain readings from 40 to 100% speed in 10 to 15% increments.

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 utilized the Indiana TRM, which provides deemed values for system demand, energy savings factor, and bonus factor for additional savings from reduced cooling loads.

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.

ADM utilized DEER's prototypical model for grocery stores to determine energy savings for refrigerated case door retrofits. The baseline model assumes that the medium temperature cases are without doors, while the as-built model assumes doors are in place. The addition of doors is taken into consideration by reducing the infiltration rate into the refrigerated cases. The baseline and as-built infiltration rates are based upon ASHRAE's "Infiltration by Direct Flow through Doorways" calculation methodology, which can be seen on Page 13.8 in 2006 ASHRAE Handbook Refrigeration. The models were run using TMY3 weather data from the customer's location, in which savings was normalized to foot of door installed.

3.2 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 26 projects completed during the program year. The results of the analysis are reported in this section.

3.2.1 Gross kWh Savings

The gross kWh savings of the C&I Prescriptive Program during the period January 2015 through December 2015 are summarized in Table 2-4. The achieved gross savings of 23,189,931 kWh are equal to 91% of the ex ante savings.

Table 3-4 Gross kWh Savings for C&I Prescriptive Program

Ex Ante Gross kWh Savings	*Gross Audited kWh Savings*	*Gross Verified kWh Savings*	*Ex Post Gross kWh Savings*	*Gross Realization Rate*
25,386,828	25,386,828	25,071,645	23,189,931	91%

Gross kWh savings are summarized by sampling stratum in Table 2-5. For PY6, audited savings were equal to ex ante savings, as there were no issues found in ex ante tracking data. Ex ante, verified and ex post kWh savings are shown in Table 2-6 for each project sampled in PY6.

Table 3-5 Gross kWh Savings by Sample Stratum

Stratum	*Ex Ante kWh Savings*	*Verified kWh Savings*	*Ex Post kWh Savings*	*Gross Realization Rate*
5	5,591,905	5,625,782	4,939,894	88%
4	4,052,220	3,883,475	4,378,671	108%
3	6,557,993	6,557,993	5,718,146	87%
2	5,587,844	5,587,844	5,003,848	90%
1	3,596,866	3,416,551	3,149,371	88%
Total	25,386,828	25,071,645	23,189,931	91%

Table 3-6 Gross kWh Savings for C&I Prescriptive Program by Sampled Project

Project ID	*Ex Ante kWh Savings*	*Verified kWh Savings*	*Ex Post kWh Savings*	*Project Gross Realization Rate*
1011	166,738	166,738	164,649	99%
1059	638,307	616,325	687,732	108%
1078	8,256	8,256	5,414	66%
1096	4,574	4,574	2,950	64%
1098	27,968	27,968	15,671	56%
1152	267,300	267,300	262,591	98%
1199	1,185	1,185	832	70%
1210	148,641	148,641	112,558	76%
1213	341,817	341,817	388,313	114%

1222	9,146	9,146	12,290	134%
1227	93,600	93,600	42,988	46%
1228	78,000	78,000	89,995	115%
1248	10,815	9,734	13,004	120%
1252	179,772	179,772	125,010	70%
1260	79,771	79,771	84,517	106%
1268	73,880	73,880	68,541	93%
1275	787,334	702,448	789,223	100%
1278	10,793	10,793	11,738	109%
1291	30,495	30,495	28,426	93%
1296	14,241	6,891	7,563	53%
1324	17,239	17,239	18,517	107%
1325	34,320	34,320	44,014	128%
1349	44,039	44,039	31,373	71%
1377	1,282,862	1,282,862	1,180,025	92%
1385	798,847	798,847	907,781	114%
1398	4,342,920	4,342,920	3,759,869	87%
All Non-Sample Projects	15,893,968	4,719,071	14,334,347	90%
Total	25,386,828	14,096,632	23,189,931	91%

3.2.2 Gross Peak kW Savings

The achieved gross peak demand kW reductions of the C&I Prescriptive Program during the period January 2015 through December 2015 are 3,811 kW.

3.3 Results of Net Savings Estimation

To estimate net impacts for the program, data were collected and analyzed for nineteen 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 Custom and Prescriptive Programs, while Appendix D contains the decision maker survey results for the Prescriptive Program.

3.3.1 Ex Post Net kWh Savings

The data used to assign free ridership scores were collected through a customer survey of 33 customer decision makers for projects completed during the period January 2015 through December 2015. However, responses from two respondents were removed from the analysis because they did not provide answers to key questions used in the determination of free ridership.

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 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 Program?” a free ridership score of 0 was assigned to the project. That is, if a participant required financial assistance from the C&I 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 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 3-7 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*
86%	4%	9%	19%	11%

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. Eleven 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 3-8 Estimated Free-ridership for kWh Savings from C&I Prescriptive Program

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	N	N	N	44%	0%
N	N	Y	N	19%	0%
N	N	N	Y	11%	33%
N	Y	N	N	9%	33%
Y	N/A	N	N	4%	100%
Required program incentive to implement measures.				14%	0%
Total				100%	11%

None of the survey respondents reported that additional measures that qualified for 2015 spillover savings were installed.

The ex post energy savings of the C&I Prescriptive Program during the period January 2015 through December 2015 are summarized in Table 2-10. During this period, ex post net energy savings for the program totaled 20,715,700 kWh. The net-to-gross ratio for the C&I Prescriptive Program is 89%.

Table 3-9 Summary of kWh Savings from C&I Prescriptive Program

Ex Ante kWh Savings	*Ex Post Gross kWh Savings*	*Free Ridership*	*Spillover*	*Ex Post Net kWh Savings*	*Net to Gross Ratio*
25,386,828	23,189,931	2,474,230	0	20,715,700	89%

3.3.2 Ex Post Net Peak kW Savings

The ex post net peak kW reductions of the C&I Prescriptive Program during the period January 2015 through December 2015 are summarized in Table 2-11. The ex post net peak demand reductions for the program total 3,407 kW.

Table 3-10 Summary of Peak kW Savings from C&I Prescriptive Program

Ex Post Gross Peak kW Savings	*Free Ridership*	*Spillover*	*Ex Post Net Peak kW Savings*	*Net to Gross Ratio*
3,811	405	0	3,407	89%

3.4 Process Evaluation

This section presents the results of the process evaluation for Indiana Michigan Power's (I&M) C&I Prescriptive Program during PY6. The purpose of the process evaluation is to assess aspects of the program design, delivery, and impact to determine how effectively it is achieving its intended outcomes. Process evaluation activities included a review of program documentation, a survey of program participants, and interviews with program staff. 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.

3.4.1 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 PY6 activity include:

Did the C&I Prescriptive Program achieve its energy savings goal?

Was the C&I Prescriptive Program delivery effective and efficient?

Were participants satisfied with the program and the equipment they installed?

What changes will occur in PY7?

During the evaluation, data and information from multiple sources were analyzed to achieve the stated research objectives. Insight into the customer experience with the C&I Prescriptive Program was developed from a survey of program participants. 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.

3.4.2 Summary of Primary Data Collection

- **Participant Surveys:** Participant surveys were the primary data source for several components of this process evaluation, and serve as the foundation for understanding the customer perspective. The participant surveys provided customer feedback and insight regarding customer experiences with the C&I Prescriptive Program. Respondents reported 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. Thirty-three decision makers completed the survey.

- **Interviews with I&M Staff Members:** Interviews with I&M staff members 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.

- **Interviews with Trade Allies:** Interviews were completed with 12 trade allies that completed projects through the program. Interview respondents provided their perspectives on the design of the program, the program procedures, and its support of trade allies.

- **Interviews with Lockheed Martin Staff**: Lockheed Martin took over the implementation of the C&I Prescriptive Program in 2015 (PY6). Interviews were completed with four Lockheed Martin staff to better understand how the program will evolve in 2015 and learn about future plans to improve the program's operational efficiency.

3.4.3 C&I Prescriptive Program Activity

The evaluation team reviewed program tracking data to assess the range of measure types implemented through the Prescriptive Program during PY6. Table 3-11 displays a summary of PY6 Prescriptive Program ex ante kWh savings by measure category. Lighting measures accounted for 86% of kWh savings during 2015. Variable frequency drives (VFDs) accounted for 10% of program savings, followed by refrigeration (3%) and commercial kitchen equipment (0.2%).

Table 3-11 Prescriptive Program Activity by Measure Category

Measure Category	*Total kWh Savings per Measure Category*	*Total Incentive per Measure Category*	*Percent of Savings*
Lighting	21,993,436	$1,230,628	87%
VFD	2,547,768	$46,690	10%
Refrigeration	791,998	$26,488	3%
Commercial Kitchen	53,626	$4,670	<1%
Total	25,386,828	$1,326,593	100%

Ex ante kWh savings by building type in shown in Table 3-12. Industrial businesses accounted for the majority of Prescriptive Program ex ante kWh savings (41%), followed by healthcare (11%), lodging (10%) and education (9%).

Table 3-12 Project Savings by Business Type

Building Type	*kWh Savings*	*Percent of Savings*
Industrial	10,351,537	41%
Healthcare	2,862,658	11%
Lodging	2,511,777	10%
Education	2,399,099	9%
Retail	1,954,835	8%
Government	1,319,793	5%
Grocery and Convenience	769,646	3%
Office	767,597	3%
Warehouse	748,822	3%
Entertainment/Recreation	512,862	2%
Automotive Services	458,453	2%
Food & Beverage Service	454,344	2%
Gas Station	203,555	1%
Faith-Based	71,850	0%
Total	25,386,828	100%

Figure 3-1 displays the cumulative and monthly ex ante kWh savings associated with application submission dates. The figure shows that monthly savings associated with initial applications were generally consistent during the program year. In August there was a spike in kWh savings. This spike in activity may have been due to a bonus incentive period that increased incentives by $0.01 per kWh saved for projects completed by the end of September.

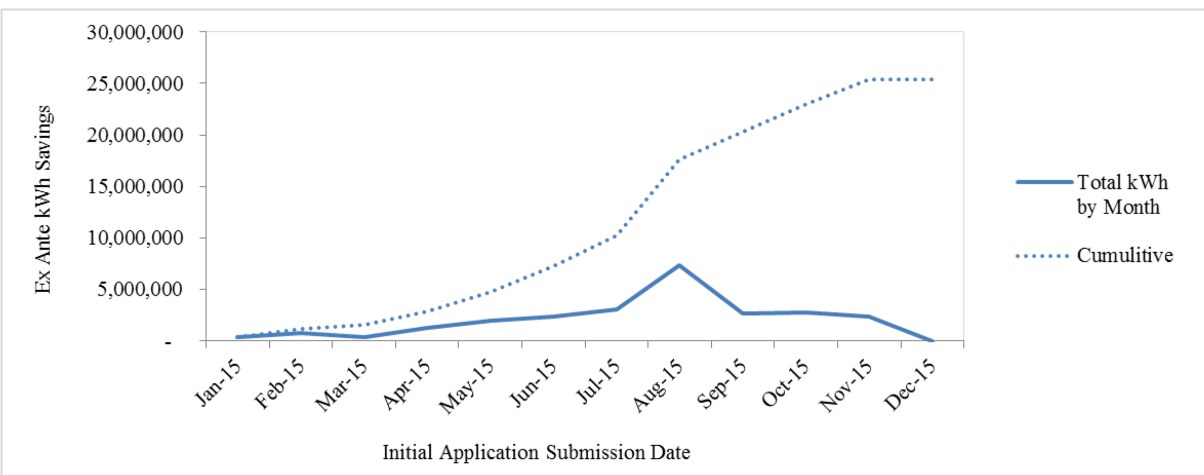


Figure 3-1 Monthly and Cumulative Ex Ante Savings by Initial Application Submission Date

Figure 3-2 displays the cumulative and monthly ex ante kWh savings associated with project end dates. During the Q1 through Q2 period, program savings accumulated at a slow rate, with the first incentive being paid out in March. The Prescriptive Program picked up momentum over the summer and activity accelerated through the end of the program year.

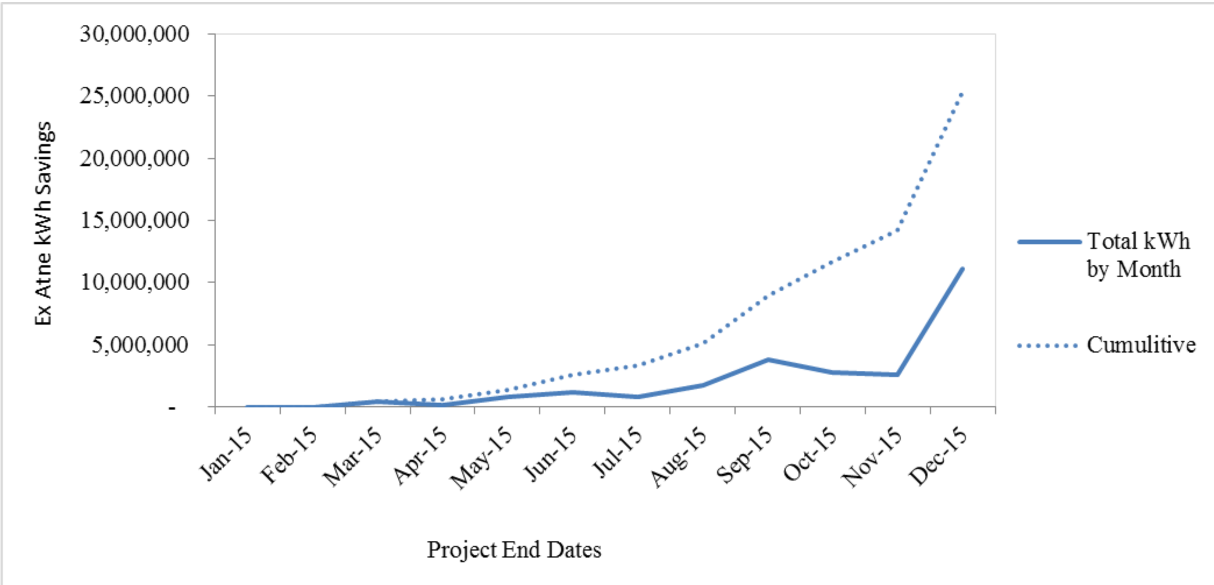


Figure 3-2 Monthly and Cumulative Ex Ante Savings by Project End Date

Table 3-13 provides a summary of projects by size as defined by ex ante kWh savings. As is typical of prescriptive programs, a large share of the projects was composed of relatively small projects. Eighty-eight percent of projects generated less than 100,000 kWh in savings and accounted for 35% of ex ante savings. Another 35% of Prescriptive Program ex ante savings was generated by 49 projects that were less than 500,000 kWh and more than 100,000 kWh. Twenty-two percent of savings were generated by two large projects that exceeded 1,000,000 kWh in ex ante kWh energy savings.

Table 3-13 Program Activity by Project Size

Project Size	*Count*	*Ex Ante kWh Savings*	*% of Ex Ante kWh Savings*
<100,000 kWh	378	8,774,932	35%
>100,000 kWh < 500,000 kWh	49	8,795,503	35%
>500,000 kWh < 1M kWh	3	2,224,488	9%
> 1,000,000 kWh	2	5,591,905	22%
Total	432	25,386,828	100%

3.4.4 Customer Outcomes

Telephone surveys were used to collect data on customer decision-making, preferences, and opinions of the C&I Prescriptive Program. In total, 33 out of 175 customers responded to the survey, which represents a 19% response rate.

A large number of projects for which the primary contact was the same individual as the trade ally contact was found during the process of preparing the project tracking data for use in administering the participant survey. Specifically, for the Prescriptive Program, 26% of projects listed the trade ally contact as the primary contact. To survey participating customers for the purpose of estimating net savings and garnering program feedback, it is important the program tracking data include customer-decision maker contact information.

3.4.4.1. Customers' Business Sector and Program Awareness

Customers provided responses to several questions about their role, their participating business sector, as well how they learned about the incentive opportunities offered through I&M. Twenty-four percent (8) of respondents identified themselves as the President/CEO, followed by 21% (7) of respondents identified as a Director or Facilities Manager, and 18% (6) who identified as a General Manger. Other job titles were mentioned such as Finance, Engineer, and Proprietor however not as frequent as CEO, Director or General Manager.

Survey respondents represent a variety of business sectors, as displayed Figure 3-3. The industrial sector (19%) was most widely represented, followed by retail (15%), office buildings (15%) and churches (15%).

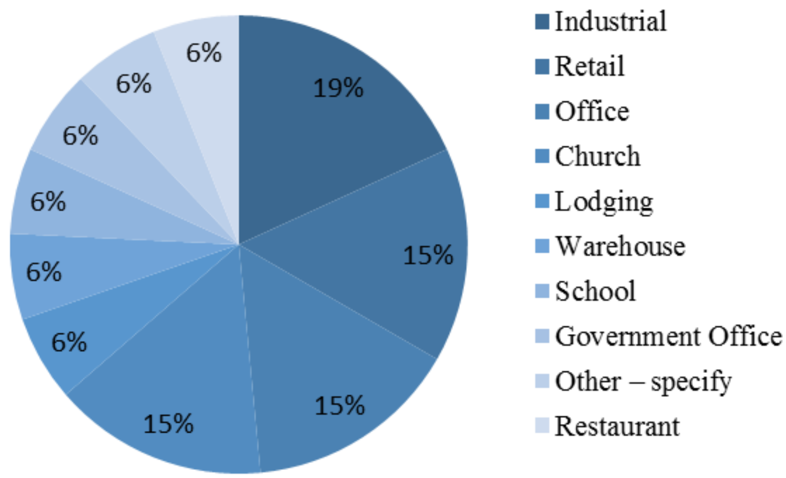


Figure 3-3 Customers' Business Sector

Respondents were asked how they first learned of I&M's Prescriptive Program. Figure 3-4 the results. Utility account representatives (30%) and contractors (27%) were most frequently mentioned by respondents. Twelve percent of respondents mentioned friends or colleagues, while the remaining customers indicated they learned about the program through I&M website (9%), informational brochures (6%), advertisements (6%), program representatives (3%), or a public event (3%). Next, decision makers were asked who initiated the discussion about the program incentive opportunities. The responses were evenly split with 30% of respondents indicated they initiated it while 33% indicated the vendor or contractor initiated it and 15% indicated the idea arose in discussion between their organization and the contractor.

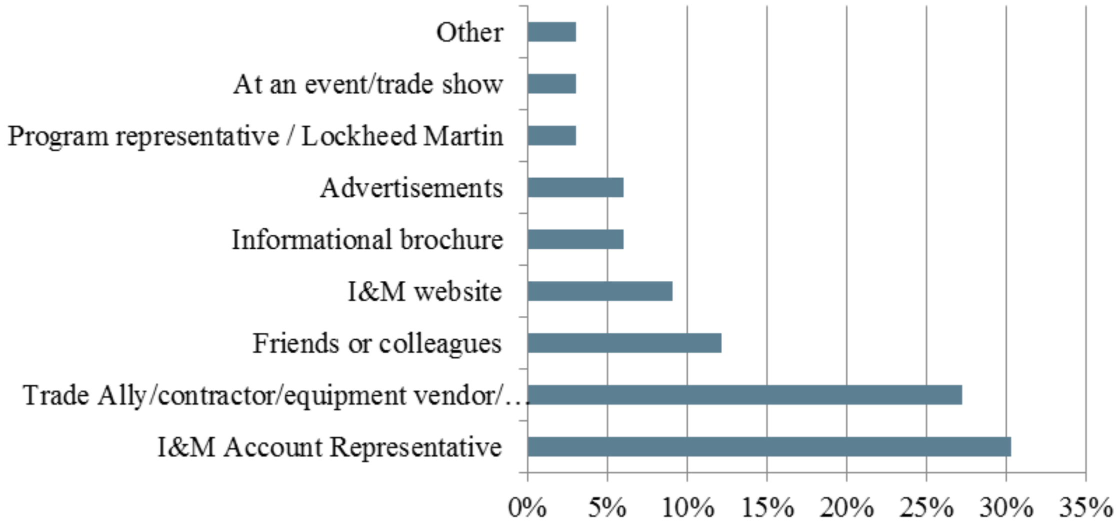


Figure 3-4 How Customers Learned about the Prescriptive Program

Customers were asked a series of questions designed to collect data on their level of awareness with regards to the other two Commercial and Industrial Programs offered by I&M. When asked "In addition to the incentives for specific prescriptive equipment upgrades you received, did you know you could qualify for incentives by proposing a custom energy-upgrade?" Seventeen respondents (52%) indicated they were aware of custom incentives, while 16 (48%) were unaware. The 17 respondents that were aware of the custom incentives were asked why they chose the prescriptive incentive route. The majority of respondents (29%) indicated that all the equipment they were interested in was listed on the Prescriptive application or simply did not know (24%). Other respondents indicated the application was too complicated (12%), or they did not want to complete another application (6%). Other open-ended responses for not choosing the custom application were:

"[The Prescriptive application] was just too easy."

"[The Custom path] wasn't beneficial for us."

3.4.4.2. Organizational Policies and Decision Making

Prescriptive Program participants were asked about their organizations' internal energy efficiency policies and who influenced their decision to install the energy efficient equipment, Figure 3-5 displays the results. The majority of respondents (55%) indicated their organization has a specific policy requiring that energy efficiency be considered when purchasing equipment, 48% indicated they have defined energy savings goals, 42% have an person responsible for managing energy use, and 21% of customers' organizations have energy savings goals. The results indicate the majority of project decision makers are Presidents/CEOs or Facilities Directors whose energy efficiency decisions are guided by internal purchasing requirements and/or defined energy savings goals.

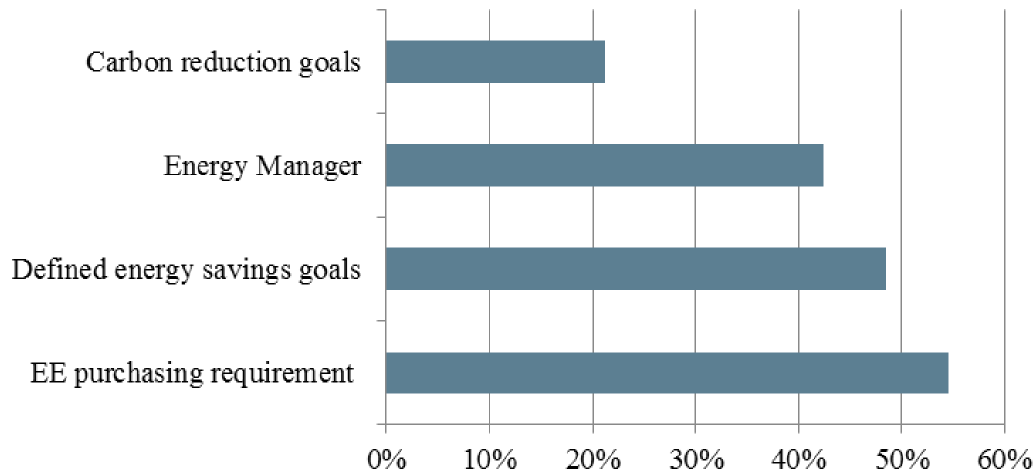


Figure 3-5 Internal Policies for Making Decisions about Energy Efficiency

Next participants were asked how various people affected their decision to install the energy efficient equipment by rating that person's effect on a scale of 1 to 5. Figure 3-6 below provides a summary of the results. The data shows that 47% of respondents indicated that the equipment vendor and contractor (36%) provided the most valuable input into their decision to install energy efficient equipment, followed by program representatives. Utility staff and architects were consistently rated a 1 or 2, suggested they had little to no input in the customer's decision to install the energy efficient equipment.

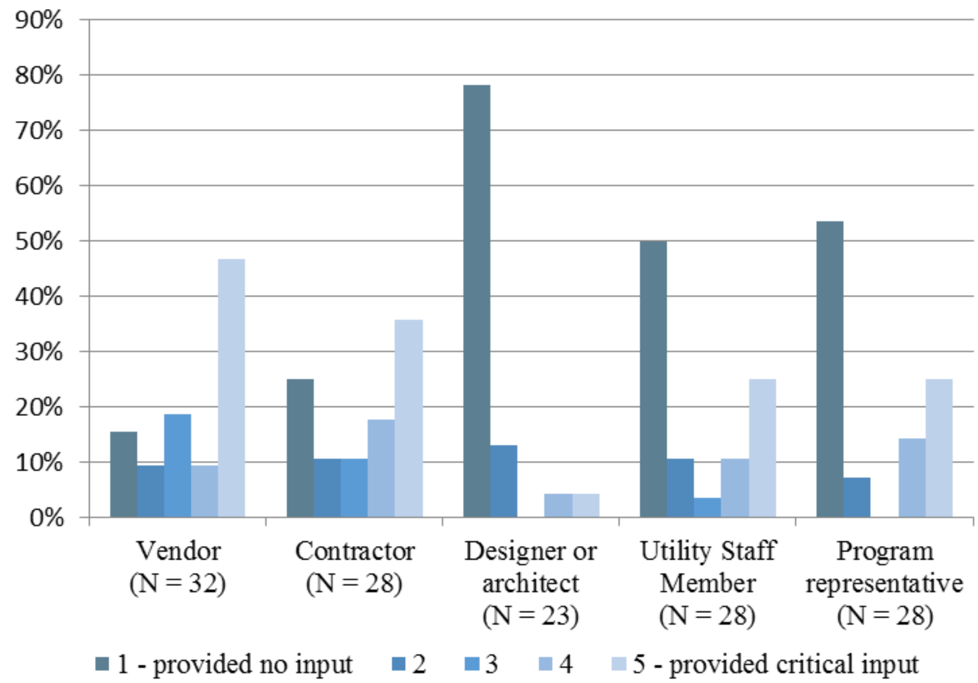


Figure 3-6 How Various People Affected the Decision to Install

3.4.4.3. Customers' Experience with the Prescriptive Program Participation Process

Participants were asked a series of questions regarding the application and participation process. This feedback can be used to further refine the application tool and identify program areas that could be improved upon.

When asked who worked on completing the program application and collecting the required documentation, the majority of respondents (73%) indicated they worked on it, respondents were allowed to choose multiple responses. Twenty-seven percent indicated someone else in their organization worked on the application, 39% referenced their contractor, 48% referenced their equipment vendor, and 9% indicated their architect or building designer worked on the program application. Eighty-three percent of decision makers that took the survey (20) submitted the application via email, online or my mail. The feedback suggests that the respondents are well-positioned to comment on the participation process and application tool. The following section summarizes their feedback.

Participants who indicated they worked on the application, 24 in total, were asked to rate the clarity of information on how to complete the application using a scale where 1 means not at all clear and 5 means completely clear. Table 3-14 below summarizes the results. Sixty-three percent of respondents provided a rating of a 4 or 5, while 25% provided a rating of 3 or lower. Respondents were also asked if they had a clear sense of who to go to for assistance with the application process. Eight-eight percent said yes. The feedback suggests the application instructions were clear and the majority of participants knew who to go to for assistance in needed.

Table 3-14 Clarity of Information on How to Complete the Application

	Response	*(n=24)*	*Percent of Respondents*
Thinking back to the application process, please rate the clarity of information on how to complete the application using a scale where 1 means not at all clear and 5 means completely clear.	1 - not at all clear	1	4%
	2	1	4%
	3	4	17%
	4	10	42%
	5 - completely clear	5	21%
	Don't know	3	13%

Customers were next asked to rate various aspects of the application process using scale where 1 indicates completely unacceptable and 5 indicates completely acceptable. Figure 3-7 below summarizes customers' feedback. Customers were asked about the ease of finding forms on the I&M website. The majority of respondents (94%) rated this as either a 4 or 5. The rating for the ease of use regarding the use of the electronic worksheets was slightly higher, with 100% of customers indicating it was acceptable or completely acceptable.

The time it took to complete the application was rated as a 4 or 5 by 82% of participants, while 18% of customers provided a rating of 2 or 3. The effort to provide documentation was rated similarly, with 72% of respondents providing a 4 or 5 rating and 22% giving this element a 2 or 3. It must be noted that the majority of respondents rated the required effort as a 4 or 5, this aspect of the application received lower ratings than all other application aspects that were asked about. In conclusion, 83% of respondents indicated the overall application process was acceptable to completely acceptable.

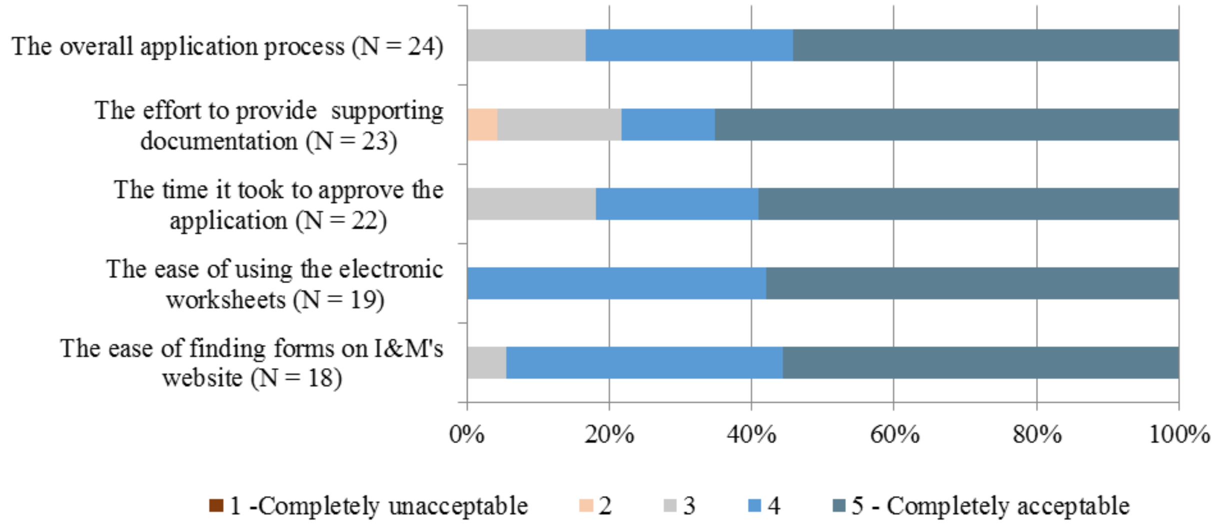


Figure 3-7 Customers' Experience with Application Process

Customers were asked to provide feedback regarding their experience with program staff. Of the 33 surveyed respondents, 13 (39%) indicated that the project was inspected by a program representative. Twelve of these respondents responded to questions about the degree to which they agree with two statements regarding their experience with the inspector. Table 3-15 provides a summary of the results. Eleven of the 12 customers (92%) agreed or completely agreed that the inspector was both courteous and efficient.

Table 3-15 Customers' Experience with Inspector

Using the scale where 1 means you do not agree at all and 5 means you completely agree, please rate your agreement with the following statements:	*1 - do not agree at all*	*2*	*3*	*4*	*5 - completely agree*
The inspector was courteous	0%	0%	8%	25%	67%
The inspector was efficient	0%	0%	8%	33%	58%

Next customers were asked to rate their level of satisfaction with a series of program attributes including program staff, installed and eligible equipment, the timing of rebates and the overall program, their responses are summarized in Table 3-16. Eleven out of 33 respondents had direct interactions with program staff and were asked to provide feedback. The majority respondents (91%) indicated they were satisfied or very satisfied with the length of time and thoroughness of program staff in addressing their questions and concerns.

All 33 respondents were able to provide feedback on program qualifying equipment, 97% of respondents indicated they were satisfied or very satisfied with the equipment that was installed. Ninety-five provided the same rating for the quality of the installation. Similarly, the majority of participants were mostly satisfied to very satisfied with the steps required to get through the program and the amount of time it took to get the incentive payment (81% and 77% respectively). Respondents were slightly less satisfied with the range of eligible equipment, 75% indicated a rating of 4 or 5, with 25% providing a rating of 3. Overall, 88% of respondents indicated they were either satisfied or very satisfied with the program overall.

Table 3-16 Customers' Satisfaction with the Prescriptive Program

Using a scale of one to five, where one is very dissatisfied, five is very satisfied, and a three is neither particularly dissatisfied nor satisfied, please rate how satisfied or dissatisfied you are with each of the following	*1 - Very dissatisfied*	*2*	*3 - Neither satisfied nor dissatisfied*	*4*	*5 - Very satisfied*
How long it took program staff to address your questions or concerns	0%	0%	9%	0%	91%
How thoroughly [program staff] addressed your questions or concerns	0%	0%	9%	9%	82%
The equipment that was installed	0%	0%	3%	9%	88%
The quality of the installation	0%	0%	5%	10%	85%
The steps you had to take to get through the program	0%	3%	16%	34%	47%
The amount of time it took to get your rebate or incentive	0%	6%	16%	16%	61%
The range of equipment that qualifies for incentives	0%	0%	25%	32%	43%
The program overall	0%	0%	13%	22%	66%

3.4.4.4. Key Findings from Prescriptive Program Participant Survey

The following section summarizes key findings that surfaced during the participant survey data collection and analysis effort.

- Program outreach by staff and contractors were the most common sources by which customers learned about the Prescriptive Program. Respondents also indicated that contractors and vendors were the most influential their decision to install energy efficient equipment. The data suggests that contractor and vendor outreach to customers was the most effective outreach channel in 2015, followed by program staff.
- Customers are generally very satisfied with the Prescriptive Program, which includes the application process, program staff interactions, the installed equipment, the participation process, and program offerings. Dissatisfaction was only noted for the time to receive the rebate and the steps required to complete the program process and the share of respondents stating dissatisfaction. However, only 6% and 3% of participants noted dissatisfaction with these aspects of the program process, respectively.

3.4.5 Trade Ally Perspectives

ADM completed interviews with twelve trade allies that completed projects through the C&I Custom and Prescriptive Programs to gain insight into their perspectives and experience with the programs. Ten of these trade allies had completed at least four projects, and as many as 44 projects, during 2015. The remaining two respondents had completed only one project each.

During the interviews, trade allies were asked about the following topics:

- Status as a registered trade ally
- Comparison of I&M Program to other utility programs;
- Feedback on training, newsletter; and other program communication;
- Assessment of New Application Tool;
- Program marketing;
- Awareness of and promotion of bonus incentive; and
- Program satisfaction.

Most respondents reported that they most typically targeted one or a few types rather than targeting a broad range of building types. Service providers most often reported targeting building types with high energy usage. The most often building type respondents cites as working with were industrial/manufacturing businesses, followed by health care facilities and hospitals, and educational facilities.

Table 3-17 Building Types Targeted by Respondents

Building Type	*Percent of Respondents (n = 12)*
Industrial/manufacturing plants	58%
Health care/hospitals	42%
Schools, colleges, or universities	33%
Retail (non-food)	17%
Lodging (hotels/motels)	8%
Gas Stations	8%
Warehouses	8%
No specific type	8%
Other	17%

Respondents represented a range of sizes, from small firms that with fewer than 20 employees to large multinational firms.

3.4.5.1. Status as a Registered Trade Ally

Five of the respondents were not registered as program trade allies. All but one of these respondents indicated that they planned to register as a trade ally in 2016. The one respondent who indicated that the firm had no such plans stated that it was unclear what the benefits of being a registered trade ally would be. These results indicate that most firms that are not currently registered as trade allies with the program see value in developing stronger ties with the programs.

3.4.5.2. Comparison of I&M Program to Other Utility Programs

Trade allies were asked what, if any, other utility programs they also work with to understand how the incentives offered and measures covered by the I&M program compare with these other programs. These questions were also developed to explore if the relative incentive levels between programs affect trade allies' promotion of the I&M incentives.

All of the interview respondents indicated that they worked with additional programs. Most often, the trade allies reported working with programs offered by NIPSCO, Duke Energy, Indianapolis Power & Light, and MidAmerican Energy.

Trade ally comparisons of I&M incentives to those provided through other utility programs varied. As shown in Table 3-18, more than one-half of respondents indicated that the incentives were higher or the same as offered elsewhere, while 42% thought they were lower. The differences in perceptions may be a function of the specific programs or measures that the respondent is most familiar with.

Table 3-18 How I&M Incentives Compare to Other Utility Programs

Comparison of Incentive Levels to Other Programs	*Percent of Respondents (n = 12)*
I&M's Incentives Are Higher	25%
About the Same	33%
I&M's Incentives Are Lower	42%

Respondents who stated that the I&M incentives were lower than those offered through other programs were asked additional questions to understand what impact, if any, the comparatively lower incentives had on their outreach efforts to I&M customers. One-half of the respondents that indicated the incentives were lower stated that it did not affect how much they promote the I&M program. One of these respondents indicated that the lower incentives did not impact their efforts with I&M customers because they generally found there to be less competition from other firms in I&M's territory, and because I&M staff were great to work with. The other respondent stated that they generally do not heavily promote the program and tend to work where they are hired. The remaining respondents did indicate that they more actively promote the higher incentives offered elsewhere.

In addition to general assessments of how the amount of the I&M incentives compared to those offered in other service territories, two respondents indicated that incentives for high-intensity discharge (HID) lights were low. Specifically, two respondents stated that the incentives for replacement of 400W HID lighting were too low, and one respondent noted that the incentives were lower than those offered by Duke and Indianapolis Power & Light. The other respondent indicated the incentives were too low without making a comparison to specific programs. One of these two respondents also noted that 200W HID replacement incentives were low.

Few of the interview respondents identified additional measures that are not covered by the I&M programs. One respondent stated that the program should provide incentives for replacement of

8-foot T-12s. The remainder of respondents did not have any specific suggestions and several stated that I&M covered all of the relevant measures.

During the interview, two respondents raised other issues about the program design. One of these respondents stated that limiting lighting measures those listed as ENERGY STAR® qualified, Designing Lights Consortium qualified, or Consortium for Energy Efficiency qualified limited program flexibility. However, these qualifications are a standard component of efficiency programs and designed to prevent customers from purchasing lower quality lamps.

A second trade ally noted that the time required to implement some projects may exceed the 90-day period allowed for project completion after pre-approval. However, inclusion of the 90-day limit enables the program to ensure that all approved projects will be paid without locking up funds that will not be paid out because projects are not completed. Typically, program staff will work on a case-by-case basis with customers implementing projects that require longer implementation periods. This point may need to be more effectively communicated to trade allies to ensure that they are not avoiding larger projects because they do not think they can be completed in accordance with program guidelines.

3.4.5.3. Feedback on Training, Newsletter, and Other Program Communication

Trade allies provided information on their experience with program training, their assessment of the trade ally newsletter, and provided suggestions for improving program communication with trade allies.

Two-thirds of respondents reported that they had personally attended program training sessions, while the remaining participants had not attended training (25%) or indicated that another member of their firm had (8%).

Respondents provided generally favorable ratings of the training offered as summarized in Figure 4-5. However, some respondents indicated that the location or time was not convenient. None of the interview respondents suggested other training topics or sessions that should be provided.

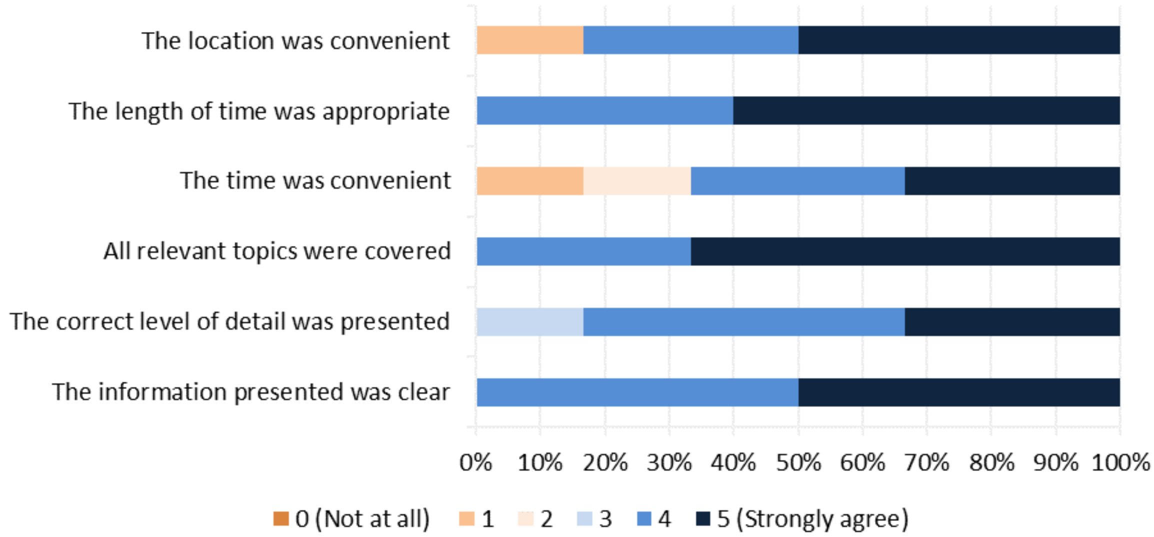


Figure 3-8 Ratings of Aspects of Training

The program provides an electronic monthly newsletter for trade allies that contains updates on the programs. The newsletter generally covers all commercial incentive programs and provides updates on the programs. One-half of respondents reported that they receive the electronic newsletter. Of these respondents, two-thirds indicated that they had read a few issues and the remaining one-third stated that they had read all or most of them. All respondents indicated that the newsletters were at least somewhat useful. A few respondents offered suggestions for the newsletter summarized below:

- Provide case studies or success stories;
- Provide updates on the program budget; and
- Include more coverage of compressed air.

Interview respondents were asked for any additional suggestions to improve program communication with trade allies. Most interview respondents did not have any suggestions, although one trade ally stated that they would like to receive the program guidelines two to three months before the start of the program year because it changes from year-to-year. Another stated a preference for additional email communication, such as notifications when flyers are coming out, and that a plain text email may be best to avoid having the email flagged as spam.

Two trade allies also provided additional comments regarding communications with clients or about projects. One of the interview respondents asked that program staff have fewer communications with their customers because customers can find this confusing. Another stated that it can be difficult to contact engineers reviewing applications and that more phone support for urgent matters is needed.

Overall contractors had favorable assessments of program training and communications and few provided any suggestions for improving them. Aspects such as the newsletter appear to be valued and appreciated by the tradespeople working with the program.

3.4.5.4. Assessment of New Application Tool

Program staff revised the application tool used by trade allies. The tool allows trade allies to enter measure characteristics and quantities and site information. The tool summarizes project information including the total cost, the cost less the incentive, the estimated annual savings, the estimated payback, and the one and five-year return on investment. It also provides a checklist of information required and informs the user if it is not fully completed.

All but one of the respondents with experience using the new tool and the previous application indicated that the new version was an improvement. These customers highlighted the following improvements:

- Ease of use;
- All programs are on one form;
- It is more streamlined;
- It provides feedback on the completeness of the application;
- It provides an application completion checklist; and
- The calculation of return-on-investment is useful for customer discussions.

The remaining respondent said the new tool was about the same as the previous application but that the larger file size can make it difficult to work with on an old computer. However, this respondent also stated that it was “pretty slick” once you get used to it.

One respondent indicated that the new tool worked better for smaller projects, but could not handle very large projects.

3.4.5.5. Program Marketing

Respondents were asked about their level of effort to market the program and their assessment of the program provided marketing materials. Two-thirds of respondents stated that they actively promote the incentives with their customers. Among the respondents that do actively promote the program, one-third stated that they use the program marketing materials. One of these respondents stated that the materials were pretty effective with customers and another stated that they frequently use one of the case studies when discussing projects with customers. The third respondent suggested providing more case studies.

3.4.5.6. Awareness of and Promotion of Bonus Incentives

Less than half (42%) of the interviewed respondents stated that they were aware that the program offered a bonus incentive of $0.01 per kWh for a period of time. Three of the respondents indicated that they promoted the incentive. These respondents indicated that the incentive was somewhat influential on their efforts to sell program-qualified equipment.

3.4.5.7. Program Satisfaction

Interview respondents were asked to rate their satisfaction with various aspects of the I&M incentive programs. Their responses are summarized below in Figure 4-6. As shown, all respondents indicated satisfaction with most aspects of the program. However, one respondent indicated slight dissatisfaction with the incentive levels.

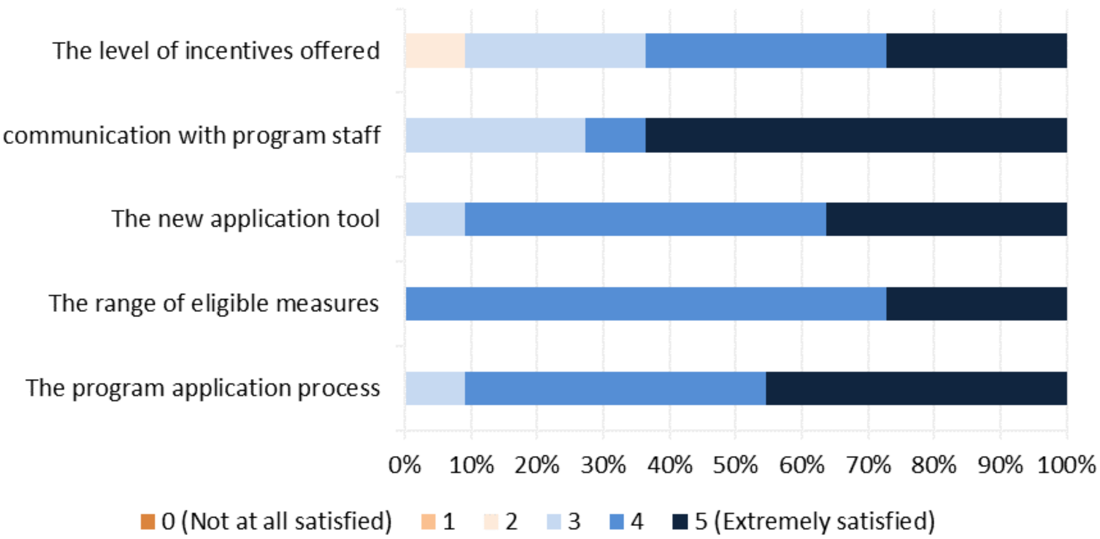


Figure 3-9 Program Satisfaction

3.4.5.1. Summary of Findings

Overall, trade allies provided favorable assessments of the design and operations of the Custom and Prescriptive Programs. A majority of the interviewed trade allies thought that, overall, the incentives offered by I&M were equal to or greater than the incentives offered by other utility programs they work with. A few thought they were generally lower, but only two respondents in total indicated that they less actively promoted the programs because the incentives were lower than those provided elsewhere. Two respondents also noted that the incentives for replacement of HID lamps could be higher.

Training and communication processes are largely meeting trade ally needs. Those who attended training indicated that the content was clearly presented with the correct level of detail and that all key topics were covered.

Respondents provided favorable assessments of the new application tool and a number of benefits were identified by the interviewed trade allies.

Trade allies are largely satisfied with the program. Only one trade ally noted dissatisfaction with the level of incentives offered.

Suggestions for improving the program based on trade ally feedback are summarized below:

- Communicate to trade allies the value of using qualified lamps;
- Explain procedures for approving incentive projects that have implementation time frames of more than 90 days through training or application materials.
- Review distribution list for electronic newsletter. Several trade allies indicated they did not receive it and it is generally considered a valued resource

3.4.6 Program Operations Perspective

The following section provides a detailed overview of the Prescriptive Program operations developed from interviews with staff and reviews of program documentation. This section summarizes the roles and responsibilities of the staff responsible for managing program operations; the program design and any changes that have occurred; implementation procedures; communication between the utility and the implementation team; marketing and outreach; and successes and challenges from PY6. In closing, key findings will highlight the most salient themes from the program areas and research activities described above.

3.4.6.1. Staff Roles and Responsibilities

The evaluation team interviewed four key program personnel; three Lockheed Martin and one I&M staff member. The interviewees were asked to identify their roles and responsibilities with the I&M energy efficiency programs. The interviewees included one C&I DSM Programs Supervisor, one Marketing Manager, and two DSM Coordinators.

The C&I DSM Programs Supervisor oversees the implementation contractor, serves as the primary point of contact for approved contractors, and is responsible for customer outreach in I&M’s southern territory. The Marketing Manager fulfills a marketing oversight role for both the Residential and the C&I Programs. The two DSM Coordinators are responsible for customer outreach in the South Bend and Fort Wayne regions.

The implementation contractor took over as the single implementer for I&M’s portfolio of C&I Programs during PY6 (2015). Several changes in organizational structure took place as a result. The Lockheed Martin Program Manager from previous years is now the Sr. Program Manager, responsible for providing guidance related to program design and regulatory oversight. The new Program & Operations Manager handles the day to day operations and coordination of program delivery and also takes the lead on maintaining communication and collaboration with I&M. The Lockheed team also consists of one Marketing & Trade Ally Coordinator, two Project Coordinators, one full-time engineer and three field staff who reside in the I&M territory and work closely with the I&M DSM Coordinators.

During PY6, the marketing and outreach function was led by I&M and supported by the implementation contractor’s Marketing & Trade Ally Coordinator. The implementation contractor is responsible for drafting, designing, and printing marketing collateral. I&M’s marketing manager is responsible for approving those materials. Email campaigns, analytic tracking, website updates, and trade ally coordination are also handled by Lockheed Martin. Marketing materials, outreach events, and trade ally communication is discussed in greater detail in Section

3.4.6.2. PY6 Program Goals and Implementation

Table 2-17 summarizes the goals and expected year-end savings for each of the three C&I programs. As shown, the plan filing goals split expected savings between the Custom and Prescriptive Programs such that approximately 75% of the savings would come from prescriptive projects and 25% from custom projects. The implementation contractor noted that their preferred design is a 60/40 custom/prescriptive split of the savings goals. However, the filed goals were revised midyear to roughly split the savings expectations equally between the Custom and Prescriptive Programs. The revision was based on initial program activity and some of the changes made to the programs discussed below.

Table 3-19 PY6 C&I Program Energy Savings Goals

C&I Program	*2015 kWh Goals (Plan Filing)*	*2015 kWh Goals (Revised)*	*Gross Ex Ante kWh Savings*
C&I Custom	12,000,000	31,363,636	37,072,689
C&I Prescriptive	35,000,000	29,000,000	25,386,828
C&I SBDI	3,000,000	3,067,134	2,573,902

To accommodate these revisions to the goals, program budget funds were revised as well. I&M's policy regarding funds transfer within the C&I portfolio provides for movement of up to 25% of program funds to another program. This flexibility was particularly valuable during PY6 with the change in implementation contractor and program design that made forecasting program activity difficult. Implementation staff indicated that 2016 goals should be more aligned with expected savings for next year.

The Prescriptive Program got off to a slower start as compared to the Custom Program. At the beginning of 2015 the statewide program came to an end, I&M took over as program administrator and contracted with Lockheed Martin for implementations services. Staff indicated that dispersing information including the new program design, application materials and program contacts took time and there was some initial confusion about which measures fell under which programs and who to reach out to for assistance. To address the lower than expected activity, the program offered a bonus of incentive equal to $0.01 per kWh saved. The bonus was offered from mid-June through September 30. Projects had to be completed and all documents submitted by the deadline to qualify. Figure 3-10 below provides a screenshot of the electronic flyer that was used to inform customers and trade allies of the bonus incentive.

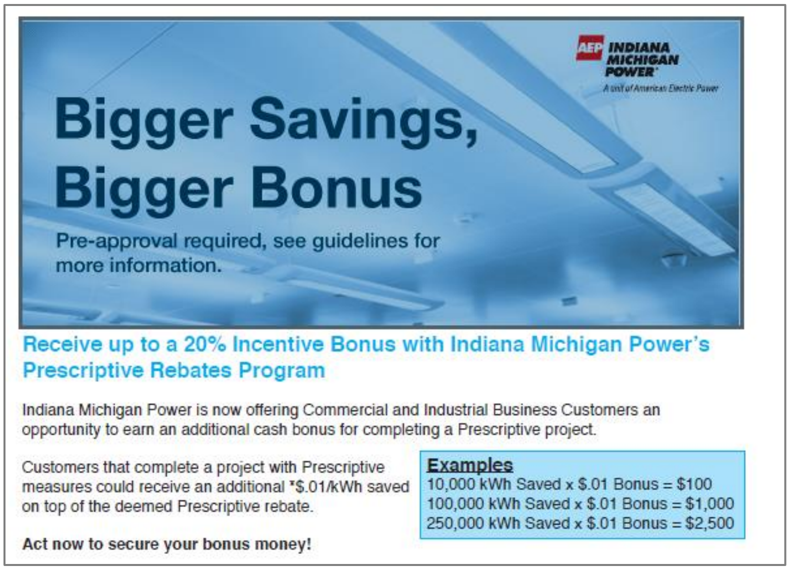


Figure 3-10 Prescriptive Incentive Bonus Electronic Flyer

3.4.6.3. PY6 Program Changes

During PY6 a new application tool was implemented by Lockheed Martin. It is an Excel based tool that consolidates Custom, RCx, and Prescriptive measures into one workbook. Each worksheet tab collects information specific to the customer's project. The applicant inputs the parameters that define the pre- and post-installation operating conditions, the efficient equipment to be installed, and the project costs. Based on these inputs the application tool calculates the incentive amount, kWh savings and project payback for the customer. The proposed measure(s) will not receive an incentive if the minimum payback threshold of 12 months or a benefit/cost ratio of 1 is not met.

Implementation staff indicated they received positive feedback from trade allies about the new application. Staff believe the positive feedback is mostly related to the Excel platform because it is software that end-users and tradespeople are familiar with. Additionally, the application does not contain macros, enabling users to operate it without security concerns and to submit it by email, although, if desired, the application can also be printed and mailed or faxed to the implementation contractor. Utility staff also provided positive feedback about the new application, emphasizing that more information is now available to the customer so they can make decisions based on the initial investment and the long-term energy savings. Overall there was consensus among staff that the new application was a key success during PY6.

3.4.6.4. Quality Control and Quality Assurance Procedures

Projects that exceed $10,000 in incentives require pre-approval similar to custom projects with incentives that exceed $10,000. Prescriptive projects that request less than $10,000 in incentives are considered "fast track," and pre-approval is not required.

Figure 3-11 below is a process diagram, provided by Lockheed Martin that depicts the various stages of processing and review of fast-track prescriptive incentives.[2]

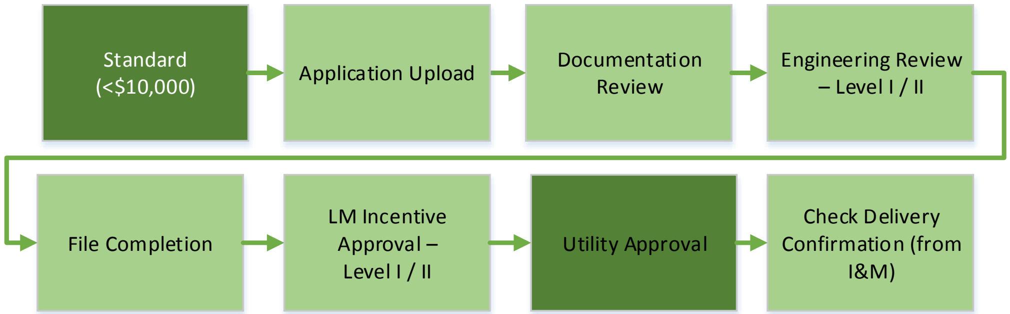
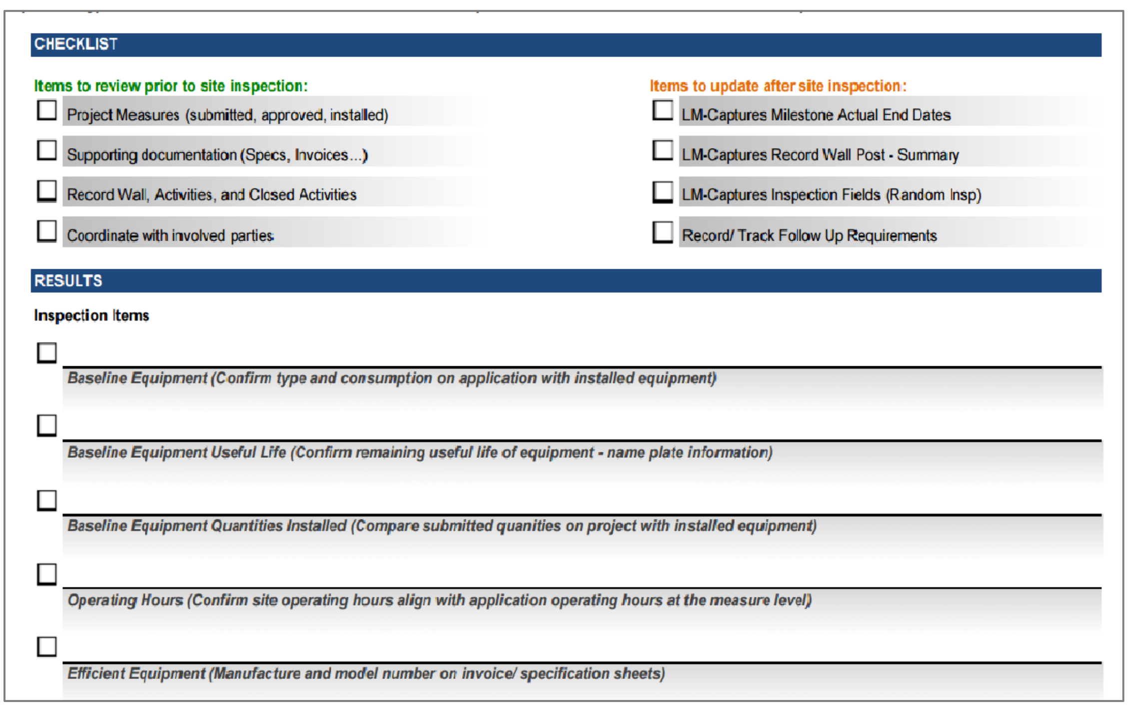


Figure 3-11 Prescriptive Program Application and Project Review Process (Projects <$10,000 Incentives)

Inspections are guided by a form. The form is populated with specific project and contact information, and includes checklists for inspection staff to ensure appropriate documents are reviewed during the pre-inspection, and the database is updated during post-inspection. The inspection form also contains fields for staff to collect data regarding baseline equipment and equipment operating hours. Figure 2-9 below provides a screenshot of the bottom half of the inspection document where the technical information is recorded.



CHECKLIST

Items to review prior to site inspection:
- ☐ Project Measures (submitted, approved, installed)
- ☐ Supporting documentation (Specs, Invoices...)
- ☐ Record Wall, Activities, and Closed Activities
- ☐ Coordinate with involved parties

Items to update after site inspection:
- ☐ LM-Captures Milestone Actual End Dates
- ☐ LM-Captures Record Wall Post - Summary
- ☐ LM-Captures Inspection Fields (Random Insp)
- ☐ Record/ Track Follow Up Requirements

RESULTS

Inspection Items
- ☐ *Baseline Equipment (Confirm type and consumption on application with installed equipment)*
- ☐ *Baseline Equipment Useful Life (Confirm remaining useful life of equipment - name plate information)*
- ☐ *Baseline Equipment Quantities Installed (Compare submitted quanities on project with installed equipment)*
- ☐ *Operating Hours (Confirm site operating hours align with application operating hours at the measure level)*
- ☐ *Efficient Equipment (Manufacture and model number on invoice/ specification sheets)*

Figure 3-12 PY6 C&I Inspection Form

[2] Lockheed Martin, *AEP Indiana Michigan Power Program Abstract: Prescriptive Program*, (2015).

As part of the gross savings analysis, the evaluation team performed desk reviews of all sampled projects. Most documentation was directly accessible through the program tracking system. However, larger files cannot be uploaded to the data tracking system and instead reside on the implementation contractor's servers. These documents were provided to the evaluators upon request.

A second documentation issue identified was that some of the project invoicing did not provide clear information on the quantities of lamps or fixtures for each specific measure type.

Lastly, evaluation staff indicated that project monitoring was not included with the documentation for which that data was collected. ADM recommends including monitoring data with the documentation package if it is collected.

3.4.6.5. Communication

The program team has a weekly scheduled conference call to discuss program activity, the status of savings and spending, as any issues pertaining to specific projects. The Program Manger provides the following reports for I&M's review: weekly program tracking data from the Lockheed Martin Captures, weekly summary of implementations activities and forecasts, and monthly scorecards. I&M staff indicated that generally the level and quality of communication between parties is sufficient, and the reporting protocols are well organized. The well-organized reporting facilitates higher levels of program oversight than what existed in previous years.

One area where the potential to improve coordination and communication may exist is in the execution of the program marketing function. Staff indicated that the I&M Marketing Manager provides marketing oversight for both the C&I and Residential Energy Efficiency Portfolios, totaling 11 programs. The Lockheed Martin Marketing Manager is responsible for reviewing, editing and approving all marketing collateral drafted by Lockheed Martin. However, the I&M Marketing Manager does not currently participant in the weekly calls with the implementation team. Lockheed Martin staff indicated there were multiple instances during PY6 when direct communication between I&M and Lockheed Martin Marketing staff would have been beneficial. Staff suggested that having direct access to the I&M Marketing department could help improve the cohesion of messaging, facilitate expansion of the marketing effort and speed up the approval process.

3.4.6.6. Marketing / Outreach

The marketing and outreach functions were shared between I&M and Lockheed Martin staff during PY6. Staff from both organizations indicated the level of collaboration among the groups was a major success. Lockheed Martin indicated their role is more administrative in nature in supporting the C&I programs. Below is a summary of primary marketing activities Lockheed Martin is responsible for as part of implementing the Prescriptive Program:

- Marketing collateral: Lockheed Martin marketing staff is responsible for designing and printing all approved newsletters, postcards and mailers.

- Managing email campaigns: Lockheed Martin designs all news blasts that inform customers and trade allies about the program offerings and changes throughout the year. Email campaign analytics are reported to I&M on an ad-hoc basis.
- Web messaging: Lockheed Martin contractor is responsible for copywriting all website material. This task involves coordinating with I&M web developers to design and implement the website messaging.
- Attending industry specific events: Lockheed Martin teamed up with several organizations throughout the year in an effort to deliver a more targeted message to specific sectors.

Table 2-18 provides a summary of the in-person events hosted by program staff during PY6, followed by a summary of email campaigns in Table 2-19.

Table 3-20 PY6 In-Person Events Hosted by Program Staff

Program	*Date*	*Title/Description*	*Location(s)/Purpose*
Custom/Prescriptive	3/25 - 3/26	M-Pact	Targeted custom and prescriptive customers in the gas station and convenience store sectors
Custom/Prescriptive	5/21	IN Association of School Business Officials Annual Meeting	Exhibited and had a speaking role. Targeted to the education sector.
Custom/Prescriptive	9/24	Facilities Maintenance Expo	Exhibited and had 2 speaking roles. Specially targeted to building operation staff, building owners/managers and contractors.
Custom/Prescriptive	November	Tri-State Compressed Air Events	Elkhart, South Bend- Invited by trade ally to speak to customers about program.
Custom/Prescriptive	NA	Graybar Event	Invited by trade ally to speak to customers about program.

Table 3-21: PY6 Email Campaigns

Program	*Date*	*Purpose*
All Programs	12/23/14	Initial Kick Off Invitation for 2015 TA Network
All Programs	1/10/15	TA Recruitment
All Programs	1/29/15	TA Winter Newsletter
All Programs	2/10/15	TA Recruitment
All Programs	3/19/15	Update to Measure List
All Programs	5/29/15	Update to Measure List
Prescriptive	6/17/15	Incentive Bonus
All Programs	7/6/15	TA Recruitment
All Programs	8/10/15	TA Summer Newsletter
All Programs	8/27/15	Increase to Incentive Cap
All Programs	10/7/15	Communicate upcoming deadlines
All Programs	10/12/15	End of push to have projects complete

I&M was responsible for most of the customer facing marketing and outreach during PY6. An important marketing channel utilized by I&M to communicate with C&I customers is the monthly Questline email newsletter. The newsletter provides (1) information and resources for customers to better understand facility energy usage, (2) conservation techniques, (3) routine maintenance advice and (3) information on how to take advantage of program incentives. I&M staff indicated that the newsletter is opened approximately 20% of the time.

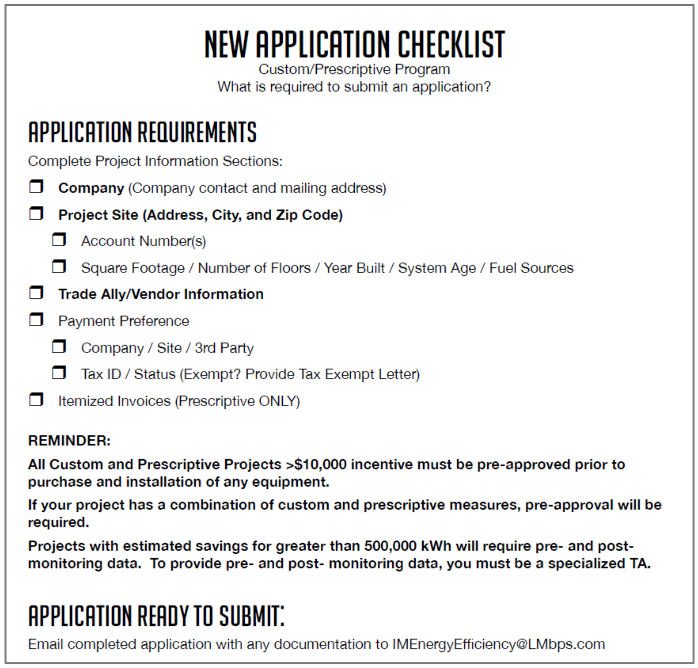
Program staff were also asked to provide suggestions on how the program could better reach non-residential customers through enhanced outreach, marketing, or through strategies to support trade ally efforts. Staff indicated that during 2016 the implementation team drafted a proposal that included expanding the current co-branding strategy to include apparel for trade allies; currently the only approved co-branding is digital. Program staff said the proposal was currently under review.

3.4.6.7. Trade Allies

An effort was made to increase the number of trade allies that are registered as part of the trade ally network. However, tradespeople do not need to be registered to submit projects for incentives.

To register as a trade ally, interested tradespeople complete a program application and are invited to attend a program sponsored event such as the kick-off meeting or a Trade Ally Breakfast. At these events contractors are provided instruction on the program participation process, energy efficiency equipment qualifications, and the value of collaborating with other contractors in the area. Registered trade allies can have their company information listed on the program website. All trade allies receive the monthly trade ally email newsletter and ad hoc emails regarding changes to the list of eligible measures, other program changes, and approaching deadlines.

Additionally, to support the administrative project enrollment and approval process, trade allies are provided a checklist that details all documents and customer data requirements that must be collected and submitted during the application, offer acceptance and completion. Figure 2-10 below provides a screenshot of the Custom and Prescriptive Program Application Checklist.



NEW APPLICATION CHECKLIST

Custom/Prescriptive Program

What is required to submit an application?

APPLICATION REQUIREMENTS

Complete Project Information Sections:

- ❒ **Company** (Company contact and mailing address)
- ❒ **Project Site (Address, City, and Zip Code)**
  - ❒ Account Number(s)
  - ❒ Square Footage / Number of Floors / Year Built / System Age / Fuel Sources
- ❒ **Trade Ally/Vendor Information**
- ❒ Payment Preference
  - ❒ Company / Site / 3rd Party
  - ❒ Tax ID / Status (Exempt? Provide Tax Exempt Letter)
- ❒ Itemized Invoices (Prescriptive ONLY)

REMINDER:

All Custom and Prescriptive Projects >$10,000 incentive must be pre-approved prior to purchase and installation of any equipment.

If your project has a combination of custom and prescriptive measures, pre-approval will be required.

Projects with estimated savings for greater than 500,000 kWh will require pre- and post-monitoring data. To provide pre- and post- monitoring data, you must be a specialized TA.

APPLICATION READY TO SUBMIT:

Email completed application with any documentation to IMEnergyEfficiency@LMbps.com

Figure 3-13: Customer & Prescriptive Program New Application Checklist

Overall, the program has sufficient resources for managing and engaging trade allies with the Prescriptive Program. However, relatively little of the resources or information about the trade ally network are provide on the program website. Staff should consider offering a section for trade allies that includes the trade ally network application and participation requirements. The website can also be used to provide other resources such as copies of the trade ally newsletter and the application checklist.

3.4.6.8. Success and Challenges

One of the key successes noted by program staff was the collaboration on program outreach. Both the implementation contractor and I&M employ field staff to perform outreach in the service territory. Together they were able to target large usage customers and cover more geographic area than what could have been accomplished by any one team working independently. As a result, the program has increased expected energy savings and C&I customer awareness. Staff also indicated the 2016 pipeline already has several large projects, totaling approximately 8 GWh in expected savings.

The implementation contractor indicated that there they were allowed additional flexibility with program budgets, which allowed funds to be shifted between programs in response to program activity. Additionally, staff indicated greater flexibility to work with customers on adjusting incentive levels as project scopes changed. The flexibility allowed for investing staff time and resources in reviewing projects, supporting customers, and getting incentives paid.

All program staff interviewed thought the new application tool was one of the factors contributing to the success of the Custom and Prescriptive programs during PY6. Staff indicated they received positive feedback from contractors regarding the application.

The growth in the Trade Ally Network was also noted as a program success. The list of approved contractors grew to 75 by the end of the program year. Most participating contractors specialize in lighting, although there is a significant share of companies that offer HVAC and Refrigeration services as well. The trade allies are dispersed throughout the I&M service territory and are a mix of small local companies and firms that operate nationwide. The challenge moving forward will be to motivate trade allies to promote the program and get projects completed. Although new contractors are joining the trade ally, most have yet to produce a project.

Program staff was asked to comment on the challenges the program may face in 2016. Staff noted that the success of achieving significant momentum creates the difficulty of managing program budget funds throughout the program year. If funds are fully reserved, the program may have to advance year-end deadlines and bring the activity to a stop. There is concern that slowing momentum would create uncertainty in the market and would hamper the continuation of the program’s success in 2017.

Another factor that may create a challenge noted by staff was competition from programs in adjacent service territories where incentives are slightly higher. Staff indicated that higher incentives in other territories may induce contractors to more heavily promote incentives in those locations and keep program success dependent on staffs’ outreach efforts.

3.4.7 Summary of Conclusions and Recommendations

The following presents a selection of key conclusions from PY6:

- **The program fell short of its expected savings goal:** The expected electricity savings of the Custom Program equaled 25,386,828 kWh hours and fell short of the program goal of 29,000,000 kWh (88% of goal). Lighting projects accounted for most (87%) of the program expected savings, followed by variable frequency drives (10%).
- **Multiple program changes:** In addition to the change in implementation contractor, the program changed multiple program aspects including discontinuing tiered incentives based on project size in favor of a flat incentive rate, a revised application form, and no longer requiring special approvals for projects with incentives that exceed $20,000.
- **Program awareness driven by staff and outreach efforts:** Forty-two percent of survey respondents reported that they learned of the program from I&M account representatives, the program website, program representatives, and program marketing activities. However, vendors, trade allies, and contractors were also cited as the source of initial program awareness by 27% of survey respondents.

- **Utility and implementation staff working effectively together:** Discussions with program staff indicate that the implementation contractor and utility staff are effectively working together and collaborating on multiple aspects of delivering the program. One potential area for improvement is enhanced collaboration between the parties marketing teams. Direct communication between the marketing managers at I&M and Lockheed Martin may enable more efficient program delivery.
- **Program participants are satisfied with all elements of the program:** Customers are generally very satisfied with the Prescriptive Program, which includes the application process, program staff interactions, the installed equipment, the participation process, and program offerings. Dissatisfaction was only noted for the time to receive the rebate and the steps required to complete the program process and the share of respondents stating dissatisfaction. However, only 6% and 3% of participants noted dissatisfaction with these aspects of the program process, respectively.
- **Few problems with the application and project completion process:** The incidence of customers identifying aspects of the application process that were not acceptable was low. Only the effort required to provide supporting documentation was rated as unacceptable by any participants most likely to be unacceptable. Moreover, only one survey respondent reported that this was not acceptable.
- **New application was well received:** All respondents rated the ease of completing the electronic worksheets as acceptable or completely acceptable. Interviewed trade allies also provided positive feedback on the application, noting that it is easy to use, convenient in that it combines all programs, provides useful financial information to discuss with clients, and provides an application completion checklist.
- **Robust resources for engaging trade allies and keeping them informed of the program:** The program hosts a number of outreach events and provides an email newsletter to keep trade allies informed about the program. Additionally, the program provides trade allies with marketing materials for use. However, the evaluators noted that little information on how to become a trade ally or available resources is provided through the program website. Additionally, multiple trade allies, including registered trade allies, reported that they were not receiving the newsletter. It is possible that emails are being blocked by network filters.
- **Trade Allies are generally satisfied with all elements of the program:** When asked about their satisfaction with elements of the program, trade allies were generally satisfied with all elements of the program.
- **Evaluation staff identified a few documentation issues:** During the course of completing the gross savings analysis, ADM encountered a few documentation issues including invoicing that did not have clear counts of specific measures installed and projects for which collected monitoring data was not included with the initial project documentation.

ADM offers the following recommendations for consideration:

- **Consider adding a statement to the application form that states that invoicing needs to clearly state quantities of specific measures.**
- **Consider including any collected monitoring data in the project documentation file.**
- **Consider adding a section to the program website that provides information and resources to trade allies including the trade ally registration application form, copies of past newsletters, and other documents provided to assist trade allies.**
- **Consider advising registered trade allies to add the program email newsletter email address to the safe sender list.**
- **Consider enhanced collaboration between utility and implementer marketing teams to the extent feasible.**
- **Ensure that customer decision-maker contact information is collected and provided to the evaluator.** Review of the program tracking data indicated that a significant share of projects that listed the trade ally as the primary contact.

4. Commercial and Industrial Small Business Direct Install 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 Small Business Direct Install (SBDI) Program during the period January 2015 through December 2015. Appendix E contains specific methodologies, by measure type, for estimating gross savings and savings estimation results for projects completed under this program.

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 SBDI Program were collected for samples of projects completed during the period January 2015 through December 2015. Data provided by the implementation contractor and utility showed that during PY6, there were 164 projects completed, which were expected to provide savings of 2,573,902 kWh annually.

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 ±6.9%.

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. Sampling was performed at the project level.

Table 4-1 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 C&I SBDI Sample Design

	Stratum 1	*Stratum 2*	*Stratum 3*	*Stratum 4*	*Totals*
Strata boundaries (kWh)	< 17,000	17,000 – 28,000	< 15,000	15,000 – 31,000	
Number of projects	70	46	36	12	164
Total kWh savings	393,349	651,661	977,869	551,023	2,573,902
Average kWh Savings	5,619	14,167	27,163	45,919	15,695
Std. dev. of kWh savings	2,451	2,763	4,641	5,120	12,313
Coefficient of variation	0.44	0.20	0.17	0.11	0.78
Final design sample	6	5	6	5	22

The sampled projects account for approximately 19% 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	230,283	551,023
3	149,610	977,869
2	74,111	651,661
1	42,365	393,349
Total	496,369	2,573,902

4.1.2 Review of Documentation and Savings Estimation Procedures

I&M's program implementation contractor provided documentation for the energy efficiency projects undertaken at customer facilities. The implementation contractor also provided savings estimation procedures, including the TRM referenced for each measure, for review. 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 for each rebated measure was reviewed prior to the on-site visit. Each application was reviewed to determine whether documentation for the equipment changed, as well as the new equipment, had been provided. Follow up requests for additional documentation were made to the implementation contractor and/or trade ally staff prior to, or after, on-site visits were completed.

4.1.3 On-Site Data Collection Procedures

On-site visits were used to collect data that were used, along with the Indiana TRM, 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.

4.1.4 Procedures for Estimating Savings from Measures Installed through C&I SBDI 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
- Case 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 4-3.

Table 4-3 Typical Methods to Determine Savings

Type of Measure	*Method to Determine Savings*
Lighting	Indiana TRM; lamp wattages and operating parameters, including TOU, collected on-site
Case Lighting	Indiana TRM; operating parameters, including TOU, collected on site

The activities specified in Table 4-3 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 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 were conducted. The following discussion describes the basic procedures used for estimating savings from lighting measures. Project-specific information regarding savings calculations and savings estimation are contained in Appendix E.

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.

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 actual installation data, when available, and in-house and TRM data on standard wattages of lighting fixtures and ballasts.

ADM collects hours of operation data for retrofitted fixtures via site-visit interviews. Usage areas are defined to be those areas within a facility that are expected to have fixtures with comparable 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.

Lighting retrofit energy savings and peak kW reductions are calculated per the Indiana TRM as:

$$\Delta kWH = (WATTSbase - WATTSee) * HOURS * (1 + WHFe) / 1000$$

$$\Delta kW = (WATTSbase - WATTSee) * CF * (1 + WHFd) / 1000$$

Where*:*

WATTSbase	*= connected wattage of the baseline fixtures*
WATTSee	*= connected wattage of the high efficiency fixtures*
HOURS	*= annual operating hours of the lighting.*
WHFe	*= lighting Waste Heat Factor for energy*
1+WHFe	*= Heating-Cooling Interactive Factor (HCIF)*
1 / 1000	*= conversion factor from watts to kilowatts*
WHFd	*= lighting Waste Heat Factor for demand*

1+WHFd = *Heating-Cooling Interactive Factor (HCIF)*

CF = *Summer Peak Coincidence Factor for measure*

Operating hours obtained from on-site interviews are used to calculate the typical annual operating hours of the metered lights in each costing period for every unique building type/usage area.

These 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.

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 Case Lighting Measures: Case lighting measures examined include retrofits of lighting in refrigerated cases. 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. Baseline fixture wattages are taken from a table of standard wattages referenced in the Indiana TRM. Post installation fixture wattages were verified on site from name plates on the fixtures themselves or specification sheets provided by the implementation contractor. Hours of operation are determined from site personnel interviews.

Case lighting retrofit energy savings are calculated as:

$$\Delta kWh = (WATTSbase - WATTSee) / 1000 * Ndoors * HOURS * (1 + WHFe) * ESFMC$$

$$\Delta kW = (WATTSbase - WATTSee) / 1000 * Ndoors * (1 + WHFd) * DSFMC * CF$$

Where:

WATTSbase = *connected wattage per door of the baseline fixtures*

WATTSee = *connected wattage per door of the high efficiency fixtures*

1000 = *conversion factor from watts to kilowatts*

Ndoors = *number of doors*

HOURS = *annual operating hours; assume 6,205 operating hours per year*

ESFMC = *Energy Savings Factor; additional savings percentage achieved with a motion sensor*

WHFe = *waste heat factor for energy to account for cooling savings from efficient lighting*

WHFd = *waste heat factor for energy to account for cooling savings from efficient lighting*

DSFMC = *Demand Savings Factor; additional savings percentage achieved with a motion sensor*

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 16 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 SBDI Program during the period January 2015 through December 2015 are summarized in Table 4-4. The achieved gross savings of 2,271,702 kWh are equal to 88% of the ex ante savings.

Table 4-4 Gross kWh Savings for C&I SBDI Program

Ex Ante Gross kWh Savings	*Gross Audited kWh Savings*	*Gross Verified kWh Savings*	*Ex Post Gross kWh Savings*	*Gross Realization Rate*
2,573,902	2,573,902	2,490,985	2,271,702	88%

Gross kWh savings are summarized by sampling stratum in Table 4-5. For PY6, audited savings were equal to ex ante savings, as ADM found no issues with implementer tracking data. Ex ante, verified and ex post kWh savings are shown in Table 4-6 for each project sampled in PY6.

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	551,023	547,679	431,880	78%
3	977,869	977,869	781,178	80%
2	651,661	577,651	578,204	89%
1	393,349	387,786	480,440	122%
Total	2,573,902	2,490,985	2,271,702	88%

Table 4-6 Gross kWh Savings for C&I SBDI Program by Sampled Project

Project ID	*Ex Ante kWh Savings*	*Verified kWh Savings*	*Ex Post kWh Savings*	*Project Gross Realization Rate*
851	17,016	17,016	15,545	91%
854	17,016	17,016	13,221	78%
857	12,877	11,727	9,084	71%
860	30,713	30,713	20,395	66%
1076	8,408	8,408	10,495	125%
1078	37,528	36,131	32,592	87%
1084	5,992	5,393	8,448	141%
1086	17,028	17,028	24,997	147%
1093	24,624	24,624	24,739	100%
1094	4,348	4,348	4,373	101%
1098	50,825	50,825	28,478	56%
1108	8,095	8,095	13,228	163%
1199	46,615	46,615	32,704	70%
1201	53,361	53,361	40,063	75%
1256	7,008	7,008	7,800	111%
1277	20,640	20,640	10,127	49%
1278	30,650	30,650	21,253	69%
1370	21,156	21,156	21,176	100%
1450	41,954	41,954	46,654	111%
1467	10,174	2,907	2,910	29%
1476	21,827	21,827	21,827	100%
1482	8,514	8,514	7,401	87%
All Non-Sample Projects	2,077,533	2,005,030	1,854,192	89%
Total	3,045,736	2,490,985	2,271,702	88%

4.2.2 Gross Peak kW Savings

The achieved gross peak demand kW reductions of the C&I SBDI Program during the period January 2015 through December 2015 are 314 kW.

4.3 Methodology for Estimating Net Savings

To estimate net impacts for the program, data were collected and analyzed for 15 customer decision makers who completed projects over the current program year. The results of the analysis are reported in this section. Appendix F contains the survey used to collect data for the C&I SBDI 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 F 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 you have been financially able to install the energy efficient [Measure/Equipment type] without the financial incentive from the SBDI 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 SBDI 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 F.)

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 energy efficient [Measure/Equipment type] before participating in the SBDI Program?" and "Would you have gone ahead with this planned installation even if you had not participated in the program?"
- The respondent answered "definitely would have" to the following question: "If the onsite assessment had not been performed and the financial incentive from the SBDI Program had not been available, how likely is it that you would have installed energy efficient [Measure/Equipment type]?"
- The respondent answered "did not affect timing" to the following question: "Did you purchase and install the energy efficient [Measure/Equipment Type] earlier than you otherwise would have without the program?"
- The respondent answered "no" in response to the following question: "Did you install more energy efficient [Measure/Equipment Type] 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 energy efficient [Measure/Equipment type] before participating in the SBDI Program?" and "Would you have gone ahead with this planned installation even if you had not participated in the program?"
- Either the respondent answered "definitely would have" or "probably would have" to the following question: "If the onsite assessment had not been performed and the financial

incentive from the SBDI Program had not been available, how likely is it that you would have installed energy efficient [Measure/Equipment type]?”

- Either the respondent answered “did not affect timing of purchase and installation” to the following question: “Did you purchase and install the energy efficient [Measure/Equipment Type] 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.
- Did you install more energy efficient [Measure/Equipment Type] than you otherwise would have without the program?

The second factor required determining if a customer reported that a recommendation from an SBDI Program representative was influential in the decision to install the equipment or measure.

The criterion indicating that program influence may signify a lower likelihood of free ridership is that the following conditions are true:

- The respondent answered “yes” to the following question: “Did a program representative recommend that you that you receive the onsite assessment or that you install the energy [Measure/Equipment type]?” and “probably would not have” or “definitely would not have” to the question: “If the SBDI Program representative had not recommended the onsite assessment or 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 SBDI Program, had you installed any equipment or measure similar to the energy efficient [measure]
- The respondent answered “Yes. Our organization purchased energy efficient equipment but did not apply for incentive” to the following question: “Has your organization purchased any significant energy efficient equipment in the last three years for which you did not apply for a financial incentive through an I&M 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 SBDI Program? (Definition 1)	*Had Plans and Intentions to Install Measure without SBDI Program? (Definition 2)*	*SBDI 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 SBDI Program the period January 2015 through December 2015.

4.4.1 Ex Post Net kWh Savings

The data used to assign free ridership scores were collected through a customer survey of sixteen customer decision makers for projects completed during the period January 2015 through December 2015.

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 SBDI Program. If a decision maker respondent answered “No” to the question of “Would you have been financially able to install the energy efficient [Measure/Equipment type] without the financial incentive from the SBDI Program?” a free ridership score of 0 was assigned to the project. That is, if a participant required financial assistance from the SBDI 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 energy efficient [Measure/Equipment type] without the financial incentive from the SBDI 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 SBDI Program (Definition 1)*	*Had Plans and Intentions to Install Measure without SBDI Program (Definition 2)*	*SBDI Program had influence on Decision to Install Measure*	*Had Previous Experience with Measure*
22%	0%	0%	57%	4%

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. Seventy-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. Only four percent of respondents met the less restrictive version of the plans criteria.

Table 4-9 Estimated Free-ridership for kWh Savings from SBDI Program

Had Plans and Intentions to Install Measure without SBDI Program? (Definition 1)	*Had Plans and Intentions to Install Measure without SBDI Program? (Definition 2)*	*SBDI 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	14%	0%
N	Y	N	N	4%	33%
N	N	Y	N	4%	0%
Required program incentive to implement measures.				78%	0%
Total				100%	1%

None of the participants indicated that they had implemented any additional measures that would count towards program spillover savings.

The realized net energy savings of the SBDI Program during the period January 2015 through December 2015 are summarized in Table 4-10. During this period, ex post net energy savings for the program totaled 2,242,749 kWh. The net-to-gross ratio for the SBDI Program is 99%.

Table 4-10 Summary of SBDI Program kWh Savings

Ex Ante kWh Savings	*Ex Post Gross kWh Savings*	*Free Ridership*	*Spillover*	*Ex Post Net kWh Savings*	*Net to Gross Ratio*
2,573,902	2,271,702	28,953	0	2,242,749	99%

4.4.2 Ex Post Net Peak kW Savings

The ex post net peak kW reductions of the SBDI Program during the period January 2015 through December 2015 are summarized in Table 4-11. The achieved net peak demand savings for the program are 312 kW.

Table 4-11 Summary of Peak kW Savings from SBDI Program

Ex Post Gross Peak kW Savings	*Free Ridership*	*Spillover*	*Ex Post Net Peak kW Savings*	*Net to Gross Ratio*
314	2	0	312	99%

4.5 Process Evaluation

This section presents the results of the process evaluation for Indiana Michigan Power's (I&M) C&I Small Business Direct Install Program (SBDI) during PY6. The purpose of the process evaluation is to assess the program design, delivery, and impact to determine how effectively it is achieving its intended outcomes. Process evaluation activities include a review of program documentation, a survey of program participants, and interviews with program staff and program trade allies. Key findings from those data collection activities are synthesized into overarching, program level conclusions. These conclusions can then provide insight into factors that affect customer satisfaction and decision making, as well as program effectiveness, efficiency, and 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.

4.5.1 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 PY6 activity include:

Did the C&I SBDI Program reach its goal?

Was the C&I SBDI Program delivery effective and efficient?

Were participants satisfied with the program and the equipment they installed?

What changes will occur in PY6?

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 SBDI Program was 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 managers and program implementation contractor staff.

4.5.2 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. In total, 15 participants completed the survey. The participant surveys provided customer feedback and insight regarding customer experiences with the C&I SBDI Program. Respondents reported on their satisfaction with the program, detailed their motivations and the factors affecting their decision making process.
- **Approved Small Business Direct Install Trade Ally (SBDI Trade Ally) Interviews:** Interviews were conducted with 6 program SBDI Trade Allies in January and February of 2016. The objective was to better understand trade allies' perspectives on program processes, design, and market opportunities. Questions specifically focused on their opinions of the application materials, training events, list of eligible measures, and experiences with program staff.
- **Interviews with I&M Staff Members:** Interviews with I&M staff members 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 Lockheed Martin Staff:** Lockheed Martin implements the SBDI Program. Interviews were completed with four program staff to understand program operations and delivery processes.

4.5.3 C&I SBDI Program Activity

The evaluation team reviewed program tracking data to assess the range of measure types implemented in PY6. Table 4-12 displays a summary of PY6 SBDI Program ex ante kWh savings by measure category. Lighting measures accounted for 93% of kWh savings during 2015. Refrigeration measures accounted for 7%.

Table 4-12 SBDI Program Activity by Measure Category

Measure Category	*Total kWh Savings per Measure Category*	*Total Incentive per Measure Category*	*Percent of Savings*
Lighting	2,399,361	$225,698	93%
Refrigeration	174,541	$5,394	7%
Total	2,573,902	$231,092	100%

Ex ante kWh savings by business type is shown in Table 4-13. Automotive services accounted for the majority of SBDI Program ex ante kWh savings (39%). Retail, gas stations, and food service business types accounted for 16%, 14%, and 13% of program ex ante kWh savings, respectively.

Table 4-13 SBDI Project Savings by Business Type

Building Type	*kWh Savings*	*Percent of Savings*
Automotive Services	1,007,230	39%
Retail	416,736	16%
Gas Station	350,896	14%
Food & Beverage Service	324,859	13%
Entertainment/Recreation	92,260	4%
Lodging	76,270	3%
Faith-Based	65,248	3%
Government	52,247	2%
Industrial	49,558	2%
Healthcare	43,124	2%
Education	34,839	1%
Warehouse	24,325	1%
Office	20,141	1%
Grocery and Convenience	16,169	1%
Total	2,573,902	100%

Figure 4-1 displays the cumulative and monthly ex ante kWh savings associated with PY6 SBDI Program application submission dates. Approximately 200,000 kWh in savings was initiated through applications submitted in December of 2015. Activity remained consistent throughout 2015, there was a slight lag in application submission in May and June, but activity picked up again in September and continued to increase through October and November.

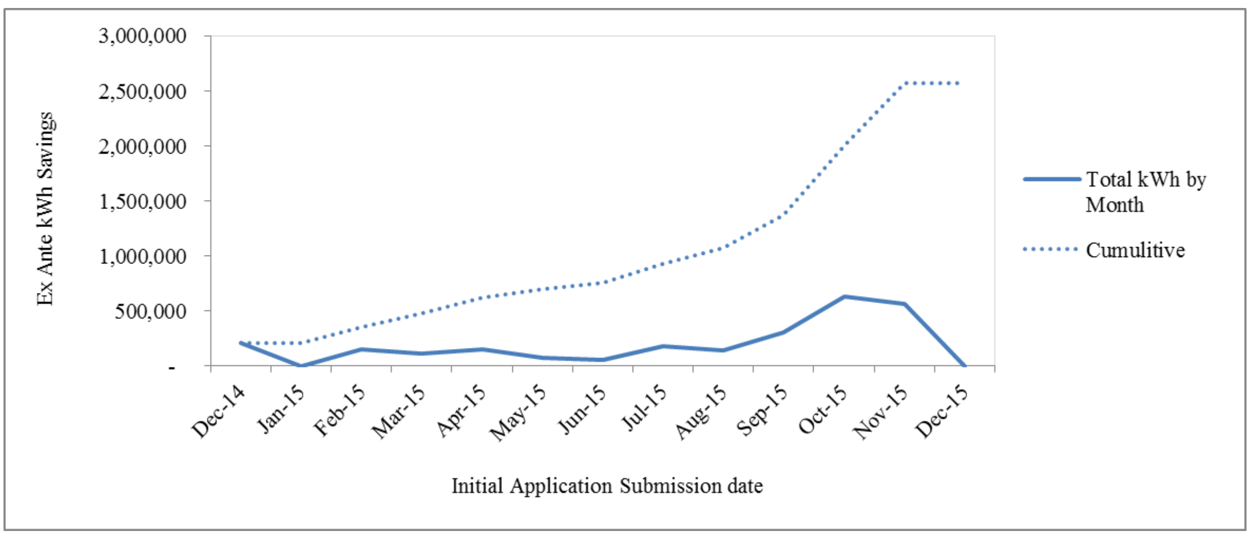


Figure 4-1 Monthly and Cumulative Ex Ante Savings by Initial Application Submission Date

Figure 4-2 displays the cumulative and monthly ex ante kWh savings associated with project end dates. During the first quarter, kWh savings associated with completed projects was relatively low, with the first incentive being paid out in April. Activity remained consistent throughout May and June, however like all C&I Programs there was a lag in activity in July. By September, activity had picked up again and the program finished strong with just over 1,000,000 kWh is SBDI Program savings occurring in December.

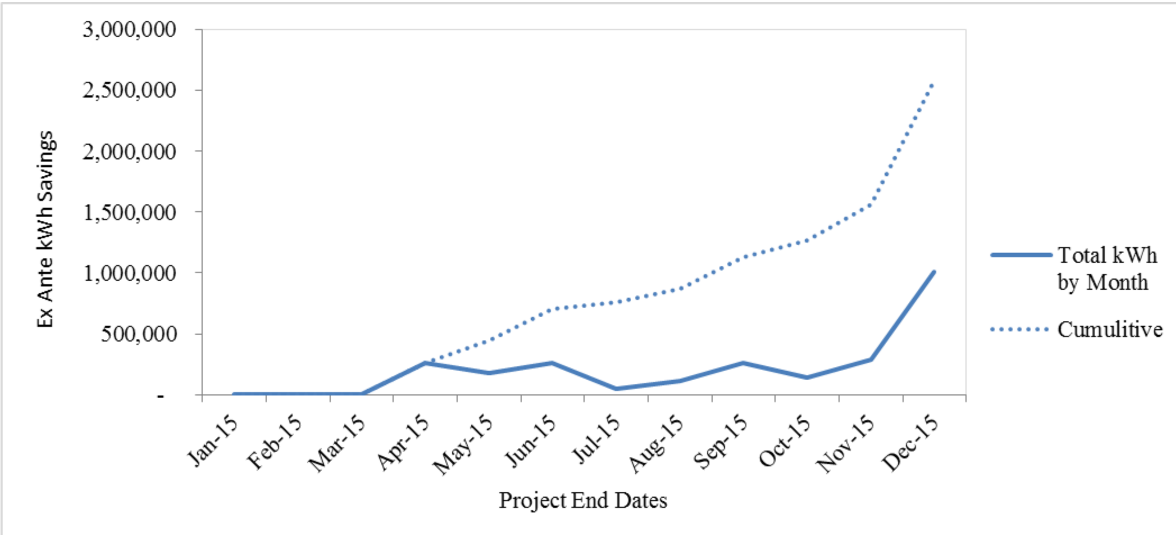


Figure 4-2 Monthly and Cumulative Ex Ante Savings by Project End Date

Table 4-14 provides a summary of projects by size as defined by ex ante kWh savings. Forty-one percent of ex ante savings were generated by projects that claimed less than 20,000 kWh, while approximately 23% of savings were generated by projects that claimed between 20,000 and 30,000 kWh is ex ante savings. Twenty-nine percent of projects claimed between 30,000 and 50,000 in ex ante kWh savings. There were a few projects (4) that had kWh savings that exceeded 50,000 kWh, these project accounted for 8% of overall SBDI Program savings.

Table 4-14 Program Activity by Project Size

Project Size	*Count*	*Ex Ante kWh Savings*	*% of Ex Ante kWh Savings*
<20,000 kWh	116	1,045,010	41%
>20,000 kWh < 30,000 kWh	24	588,539	23%
>30,000 kWh < 50,000 kWh	20	734,282	29%
>50,000 kWh	4	206,071	8%
Total	164	2,573,902	100%

4.5.4 Customer Outcomes

The evaluation team administered participant surveys to a sample of SBDI Program participants who completed projects in 2015. The objective was to collect data on SBDI Program awareness, participant decision-making, trade ally satisfaction, and overall program experiences and satisfaction. In total, 15 out of 142 customers responded to the survey, a response rate of 10%.

A large number of projects for which the primary contact was the same individual as the trade ally contact was found during the process of preparing the project tracking data for use in administering the participant survey. Specifically, for the custom program, 15% of projects listed the trade ally contact as the primary contact. To survey participating customers for the purpose of estimating net savings and garnering program feedback, it is important the program tracking data include customer-decision maker contact information.

4.5.4.1. Respondent Profile

Respondents were asked background information including their job title or role. As seen in Table 4-15, of the 15 customers that responded to the survey, 40% identified themselves as the Proprietor/Owner, 40% identified as a Manager, and 7% identified as the President/CEO. Two customers provided open-ended responses, identifying themselves as a Vice President, and a Secretary. The results suggest that most SBDI decision makers are owners or at the executive level of their organizations; Custom and Prescriptive decision makers often frequently identified themselves as energy Directors, Engineers, or Energy Managers. A common objective for SBDI Programs is to incentivize projects in the small business sector where resources are limited and there may not be specific staff responsible for energy management.

Table 4-15 Customer Roles

What is your job title or role?	*Percent of Respondents (n=15)*
Proprietor/Owner	40%
Manager	40%
Other	13%
President/CEO	7%
Facilities Manager	0%
Energy Manager	0%
Other facilities management/maintenance position	0%
Chief Financial Officer	0%
Other financial/administrative position	0%

4.5.4.2. Program Awareness and Motivation for EE

Customers were asked a series of questions about how they became aware of the SBDI Program, and their motivations for participating in the program.

Respondents were asked to provide feedback regarding the best way to reach companies like theirs with information about incentives for energy savings opportunities. Figure 4-3 displays the results. Visits from contractors or program staff was the most frequent outreach method mentioned by 60% of respondents, followed by email (40%), direct mail (33%) and by phone (33%). Bill inserts were and website updates were less frequently mentioned.

When respondents were asked if they first learned of the SBDI Program from a program contractor, 87% said yes, and one respondent did not know. Program guidelines identify SBDI Trade Allies as the primary marketing channel for the program, and feedback received from participant surveys indicate this matches with participant experiences.

These results indicate that direct program marketing is effective to making participants aware of the program, and Trade Allies are an important marketing channel for the program.

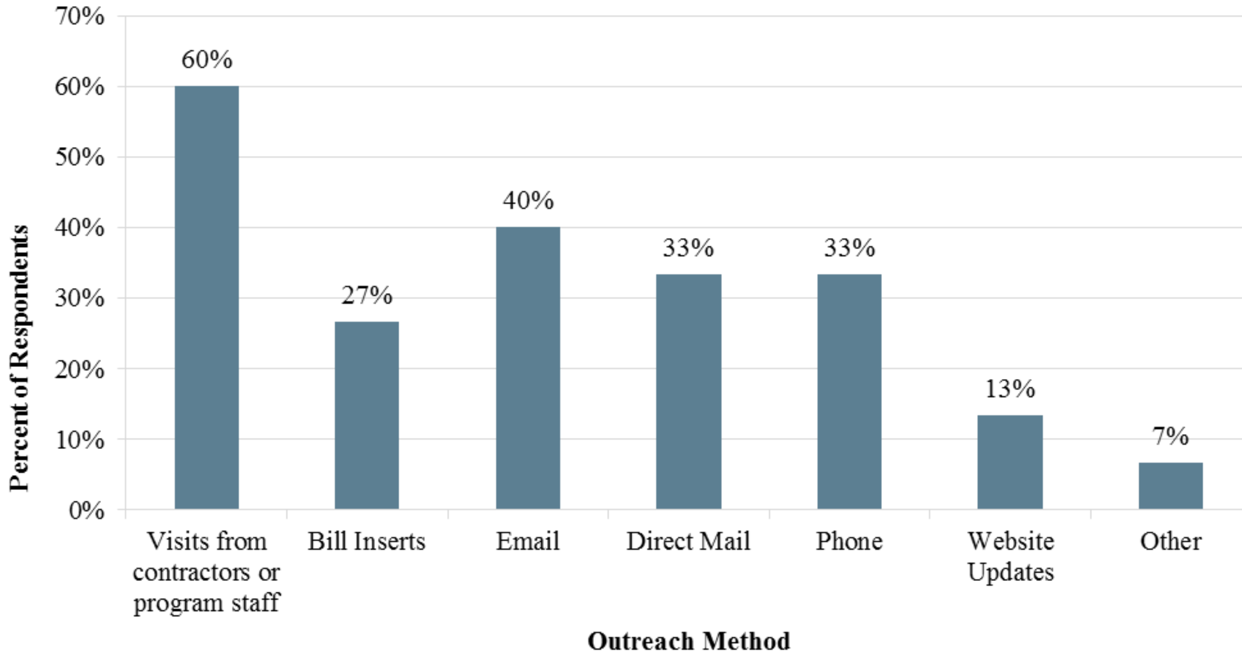


Figure 4-3 Customers' Preferential Outreach Method

Lighting projects Ten respondents (71%) indicated their facility has commercial refrigeration equipment or freezers. Of those, eight were unaware that commercial refrigeration equipment qualifies for SBDI Program incentives, and all eight stated that would like to receive information about future incentive opportunities. The evaluation team provided the implementation contractor with the customers who requested to be notified.

Customers were asked what motivated them to complete the energy efficiency project. Customers were allowed to choose more than one answer, as there can be multiple reasons why a project may be undertaken. Table 4-16 summarizes the results. The majority of respondents (53%) indicated that savings money on energy bills was a motivation for completing the project. Other common responses included conservation/protecting the environment (33%), and acquiring the latest equipment (27%) as reasons to undertake an energy efficiency project.

Table 4-16 Motivation for Completing the Project

In your own words, can you tell me why you did this efficiency project?	*Percent of Responses (n=15)*
Saving money on energy bills	53%
Conserving energy/Protecting the environment	33%
Replacing equipment that was broken	13%
Acquiring the latest equipment	27%
Participation was very easy	0%
Something else	13%

Survey respondents were next asked which financial methods their organization typically uses to evaluate energy efficiency improvements. As summarized in Table 4-17, 87% percent of respondents stated that analyzing the initial cost of an energy efficiency improvement was a method their organization uses. This is consistent with the program theory assumption that initial costs of efficient equipment is key barrier to small business energy efficiency. The second most frequently cited method was simple pay back (73%). Simple pay back is a method for calculating the amount of time it takes to recover installation costs based on the annual kWh energy savings from that installed equipment.[3] Life-cycle costs were mentioned by 67% of customers. Life-cycle costs include all recurring and one-time expenses that occur throughout the life-span of an energy efficiency measure[4]. Internal rate of return (IRR) was mentioned by 53% of respondents. IRR is the investment return rate against which the energy investment decision is compared to. IRR's are often set internally and used as a benchmark for decision making.[5]

Table 4-17 Financial Analyses Methods used to Evaluate Energy Efficiency

Which of the following financial methods, if any, does your organization typically use to evaluate energy efficiency improvements?	*Percent of Respondents (n=15)*
Initial Cost	87%
Simple payback	73%
Life cycle cost	67%
Internal rate of return	53%

4.5.4.3. Trade Ally Experience and Satisfaction

Trade Allies (TAs) are the primary marketing channel used for the SBDI Program. They have the most interaction with customers and are responsible for the application submittal and approval. TAs also provide supporting documentation to program staff and are approved to receive the incentive payment by offering a discount to the customer based on the installed cost. To better understand customers' willingness to participate they were asked if they had any concerns about

[3] https://www.business-case-analysis.com/payback-period.html
[4] http://www.businessdictionary.com/definition/life-cycle-cost.html
[5] http://www.emtfsask.ca/pdfs/gdenefftech.pdf

participating in the program when a TA first approached them. Eight-seven percent of respondents (13) indicated it was an easy decision, while only 13% indicate they had some concerns. Table 4-18 below provides a summary of the responses.

Table 4-18 Concerns about Participating in SBDI Program

When [TRADE ALLY NAME] first approached you about the program, did you have any concerns about participating or was it an easy decision?	*Percent of Respondents (n=15)*
I had some concerns	13%
It was an easy decision	87%
Refused	0%
Don’t know	0%

Respondents were next asked if the contractor provided any marketing materials such as a brochure or flyer when they discussed the program. Seven customers (47%) indicated they received program marketing materials. Five out of the seven respondents indicated the marketing materials were very influential in their decision to install the energy efficiency measures.

Customers were asked to provide feedback on their experience with their TA by rating how much they agree or disagree with several statements on a scale of one to five where one means they completely disagree, and a score of five means they completely agree. Figure 4-3 below provides a summary of the responses.

All respondents stated that they agreed or completely agreed that the TA was professional and courteous. When asked if the TA’s recommendations made sense for their organization, 93% of respondents stated that they agreed or completely agreed, and only one participant they neither agreed nor disagreed. When asked if the TA was knowledgeable, 93% of respondents stated that they agreed or completely agreed, and one respondent stated that they neither agreed nor disagreed. When asked if they would recommend the TA, all respondents stated that they would.

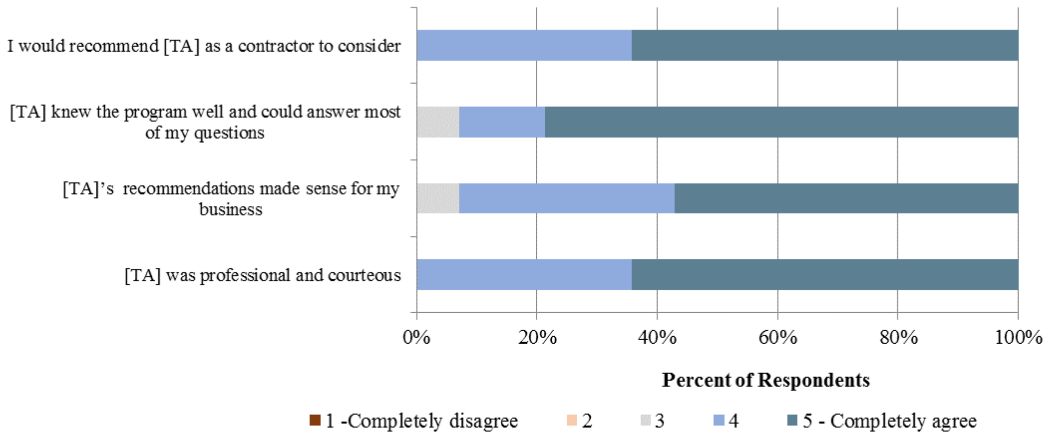


Figure 4-3 Customers' Experiences with SBDI Program Trade Allies

When asked if the TA clearly explained the participation process them, 93% of respondents indicated yes, and just one respondent indicated no. Overall customers' feedback regarding their experiences with TAs was largely positive. The majority of respondents felt that the SBDI TAs were knowledgeable about the program and the technologies, were professional and courteous, and should be recommended.

4.5.4.4. Program Participation Experience and Satisfaction

Customers were asked to provide feedback regarding their experience with the SBDI Program and the level of satisfaction they had with several aspects of the participation process. Respondents were first asked if any equipment installations occurred on the same day as the energy assessment, as program guidelines allow this practice. Of the 15 SBDI Program participants that responded to the survey, only 2 (13%) indicated same day installation.

Respondents were asked if any additional equipment was recommended during the on-site assessment that they choose not to install, and only two respondents indicated that they had. The data suggests that the majority of SBDI Program participants are installing equipment recommended by Trade Allies. When asked to rate how well the program's range of energy savings equipment options fit their needs 87% of respondents provided a rating of 3 or 4 on a 4 point scale.

Respondents were then asked to rate their satisfaction with various aspects of the program on a one to five scale where one meant very dissatisfied and five meant very satisfied. Figure 4-4 below displays a summary of the results.

Respondents were asked to rate the proposal they received from their contractor, all stated that they were either satisfied or very satisfied, with 67% stating they were very satisfied, and 33% of respondents stating they were satisfied. The amount of time between the audit and the installation was also rated either satisfied or very satisfied, but received slightly lower ratings with 53% of respondents provides a rating of 5, and 47% provided a rating of 4. All respondents were either satisfied or very satisfied with the equipment that was installed, with eighty percent stating they were very satisfied. When asked to rate the quality of the installation, 73% of respondents stated they were very satisfied, 20% rated it as satisfied, and one respondent (7%) stated they were neutral. When asked about the program discount, 93% of respondents were either satisfied (33%) or very satisfied (60%) and one respondent was very dissatisfied. When asked to rate the overall program, only one respondent did not state they were either satisfied or very satisfied with the overall program. Overall, customers were satisfied with all elements of the SBDI Program.

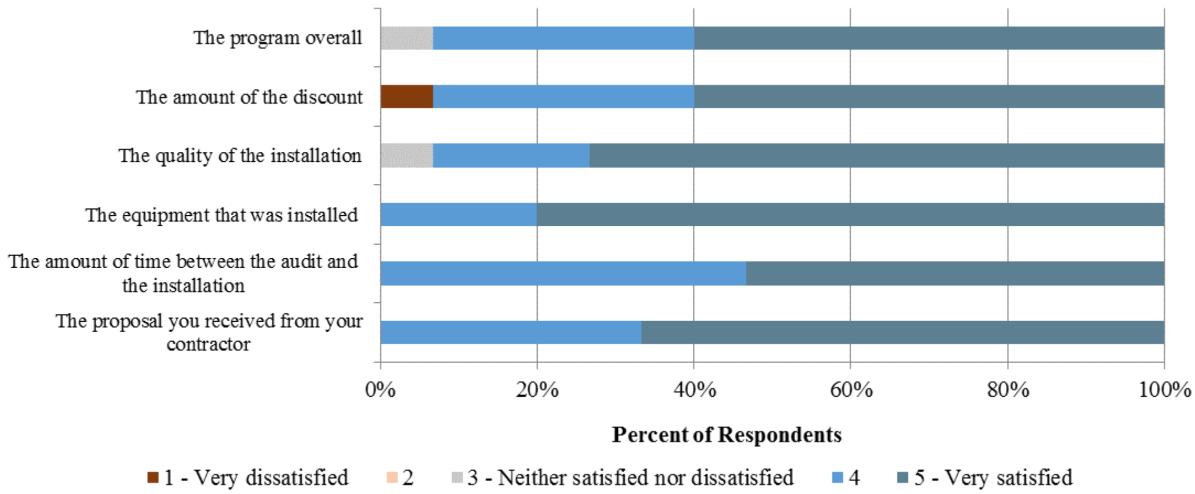


Figure 4-4 Program Satisfaction

4.5.4.5. Key Findings

The following section summarizes key findings that surfaced during the participant survey data collection and analysis effort.

- **Visits from contractors and email communication are the preferred forms of outreach by respondents.** Approximately half of respondents received program marketing materials from their contractor, and these respondents stated the materials were very influential in their decision to undertake the project.
- **Participants are satisfied with trade allies.** Customer feedback regarding their experiences with trade allies was largely positive. The majority of respondents stated SBDI trade allies were knowledgeable about the program and the technologies, were professional and courteous, and would be recommend by their customers based on positive experiences.
- **Participants are satisfied with the program.** Survey data suggests participants are very satisfied with all elements of the SBDI Program that were asked about including the proposal, the time to install the measures, the installed equipment, and the quality of the installation. Participants were also very satisfied with the discount amount, although it received slightly lower levels of satisfaction. Overall the feedback was very positive.

4.5.5 Trade Ally Perspectives

ADM completed interviews with six trade allies that are registered with the SBDI Program to understand their perspectives and experiences with the program. Five of these trade allies were active participants during 2015, having completed at least 10 projects. The remaining interview respondent did not complete any projects during 2015.

During the interviews, trade allies were asked about the following topics:

- Comparison of I&M Program to other utility programs;
- Feedback on training, newsletter; and other program communication;
- Assessment of New Application Tool;
- Program marketing;
- Program satisfaction; and
- Anticipated level of program activity in 2016.

Most respondents indicated that they provided services to a wide variety of building types, but two indicated greater specializations in the buildings they target. One of these respondents stated that that they serve office spaces and restaurants; the other respondent stated that they provide service to industrial facilities, educational institutions, and healthcare buildings. Most respondents represented small firms with five or fewer employees, but one respondent stated that their firm employed about 30 people.

4.5.5.1. Comparison of I&M Program to Other Utility Programs

Trade allies were asked questions about what, if any, other utility programs they work with to understand how the incentives offered and measures covered by the I&M program compare with these other programs. These questions were also intended to understand if programmatic differences affected trade allies' level of engagement with the I&M program.

Five of the six trade allies indicated that they work with other programs. These contractors stated they worked with other regional programs including the Michigan Efficiency United programs, the Wabash Valley Power Association Power Moves programs, the NIPSCO programs, and the ComEd programs (Illinois).

Three respondents indicated that the incentive levels offered through the other programs were comparable to those offered by I&M. The other two respondents noted that NIPSCO does not cap the incentive amount. One of these two respondents indicated that the I&M incentive cap impacts program activity and that it can act as a disincentive to promoting the I&M program.

Three of the five respondents with experience with other programs indicated that there were no additional measures that they would like to see covered by the program. The remaining respondents provided some suggestions for measures that if included would improve the comprehensiveness of the program's offerings. The additional measures noted were:

- Eight foot T12 replacements;
- Decorative or specialty lamps; and

- LED replacements of incandescent lamps.

Overall, these responses suggest that the program compares favorably to other similar programs operating in the region.

4.5.5.2. Feedback on Training, Newsletter, and Other Program Communication

Trade allies provided feedback on their experience with program training, their assessment of the Trade Ally newsletter, and any suggestions for improving program communication with trade allies.

All but one respondent reported that they had attended program training sessions. Respondents described these events as annual informational meetings, program launch event, breakfast meetings, and an online training session.

Respondents provided generally favorable ratings of the training offered, as summarized in Figure 4-5. When asked if there any additional topics should have been covered or if any additional training should be provided, only one respondent provided a suggestion. This trade ally suggested that the training should be more specific to the SBDI program and cover that program in greater detail.

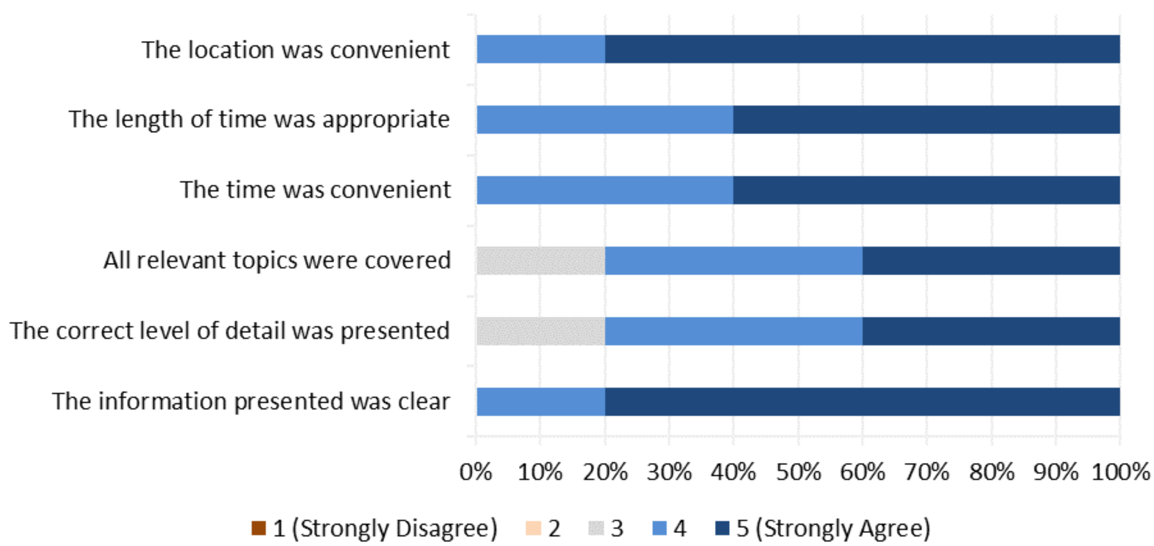


Figure 4-5 Ratings of Aspects of Training

The program provides an electronic monthly newsletter for trade allies that contains updates on the programs. The newsletter generally covers all commercial incentive programs, but also has focused on issues specific to the SBDI program. Only two of the respondents indicated that they receive the trade ally newsletter. Both respondents indicated that they read all or most of the newsletters and thought that they were informative and useful.

Trade allies were asked for any additional suggestions for how the program could improve communications with its trade allies. Three trade allies stated that they would like to receive the newsletter or other electronic communications on program updates.

One trade ally asked to receive an email when the incentive check is processed and mailed. Additionally, this respondent stated that when applications are approved and a notification is sent to the customer, it causes confusion for customers when the incentive is payable directly to the trade ally. The interview respondent suggested stating in the notification which party the incentive will be paid to.

Overall contractors had favorable assessments of program training and communications. One trade ally stated the following in response to the question about additional suggestions to improve program communications:

> *"They are willing to consider suggestions. If we can save energy, they will give an incentive. Information and communication flows wonderfully."*

4.5.5.3. Assessment of New Application Tool

Program staff revised the application tool used by trade allies. The tool allows trade allies to enter measure characteristics and quantities and site information. The tool summarizes project information including the total cost, the cost less the incentive, the estimated annual savings, the estimated payback, and the one and five-year return on investment.

Five interview respondents with experience using the tool provided feedback on it. Four of the five respondents stated that the tool was an improvement from the application tool used during the prior year. These respondents noted several aspects of the tool that they liked:

- The Excel format;
- Spreadsheets are tied together which reduces errors and data entry;
- It is clear if measures do not meet program requirements;
- It provides an application completion checklist; and
- It's easy to use.

One respondent stated it was the best tool they had used.

Only one respondent thought it was a bit worse than the old application because more information was required, including information on space heating and water heating type. However, this respondent was not sure if she was recalling the I&M application or one from another program (the I&M application does ask for space heating type, but not water heating type). Moreover, all respondents indicated that they were satisfied or very satisfied with the tool.

No respondents offered suggestions for improving the tool.

4.5.5.4. Program Marketing

Five of the six respondents reported that they actively market the program to their customers. It is worth noting that the one respondent that indicated that they did not actively promote the program did not complete any program projects in 2015. The remaining respondents that were actively promoting the program completed between 10 and 125 project during the program year.

Three out of the five respondents that actively promote the program stated that they use the program-provided marketing materials. These respondents indicated that the materials enhance their credibility with customers and one indicated that they are useful for use in training new staff. When asked if they could provide suggestions for improving the materials, one respondent stated that they would prefer more copies to leave with their customers. Another indicated that the phone numbers and website links printed on the materials were incorrect and did not direct customers to the program. It was also suggested by one respondent that the program allow co-branding as a means to enhance the trade ally's credibility with potential customers.

4.5.5.5. Program Satisfaction

Interview respondents were asked to rate their satisfaction with various aspects of the SBDI program. Their responses are summarized below in Figure 4-6. As shown, all respondents indicated satisfaction with each aspect of the program. However, one respondent provided a lower rating of the application process. This respondent indicated that it took too long to get paid.

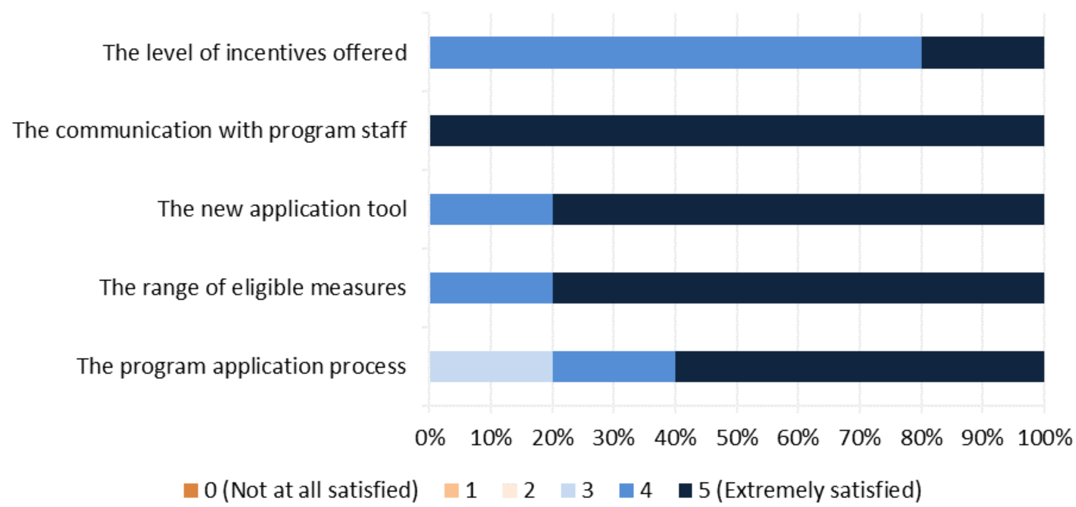


Figure 4-6 Program Satisfaction

4.5.5.6. Anticipated Level of 2016 Program Activity

All but one of the respondents indicated that they anticipate completing more projects in 2016 than in 2015. Three of these respondents indicated that they have plans or procedures that could be put in place to expand their staff. Two respondents stated specific goals for growth and increased program activity – one stated that they would like to double their activity and another that they plan to increase the number of employees fourfold in the next five years. A fifth respondent stated that their firm had already taken steps to be more active in the program. Specifically, they stated that they had already hired an additional staff member, had recently completed training another, and were in the process of hiring a third.

Overall, while several trade allies stated that they intend to be more active in the program, most of these responses could be characterized as aspirational with only one firm reporting that they had already taken steps to increase their capacity to complete more projects. None the less, these responses suggest that trade allies are actively engaged in the program. Moreover, the only respondent who indicated that they may not complete as many projects indicated that it was because they had already completed several projects (tracking data shows 62 projects during 2015 for this respondent) not because they planned on backing off their level of effort.

4.5.5.7. Summary of Findings

Overall, trade allies provided favorable assessments of the design and operations of the SBDI program. Most respondents felt that the incentives and measures offered compared favorably to other programs in the territory, although a few suggested additional measures and two noted that the NIPSCO program does not cap the incentive amount.

Training and communication processes are largely meeting trade ally needs, however, multiple trade allies reported that they did not receive the newsletter and would like to.

Respondents provided favorable assessments of the new application tool and a number of benefits were identified by the interviewed trade allies.

Some suggested program improvements for consideration are as follows:

- State which party, the customer or contractor, will receive the program incentive on the notifications of application approval.
- Send trade allies an email when the rebate check has been processed and sent.
- Provide more SBDI program specific training.
- Allow for co-branding opportunities to assist trade allies with promoting the program.
- Review the circulation list of the newsletter. Several trade allies reported they did not receive the newsletter but it is valued by those who did receive it.

4.5.6 Program Operations Perspective

The following section provides an overview of the SBDI Program operations developed from interviews with staff and reviews of program documentation. This section summarizes the roles and responsibilities of the staff responsible for managing program operations; the program goals, design and processes, staff communication effectiveness, program marketing, and notable program successes and challenges.

4.5.7 Staff Roles and Responsibilities

The evaluation team interviewed four key program personnel; three Lockheed Martin and one I&M staff member. The interviewees were asked to identify their roles and responsibilities with the I&M energy efficiency programs. The interviewees included one C&I DSM Programs Supervisor, one Marketing Manager, and two DSM Coordinators.

The C&I DSM Programs Supervisor oversees the implementation contractor, serves as the primary point of contact for approved contractors, and is responsible for customer outreach in I&M's southern territory. The Marketing Manager fulfills a marketing oversight role for both the

Residential and the C&I Programs. The two DSM Coordinators are responsible for customer outreach in the South Bend and Fort Wayne regions.

The implementation contractor took over as the single implementer for I&M's portfolio of C&I Programs during PY6 (2015). Several changes in organizational structure took place as a result. The Lockheed Martin Program Manager from previous years is now the Sr. Program Manager, responsible for providing guidance related to program design and regulatory oversight. The new Program & Operations Manager handles the day to day operations and coordination of program delivery and also takes the lead on maintaining communication and collaboration with I&M. The Lockheed team also consists of one Marketing & Trade Ally Coordinator, two Project Coordinators, one full-time engineer and three field staff who reside in the I&M territory and work closely with the I&M DSM Coordinators.

During PY6, the marketing and outreach function was led by I&M and supported by the implementation contractor's Marketing & Trade Ally Coordinator. The implementation contractor is responsible for drafting, designing, and printing marketing collateral. I&M's marketing manager is responsible for approving those materials. Email campaigns, analytic tracking, website updates, and trade ally coordination are also handled by Lockheed Martin. Marketing materials, outreach events, and trade ally communication is discussed in greater detail in Section

4.5.8 PY6 Program Goals

Program staff was asked to comment on the energy savings goals by program, which was set by senior utility staff when the 2015 2016 Plan was developed. The goals were based on previous year assumptions. All C&I Program goals were adjusted mid-year as the new implementation contractor was able to provide more concrete projections of program activity. The SBDI program picked up momentum towards the end of the program year however fell just shy of the energy savings goals. Table 4-19 below provides a summary of the adjusted goals and ex ante savings values at the end of PY6.

Table 4-19 SBDI PY6 C&I Program Goals

2015 Adjusted kWh Goals - Lockheed	*2015 kWh Goals - Plan Filing*	*Gross Ex Ante kWh Savings*
3,067,134	3,000,000	2,573,902

4.5.9 Program Design and Processes

An in-depth process evaluation of the SBDI program was completed for PY6. This section summarizes key aspects of the program design and the participation process.

The SBDI Program is designed to reduce the participation barriers for C&I customers that have monthly electric demand less than 150 kW. Multiple aspects of the program design are intended to reduce barriers to program participation and energy efficiency among small businesses. These design features include:

- High incentive levels to reduce the cost of efficient equipment options;

- Provision of incentives as a contractor discount to minimize the upfront cost of efficient equipment;
- Using approved trade allies to complete energy assessments of customer facilities to reduce barriers caused by lack of information; and
- Place burdens of completing project paperwork and submitting project documentation on trade allies.

Figure 4-7 displays a process diagram, provided by Lockheed Martin that depicts the various stages of the SBDI implementation process.[6]

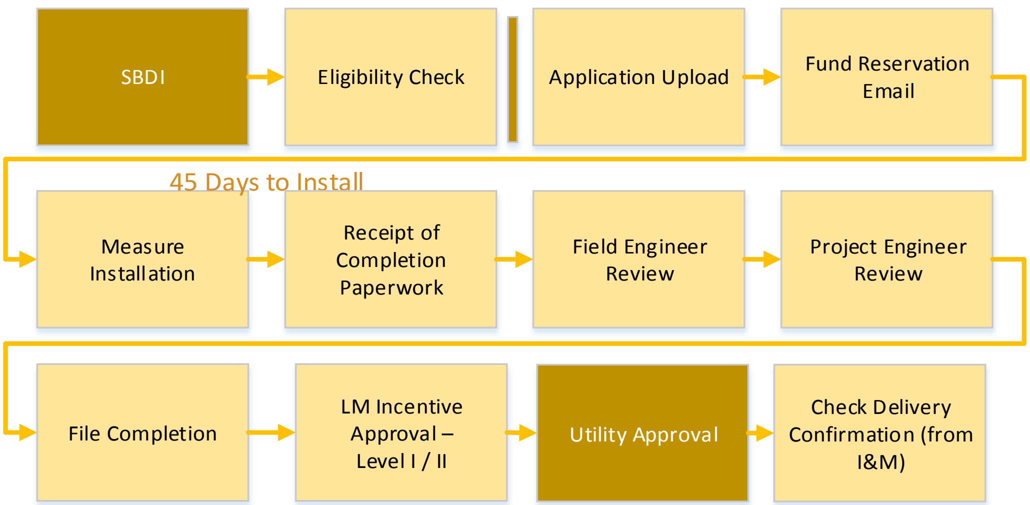


Figure 4-7 SBDI Application and Project Review Process

The post-installation inspection procedures during PY6 were unchanged. The first five projects completed by new SBDI trade allies are inspected until five consecutive projects pass inspection. Once five projects pass, projects completed by that trade ally will fall into the population of projects, of which 10% receive random inspections.

Staff indicated that there were no significant verification issues during PY6. When the evaluation team reviewed the PY6 inspection report provided by Lockheed[7], each trade allies had at least five post-installation inspections performed, which indicates Lockheed is complying with this post-inspection protocol.

Inspections are guided by a form. The form is populated with specific project and contact information, and includes checklists for inspection staff to ensure appropriate documents are reviewed during the pre-inspection, and the database is updated during post-inspection. The inspection form also contains fields for staff to collect data regarding baseline equipment and equipment operating hours. Figure 4-8 below provides a screenshot of the bottom half of the inspection document where the technical information is recorded.

[6] [6] Lockheed Martin, *AEP Indiana Michigan Power Program Abstract: SBDI Program*, (2015).

[7] Lockheed Martin, *I&M Random Inspection Results 151218.xlsx*

CHECKLIST

Items to review prior to site inspection:

- ☐ Project Measures (submitted, approved, installed)
- ☐ Supporting documentation (Specs, Invoices...)
- ☐ Record Wall, Activities, and Closed Activities
- ☐ Coordinate with involved parties

Items to update after site inspection:

- ☐ LM-Captures Milestone Actual End Dates
- ☐ LM-Captures Record Wall Post - Summary
- ☐ LM-Captures Inspection Fields (Random Insp)
- ☐ Record/ Track Follow Up Requirements

RESULTS

Inspection Items

- ☐ *Baseline Equipment (Confirm type and consumption on application with installed equipment)*
- ☐ *Baseline Equipment Useful Life (Confirm remaining useful life of equipment - name plate information)*
- ☐ *Baseline Equipment Quantities Installed (Compare submitted quanities on project with installed equipment)*
- ☐ *Operating Hours (Confirm site operating hours align with application operating hours at the measure level)*
- ☐ *Efficient Equipment (Manufacture and model number on invoice/ specification sheets)*

Figure 4-8 PY6 C&I Inspection Form

4.5.10 Communication

The program team has a weekly scheduled conference call to discuss program activity, the status of savings and spending, as any issues pertaining to specific projects. The Program Manger provides the following reports for I&M's review: weekly program tracking data from the Lockheed Martin Captures, weekly summary of implementations activities and forecasts, and monthly scorecards. I&M staff indicated that generally the level and quality of communication between parties is sufficient, and the reporting protocols are well organized. The well-organized reporting facilitates higher levels of program oversight than what existed in previous years.

One area where the potential to improve coordination and communication may exist is in the execution of the program marketing function. Staff indicated that the I&M Marketing Manager provides marketing oversight for both the C&I and Residential Energy Efficiency Portfolios, totaling 11 programs. The Lockheed Martin Marketing Manager is responsible for reviewing, editing and approving all marketing collateral drafted by Lockheed Martin. However, the I&M Marketing Manager does not currently participant in the weekly calls with the implementation team. Lockheed Martin staff indicated there were multiple instances during PY6 when direct communication between I&M and Lockheed Martin Marketing staff would have been beneficial. Staff suggested that having direct access to the I&M Marketing department could help improve the cohesion of messaging, facilitate expansion of the marketing effort and speed up the approval process.

4.5.11 Marketing / Outreach

The marketing and outreach functions were shared between I&M and Lockheed Martin staff during PY6. Staff from both organizations indicated the level of collaboration among the groups was a major success. Lockheed Martin indicated their role is more administrative in nature in supporting the C&I programs. Below is a summary of primary marketing activities Lockheed Martin is responsible for as part of implementing the SBDI Program:

- Marketing collateral: Lockheed Martin marketing staff is responsible for designing and printing all approved newsletters, postcards and mailers.
- Managing email campaigns: Lockheed Martin designs all news blasts that inform customers and trade allies about the program offerings and changes throughout the year. Email campaign analytics are reported to I&M on an ad-hoc basis.
- Web messaging: Lockheed Martin contractor is responsible for copywriting all website material. This task involves coordinating with I&M web developers to design and implement the website messaging.
- Attending industry specific events: Lockheed Martin teamed up with several organizations throughout the year in an effort to deliver a more targeted message to specific sectors.

Throughout PY6 Lockheed Martin staff hosted and attended several in-person events. In January, three SBDI trade ally events were hosted in the Ft. Wayne, South Bend, and Muncie areas. These events were held to recruit TAs and provide information and training on the program offering and new application tool.

Table 4-20 below provides a summary of email communication originating from the implementation contractor during PY6.

Table 4-20 PY6 Email Campaigns

Program	*Date*	*Purpose*
All Programs	12/23/14	Initial Kick Off Invitation for 2015 TA Network
All Programs	1/10/15	TA Recruitment
All Programs	1/29/15	TA Winter Newsletter
All Programs	2/10/15	TA Recruitment
All Programs	3/19/15	Update to Measure List
All Programs	5/29/15	Update to Measure List
Prescriptive	6/17/15	Incentive Bonus
All Programs	7/6/15	TA Recruitment
All Programs	8/10/15	TA Summer Newsletter
All Programs	8/27/15	Increase to Incentive Cap
All Programs	10/7/15	Communicate upcoming deadlines
All Programs	10/12/15	End of push to have projects complete

Program staff was also asked to provide suggestions on how the C&I Program can better reach the target markets through enhanced outreach, marketing or other strategies to support TA efforts. Staff indicated that during 2016 the implementation team drafted a proposal that included expanding the current co-branding strategy to include apparel for TAs; currently the only approved co-branding is digital. Program staff said the proposal was under review but no yet approved.

4.5.12 Success and Challenges

Staff indicated that an important strength of the program is that they stayed responsive to market feedback and were committed to continuous improvement. For example, the incentive design changed in an effort to stratify the lighting measures by wattage. As a result, we have reduced the uncertainty regarding kWh saving for lighting measures and improved the incentive approval process.

The SBDI program activity is still being dominated by national lighting vendors. While staff indicated they increased efforts to grow the trade ally network, and spoke to several contractors at events throughout the year, not all of the newly recruited trade allies are completing program projects.

4.5.13 Summary of Conclusions and Recommendations

The following presents a selection of key conclusions from PY6:

- **The program fell short of its expected savings goal:** The expected electricity savings of the Custom Program equaled 3,067,134 kWh hours and fell short of the program goal of 2,573,134 kWh (84% of goal). Lighting projects accounted for most (93%) of the program expected savings. Refrigeration projects accounted for 7% of program ex ante savings.
- **Participants are satisfied with trade allies.** Customer feedback regarding their experiences with trade allies was largely positive. The majority of respondents stated SBDI trade allies were knowledgeable about the program and the technologies, were professional and courteous, and would be recommend by their customers based on positive experiences.
- **Participants are satisfied with the program.** Survey data suggests participants are very satisfied with all elements of the SBDI Program that were asked about including the proposal received, the time to install the measures, the installed equipment, and the quality of the installation. Participants were also very satisfied with the discount amount, although it received slightly lower levels of satisfaction. Overall the feedback was very positive.
- **Opportunity to increase awareness of refrigeration equipment not aware of refrigeration incentives.** Approximately one-half of survey respondents had refrigeration equipment at their facilities and were not aware of the program's refrigeration incentives.
- **Program provided materials are influential on customer's decisions to participate.** Forty-seven percent of customers reported that their contractor provided them program marketing materials and a clear majority of these customers said they were very

influential to their decision to participate. Contractors also stated that the program marketing materials are valuable, noting that they help increase their credibility with customers. Additionally, one contractor suggested that program could further enhance its marketing materials by allowing for additional co-branded materials. The development of additional co-branded materials was also noted as a means of improving program marketing materials by the program implementation contractor.

- **Trade allies are satisfied with the program.** All of the interviewed trade allies indicated that they were satisfied with their communications with program staff, the application process, the incentive levels, and the range of measures covered by the program. A few trade allies noted some areas to enhance the program. These included sending the trade ally an email when the rebate check was processed and to provide more specific SBDI training to trade allies. Another suggestion was that the letter notifying the customer that their application was approved should state which party (i.e., the customer or contractor) the incentive payment will go to. It was noted that customers are sometimes confused when the letter states that the incentive will be paid to them when it is going to be sent to the contractor.
- **Multiple trade allies reported not receiving the newsletter.** Some registered trade allies indicated that they did not receive the program newsletter and would like to. It is possible that these emails are being blocked by the spam or network filters.
- **New application was well received:** Interviewed trade allies provided positive feedback on the new application tool, noting that it is easy to use, makes it clear if measures do not meet program requirements, and provides an application completion checklist. One respondent stated it was the best tool they had used. All trade allies reported that they were satisfied with the tool.

The evaluator provides the following recommendation for future program operations:

- **Consider revising the letter notifying customers of an approved application so that it indicates to which party (i.e., the customer or the contractor) will receive the incentive payment.** This modification may reduce confusion among program participants who do not directly receive the incentive payment.
- **Consider expanding co-branded marketing materials.** Participating trade allies suggested that additional co-branded marketing materials would benefit their marketing of the program.
- **Consider sending trade allies an email notifying them that their incentive payment has been processed.**
- **Consider advising registered trade allies to add the program email newsletter email address to the safe sender list.**
- **Ensure that customer decision-maker contact information is collected and provided to the evaluator.** Review of the program tracking data indicated that a significant share of projects that listed the trade ally as the primary contact.

5. Cost Effectiveness Testing

In evaluating the 2015 I&M Commercial and Industrial 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 commercial 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[8]:

- 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 5-1.[9]

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[8] 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>

[9] http://www.epa.gov/cleanenergy/documents/suca/cost-effectiveness.pdf

Table 5-1 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 5-2.[10]

[10] http://www.epa.gov/cleanenergy/documents/suca/cost-effectiveness.pdf

Table 5-2 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

5.1 Incremental Cost Calculations

Using the Database for Energy Efficient Resources (DEER)[11], 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.

5.2 Effective Useful Life Calculations

ADM calculated the Effective Useful Life (EUL) by measure referencing the Indiana TRM or 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 Custom program the weighted average EUL equals 13.8 years, for the C&I Prescriptive program the corresponding value is 12.2 years, and for the Small Business Direct Install program the weighted average EUL equals 11.8 years.

5.3 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 five cost effectiveness tests for each active program during 2015. Table 5-3 displays the discount rate that was incorporated into the cost effectiveness analysis for each of the five test types.

Table 5-3 Discount Rate by Test Type

Test	*Discount Rate*
Utility Cost Test	7.29%
Total Resource Cost Test	7.29%
Ratepayer Impact Measure Test	7.29%
Societal Cost Test	5.00%
Participant Cost Test	15.00%

The results of the above cost effectiveness tests and their corresponding benefits (numerator of each cost test) and total costs (denominator of each cost test) are presented in Table 5-4 through Table 5-7 below.

Table 5-4 C&I Custom Program Cost Effectiveness Test Results

Test	*Score*	*Benefits (2015 dollars)*	*Costs (2015 dollars)*
Utility Cost Test	12.28	$37,743,873	$3,074,244
Total Resource Cost Test	4.46	$37,743,873	$8,457,273
Ratepayer Impact Measure Test	0.93	$37,743,873	$40,771,563
Societal Cost Test	5.13	$43,425,472	$8,457,273
Participant Cost Test	3.90	$30,371,247	$7,779,340

[11] The DEER database can be downloaded here: http://www.energy.ca.gov/deer/

Table 5-5 C&I Prescriptive Program Cost Effectiveness Test Results

Test	*Score*	*Benefits (2015 dollars)*	*Costs (2015 dollars)*
Utility Cost Test	7.21	$17,001,820	$2,358,063
Total Resource Cost Test	2.04	$17,001,820	$8,321,244
Ratepayer Impact Measure Test	0.71	$17,001,820	$23,889,995
Societal Cost Test	2.31	$19,221,993	$8,321,244
Participant Cost Test	2.31	$18,854,302	$8,160,447

Table 5-6 C&I SBDI Program Cost Effectiveness Test Results

Test	*Score*	*Benefits (2015 dollars)*	*Costs (2015 dollars)*
Utility Cost Test	3.03	$1,700,746	$561,459
Total Resource Cost Test	1.86	$1,700,746	$915,046
Ratepayer Impact Measure Test	0.60	$1,700,746	$2,812,288
Societal Cost Test	2.09	$1,913,570	$915,046
Participant Cost Test	3.22	$1,904,901	$592,227

Table 5-7 summarizes the cost effectiveness testing results by program for each test performed.

Table 5-7 Cost Effectiveness Test Scores by Program

Program	*UCT*	*TRC*	*RIM*	*SCT*	*PCT*
C&I Custom	12.28	4.46	0.93	5.13	3.90
C&I Prescriptive	7.21	2.04	0.71	2.31	2.31
C&I Small Business Direct Install	3.03	1.86	0.60	2.09	3.22

Appendix A: C&I Custom and Prescriptive Project-Level Analyses

This section contains project-level analyses for the impact evaluation of the Commercial and Industrial Custom and Prescriptive Programs.

Project Number 718

Executive Summary

Under project 718, the customer received incentives from Indiana Michigan Power for compressed air system improvements. The realization rate for this project is 45%.

Project Description

The existing system had pressure issues throughout the facility, mostly at the north end. The customer implemented a 30hp compressor to offset the pressure loss at the north end. The system was supported by a fixed speed 200hp compressor and a fixed speed 150hp compressor. The system had two standard filters and small-diameter piping, which created a 15-psid across the system.

The old piping was replaced with larger-diameter piping, allowing the operating pressure to be reduced and the 30hp unit to be shut down. The old filters were removed and replaced with an oil mist eliminator that has near zero pressure drop. Additional storage was implemented to increase system capacitance. The fixed speed 200hp single stage compressor was removed and a 200hp two stage VSD compressor was implemented to provide trim when system demand moves beyond the capacity of the new compressor.

Measurement and Verification Effort

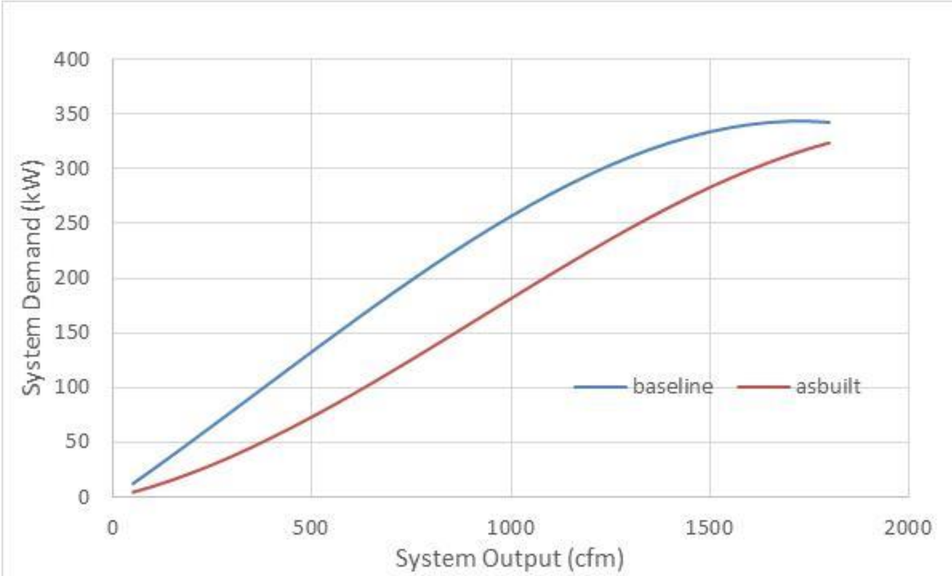
During the M&V visit, ADM verified the installation of the new equipment and shutdown of the 30hp air compressor. ADM discovered that the new system was designed to handle increased system demand from additional production equipment that has since been installed. ADM installed power monitoring equipment on the 150hp and 200hp VSD compressors to collect data for a period of two weeks in one-minute intervals. Baseline amperage data for each compressor was provided to ADM and encompassed one week's worth of data in one-second intervals.

Using a combination of the baseline amperage data, power factor curves, CAGI curves and typical compressor curves, ADM determined the cfm output for each data point for the baseline system. ADM then calculated baseline system efficiency curves (cfm vs. kW).

To determine as-built consumption, ADM used a combination of the as-built power data, CAGI curves and typical compressor curves to determine the cfm output of the as-built system.

A comparison of baseline and as-built system efficiency curves is shown below:

Baseline vs. As-Built Overall System Efficiency



Since the system capacity was expanded to accommodate an increase in compressed air demand, ADM assumed baseline demand to be equal to as-built demand. ADM then used the baseline system efficiency curves with the as-built compressed air demand to create a baseline power demand profile. The baseline and as-built profiles were extrapolated over a year, accounting for plant shutdowns, and savings were calculated as the difference between baseline and as-built system energy consumption.

Results

Verified Gross Savings/Realization Rates

Measure Category	*kWh Savings*			*kW Savings*
	Expected	*Realized*	*Realization Rate*	*Realized*
Compressed Air System	1,094,558	487,108	45%	65.16
Total	1,094,558	487,108	45%	65.16

The overall project realization rate is 45%. The difference between ex post analysis and ex ante analysis can be attributed to the assumption in the ex ante estimation that compressed air demand would decrease by 315 cfm. The ex ante estimation does not account for increased production capacity, which was implemented post-project. A comparison of baseline and as-built data shows an average increase in demand of around 46 cfm.

Project Number 792

Executive Summary

Under project 792, the customer received incentives from Indiana Michigan Power for the installation of new outside air dampers and ventilation controls. The realization rate for this project is 68%.

Project Description

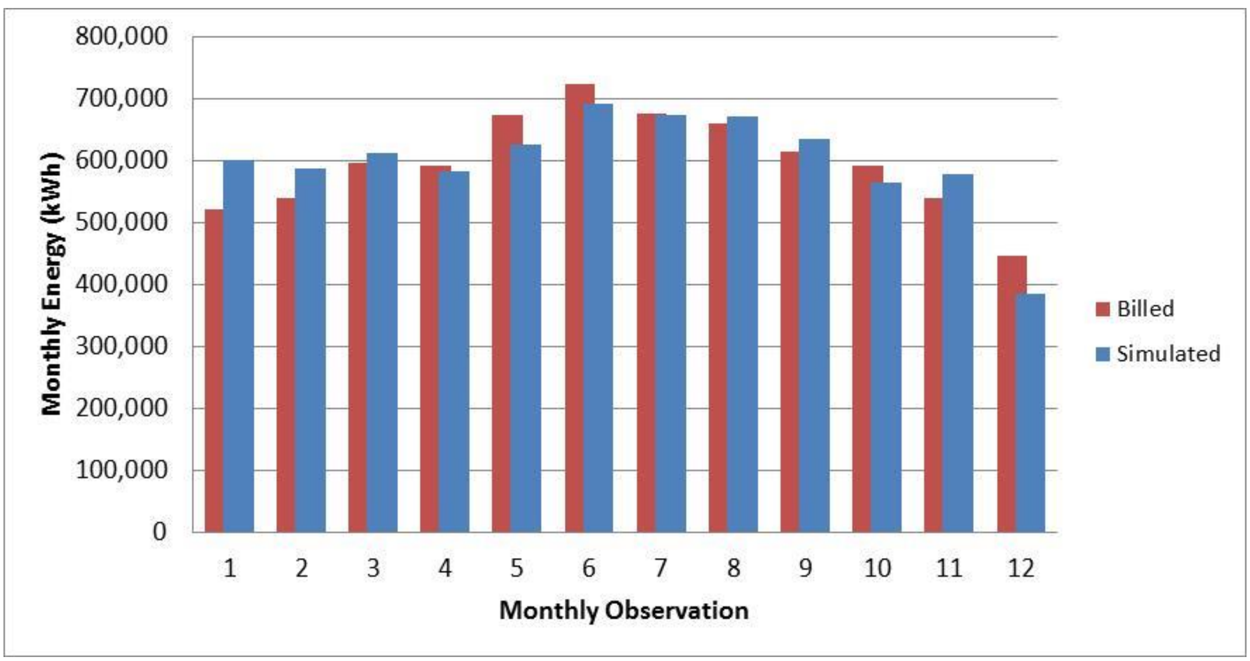
The facility is comprised of production areas and offices. The customer installed new outside air dampers and ventilation controls. The existing outside air dampers allowed for outside air infiltration when they were closed. New dampers were installed to reduce the infiltration, and ventilation controls were added to optimize the outside air.

Measurement and Verification Effort

During the M&V visit, ADM staff verified the installed measures and interviewed site contacts about the typical operation of the facility. ADM collected plans, nameplate data, and details from the EMS to better understand operation of the facility and the HVAC systems.

Energy savings for the implemented dampers and controls were determined through the construction of a site-specific eQuest model. Upon completion of the initial as-built model, a custom weather file was created using 2015 NOAA weather data for the Fort Wayne area. Using this weather file and billing data for the facility, ADM was able to ensure the model's energy load shape matched that of the bills. The results of the calibration are below:

2015 Monthly kWh Calibration



Upon completion of the calibration for the as-built eQuest model, a baseline model was created in which all the implemented control measures were removed by creating a baseline model. Baseline and as-built models were then run using TMY3 weather data for the region. Typical year annual savings are the difference between the two models' annual consumption, as can be seen below:

As-Built Vs. Baseline Annual Energy Consumption

End-Use	*Baseline kWh*	*As-Built kWh*	*Annual kWh Savings*
Lighting	*1,868,811*	*1,868,811*	*0*
Miscellaneous Equipment	*629,892*	*629,892*	*0*
Heating	*0*	*0*	*0*
Cooling	*3,815,607*	*3,414,804*	*400,801*
Pumps	*70,377*	*70,964*	*-587*
Fans	*1,613,082*	*1,612,992*	*90*
Exterior Ltg	*9,517*	*9,517*	*0*
Total	8,007,286	7,606,980	400,304

A billing analysis was also performed to triangulate the energy savings for the project. The billing analysis was done through the use of a monthly pre/post billing data regression. The regression compared the monthly billing data to the local weather in an effort to determine the effects that weather has on the building for both the pre and post conditions and accomplishes this with a R^2 of 0.86. From the regression the following equation was derived and used to calculate the monthly energy consumption for the pre and post configurations:

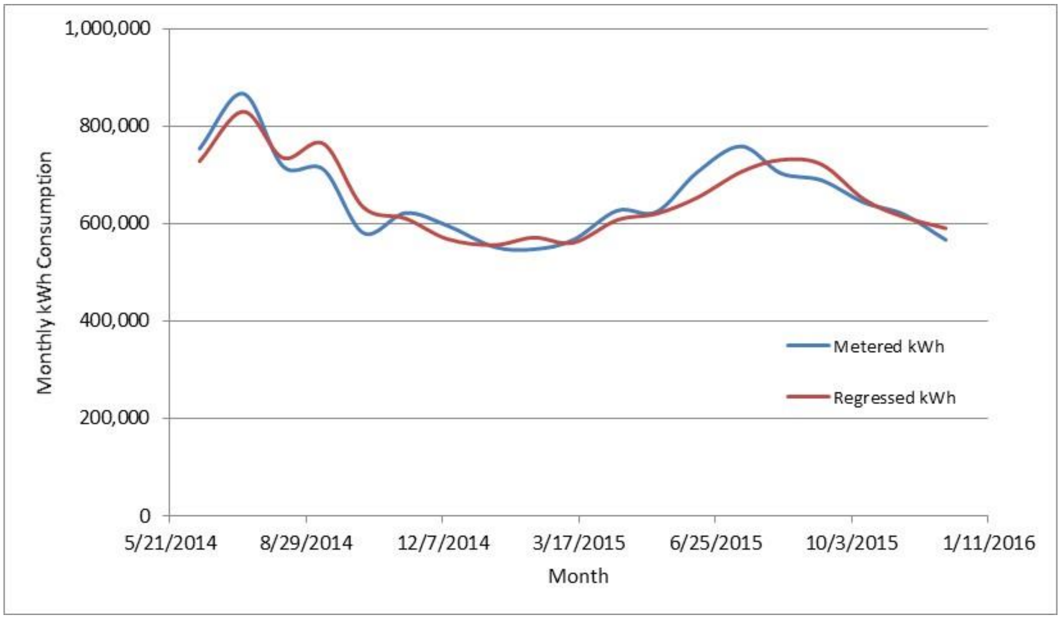
$$kWh_{Monthly} = 1{,}476 \times CDD - 110 \times HDD - 665 \times CDD_{Post} + 615{,}346$$

Where:

$kWh_{Monthly}$	*= Monthly kWh Consumption*
CDD	*= Number of Cooling Degree Days for the Month*
HDD	*= Number of Heating Degree Days for the Month*
CDD_Post	*= Number of Cooling Degree Days for the Month Multiplied by a Binary value for pre/post monthly period (0=Pre, 1=Post)*

The following plot compares the monthly billed kWh to the kWh calculated through the use of the derived equation:

Billed vs. Regressed kWh Monthly



The annual energy savings for the installed measures were determined by using the derived regression equation to calculate the monthly pre/post energy consumption of the facility. The annual energy savings are the difference between the baseline and as-built energy consumption for the facility.

The billing regression savings were less than those found in the energy simulation; however, the savings with the billing analysis were calculated at a 90% confidence interval. The energy savings using the energy simulation were within the 90% confidence interval. Thus, the billing regression is only used to validate the energy simulation savings.

Results

Verified Gross Savings/Realization Rates By Measure

Measure Category	*kWh Savings*			*kW Savings*
	Expected	*Realized*	*Realization Rate*	*Realized*
OA Dampers and Controls	585,309	400,304	68%	337.85
Total	585,309	400,304	68%	337.85

The project-level realization rate is 68%. For the outside air dampers and controls, the differences between realized and expected savings can be attributed to the ex ante analysis utilizing engineering equations and operational assumptions. This methodology does not account for the actual building operations or interactive effects. The expected savings are also an average of two different approaches. If the more conservative of the two approaches was used, the realization rate would've been 83%.

Ex post calibrated simulations are able to account for the actual operations and interactive effects. It was determined that reducing the infiltration throughout the entire year doesn't always save energy. There are certain outside temperatures that some outside air infiltration acts as free-cooling. This is similar to economizer operation, but economizer operation is only used when there is a call for cooling. The infiltration during certain outside temperatures delays calls for cooling and saves energy. This effect is likely the main difference between realized and expected savings.

The ex post simulations are further justified by a billing regression. The simulated savings are within the 90% confidence interval of the ex post billing regression. The expected savings are outside that confidence interval.

Project Number 1001

Executive Summary

Under project 1001, the customer received incentives from Indiana Michigan Power for the installation of a new air compressor. The realization rate for this project is 105%.

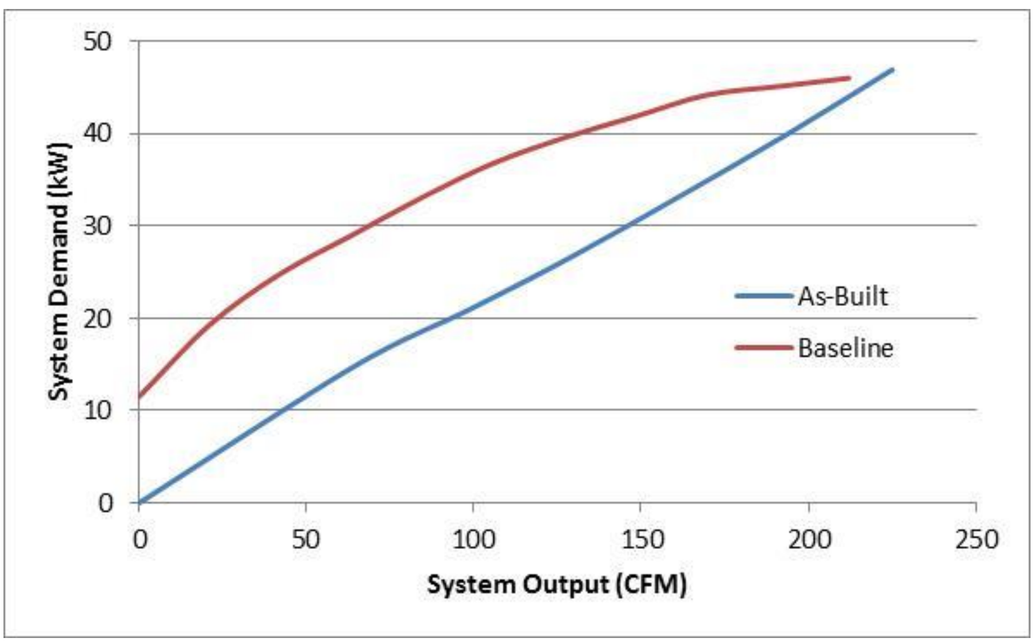
Project Description

The facility previously relied on a 50 HP Ingersoll Rand compressor with load/unload control to provide the necessary compressed air needed for production. The original compressor was replaced with a 50 HP, variable speed Sullair Model 3709V.

Measurement and Verification Effort

During the M&V visit, ADM verified the installation of the new air compressor. Logged baseline power data was provided to ADM. The data set encompassed approximately a week's worth of 15 second data. Using a combination of CAGI and typical compressor curves, the CFM output of the compressor was then determined for all of the provided data points. Using this provided data; ADM was then able to create a regression comparing the overall baseline system kW demand to the overall system CFM output, thus developing an overall baseline system efficiency curve. A comparison of the as-built and baseline compressor overall system efficiencies can be seen below:

Baseline vs. As-Built Overall System Efficiency



Using the assumption that the CFM for the pre and post retrofit compressors remains the same, the baseline monitoring was used to calculate the necessary as-built system kW demand to produce the same quantity of compressed air. The monitored baseline system consumption and the derived as-built system consumption were then used to determine a baseline and as-built weekly system kW demand profile. These profiles were then extrapolated to an entire year; in which, the difference between the two profiles equates to the annual savings for the installation of the new air compressor.

Results

Verified Gross Savings/Realization Rates

Measure Category	*kWh Savings*			*kW Savings*
	Expected	*Realized*	*Realization Rate*	*Realized*
VSD Air Compressor	110,700	115,871	105%	13.22
Total	110,700	115,871	105%	13.22

The overall project realization rate is 105%. The difference in ex post and ex ante savings can be attributed to the ex ante analysis calculating the annual savings with kW bins. The limitation to this methodology is the bins use average kW values. The ex post used the data directly without averaging. This results in a more accurate estimate since the compressed air demand varies significantly in short amounts of time.

Project Number 1011

Executive Summary

Under project 1011, the customer received incentives from Indiana Michigan Power for retrofitting lighting in the interior and exterior of their facility. The realization rate for this project is 99%.

Project Description

The customer retrofitted the following fixtures:

- (53) MH fixtures with (53) 4' T5 Linear fixtures

Measurement and Verification Effort

During the M&V visit, ADM staff verified equipment installation, baseline and post-retrofit connected load, and determined the lighting operating schedule. These data were used to calculate energy savings.

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*	*Expected kWh Savings*	*Realized kWh Savings*	*Heating Cooling Interaction Factor*	*Realization Rate*
	Old	*New*	*Old*	*New*					
MH to 4' 10L T5HO	45	45	1,078	577	6,174	141,570	139,183	1.00	98%
MH to 4' 10L T5HO	2	2	1,078	577	1,733	6,292	1,736	1.00	28%
MH to 4' 10L T5HO	1	1	1,078	577	6,163	3,146	3,088	1.00	98%
MH to 4' 10L T5HO	1	1	1,078	577	6,160	3,146	3,086	1.00	98%
MH to 4' 10L T5HO	4	4	1,078	577	8,760	12,584	17,555	1.00	140%
Total						166,738	164,649		99%

Results

Verified Gross Savings/Realization Rates By Measure

Measure Category	*kWh Savings*			*Realized Peak kW Reduction*
	Expected	*Realized*	*Realization Rate*	
Lighting Retrofit	166,738	164,649	99%	24.84
Total	166,738	164,649	99%	24.84

The project-level realization rate is 99%. The following factors impacted the project gross realization rate:

- The ex post savings analysis hours of operation verified during the M&V site visit for 4 of the fixtures (8,760) were greater than the hours of operation used to perform the ex ante savings analysis (6,292).
- The ex post savings analysis hours of operation verified during the M&V site visit for 2 of the fixtures (1,733) were less than the hours of operation used to perform the ex ante savings analysis (6,292).
- The ex post savings analysis hours of operation verified during the M&V site visit for 47 fixtures (ranging from 6,160 to 6,174) was slightly lower than the hours of operation used to perform the ex ante savings analysis (6,292).

Project Number 1015

Executive Summary

Under project 1015, the customer received incentives from Indiana Michigan Power for retrofitting lighting in the exterior of their facility. The realization rate for this project is 134%.

Project Description

The customer retrofitted the following fixtures:

- (10) T12 Linear Fluorescent fixtures with (10) 40.7W LED fixtures
- (4) T12 Linear Fluorescent fixtures with (4) 33.9W LED fixtures

Measurement and Verification Effort

During the M&V visit, ADM staff verified equipment installation, baseline and post-retrofit connected load, and determined the lighting operating schedule. These data were used to calculate energy savings.

Lighting retrofit energy savings are calculated as:

$$kWh_{savings} = \sum_{Area} \left[HCIF \times t \times \left(N_{base} \times W_{base} - N_{as\text{–}built} \times W_{as\text{–}built} \right) / 1000 \right]$$

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*	*Expected kWh Savings*	*Realized kWh Savings*	*Heating Cooling Interaction Factor*	*Realization Rate*
	Old	*New*	*Old*	*New*					
6' 1L T12HO to LED - Custom	10	10	106	40.7	8,760	3,881	5,720	1.00	147%
5' 1L T12HO to LED - Custom	4	4	69	33.9	8,760	1,300	1,230	1.00	95%
Total						5,181	6,950		134%

Results

Verified Gross Savings/Realization Rates By Measure

Measure Category	*kWh Savings*			*Realized Peak kW Reduction*
	Expected	*Realized*	*Realization Rate*	
Lighting Retrofit	5,181	6,950	134%	0.79
Total	5,181	6,950	134%	0.79

The project-level realization rate is 134%. For the lighting retrofit, the realization rate is high mainly because the verified existing fixture wattage (106W) is greater than that used to perform ex ante estimation (85W) for the 6’ 1-lamp T12HO fixtures.

Project Number 1059

Executive Summary

Under project 1059, the customer received incentives from Indiana Michigan Power for retrofitting lighting, HVAC equipment, and refrigeration equipment. The realization rate for the custom project is 96%. The realization rate for the prescriptive project is 108%.

Project Description

The customer retrofitted the following:

- (221) Incandescent lamps with (221) LED fixtures in the produce/deli area
- (82) 4’ 3LT8 fixtures with (82) 4’ 3LT8 energy efficient fixtures in the sales floor area
- (18) Incandescent fixtures with (18) LED fixtures in the freezers & coolers area
- (18) 4’ 4LT8 fixtures with (18) 4’ 4LT8 energy efficient fixtures in the sales floor area
- (4) 4’ 2LT8 fixtures with (4) 4’ 2LT8 energy efficient fixtures in the sales floor area
- (1) 4’ 2LT8 fixture with (1) 4’ 2LT8 energy efficient fixture in the back room area
- (8) 4’ 2LT8 fixtures with (8) 4’ 2LT8 energy efficient fixtures in the sales floor area
- (4) 4’ 2LT8 fixtures with (4) 4’ 2LT8 energy efficient fixtures in the sales floor area
- (322) Electronically Commutated Motors (ECMs) for evaporator fans
- Anti-Sweat Heater Controls for (168 doors)
- Refrigerated Display Case LED Lighting for (181) doors
- Motion Sensors on LED Cases for (168) doors
- Auto Door Closers - Walk-in Freezers for (3) doors
- Auto Door Closers - Walk-in Coolers for (5) doors
- VFD added to HVAC Fans for (1) HP of motor power
- (2) ENERGY STAR Commercial Dishwashers
- (227) T8 High Bay Fixtures
- (25) LED Exit Signs
- (17) CFL Lamps
- Lighting Occupancy Sensors controlling 3,920 watts.

Measurement and Verification Effort

During the M&V visit, ADM staff verified equipment installation, store hours, baseline and post-retrofit connected load, and determined the lighting operating schedule. These data were used to calculate energy savings.

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.

Custom Lighting Retrofit Savings Calculations

Measure	*Quantity (Fixtures)*		*Wattage*		*Hours*	*Expected kWh Savings*	*Realized kWh Savings*	*Heating Cooling Interaction Factor*	*Realization Rate*
	Old	*New*	*Old*	*New*					
Incandescent to LED	221	221	72	37	7,161	81,310	62,078	1.11	76%
4' 3LT8 to 4' 3LT8 28W	82	82	96	67	7,161	5,747	18,869	1.11	328%
Incandescent to LED	18	18	72	36	6,883	6,623	6,475	1.45	98%
4' 4LT8 to 4' 4LT8 28W	18	18	156	130	7,161	2,733	3,714	1.11	136%
4' 2LT8 to 4' 2LT8 28W	4	4	60	44	7,161	257	508	1.11	198%
4' 2LT8 to 4' 2LT8 28W	1	1	60	44	6,883	64	122	1.11	190%
4' 2LT8 to 4' 2LT8 28W	8	8	60	44	7,161	514	1,016	1.11	198%
4' 2LT8 to 4' 2LT8 28W	4	4	60	44	7,161	257	508	1.11	198%
Total						97,505	93,289		96%

Lighting occupancy sensor energy savings are calculated as:

$$kWh_{savings} = \sum_{Area} \left[HCIF \times W \times N \times \left(t_{base} - t_{as\text{-}built} \right) / 1000 \right]$$

Where:

$kWh_{savings}$ = Annual energy savings

N = Number of occupancy sensors

W= Wattage controlled by each occupancy sensor

t = Lighting operating hours

HCIF = HVAC interactive factor

Lighting operating hours are based on a computerized timer that changes the fraction of lighting that is in operation, based on the time of day.

The table below presents savings resulting from the prescriptive lighting retrofit measures:

Prescriptive Lighting Retrofit Savings

Measure	*Quantity (Fixtures)*		*Wattage*		*Hours*	*Heating Cooling Interaction Factor*	*Expected kWh Savings*	*Realized kWh Savings*	*Realized kW Savings*
	Old	*New*	*Old*	*New*					
HID High Bay to 4’ 6L T8	227	227	275	1.11	7,160	1.11	110,031	149,474	18.84
Incan Exit Sign to LED Exit Sign	25	25	25	1.11	8,760	1.11	3,489	5,800	0.60
Incan to CFL	14	14	100	1.11	2,168	1.11	6,255	2,119	0.88
Occupancy Sensors	4	4	980	1.11	5,840	1.11	6,868	7,610	1.34
Total							126,643	164,261	21.66

Savings from the ECMs were calculated using the algorithm from the 2015 Pennsylvania TRM, Section 3.5.2 High-Efficiency Evaporator Fan Motors for Reach-In Refrigerated Cases.

$$\Delta kW_{peak} = N \times \frac{W_{base} - W_{ee}}{1{,}000} \times LF \times DC \times (1 + \frac{1}{DG \times COP})$$

$$\Delta kWh = N \times \Delta kW_{peak\ per\ unit} \times 8{,}760$$

Where:

N = number of motors

W_{base} = input wattage of existing motor

W_{ee} = input wattage of new motor

LF = load factor

DC = duty cycle of fan motor

DG = degradation factor of compressor COP

COP = coefficient of performance of compressor

This algorithm accounts for the direct savings associated with replacement of the motor and the indirect savings of a reduced cooling load on the refrigeration unit due to less heat gain from the more efficient fan motor in the air-stream. Custom values were used for N, W_{base}, and W_{ee}, while default values were used for the remaining variables, based on the case temperature and baseline motor type.

Invoices provided with project documentation show a larger quantity of evaporator fan motors (459) than are claimed (322). To calculate savings for the claimed quantity of fan motors, ADM calculated savings for all of the invoiced motors and scaled the savings to the claimed quantity.

The table below presents savings resulting from the ECMs for evaporator fans measure:

ECM Motor Savings

Model #	*Type*	*N*	*Wee*	*Wbase*	*LF*	*DC*	*DG*	*COP*	*kW*	*kWh*
C2X-8XLEP	Cooler	6	10.61	58.92	0.9	1.00	0.98	2.5	0.37	3,218
D5X-6EP	Cooler	6	18.18	86.58	0.9	1.00	0.98	2.5	0.52	4,556
D5X-12EP	Cooler	42	18.18	86.58	0.9	1.00	0.98	2.5	3.64	31,893
D5X-6LEP	Cooler	14	18.18	86.58	0.9	1.00	0.98	2.5	1.21	10,631
D5X-8LEP	Cooler	22	18.18	86.58	0.9	1.00	0.98	2.5	1.91	16,706
D5X-12LEP	Cooler	63	18.18	86.58	0.9	1.00	0.98	2.5	5.46	47,839
ESBDS-12	Cooler	12	6.06	33.67	0.9	1.00	0.98	2.5	0.42	3,678
FL5NX-12LEP	Cooler	12	18.18	86.58	0.9	1.00	0.98	2.5	1.04	9,112
FWEG	Freezer	12	6.06	33.67	0.9	0.94	0.98	1.3	0.50	4,401
FWG-12	Freezer	32	6.06	33.67	0.9	0.94	0.98	1.3	1.34	11,737
IM-04-C-12R	Cooler	9	18.18	86.58	0.9	1.00	0.98	2.5	0.78	6,834
IM-04-C-8R	Cooler	6	18.18	86.58	0.9	1.00	0.98	2.5	0.52	4,556
IM-04-E-5R	Cooler	8	18.18	86.58	0.9	1.00	0.98	2.5	0.69	6,075
IM-05-E-5R	Cooler	3	18.18	86.58	0.9	1.00	0.98	2.5	0.26	2,278
IM-05-I-8R	Cooler	6	18.18	86.58	0.9	1.00	0.98	2.5	0.52	4,556
M5X-6GEP	Cooler	12	10.61	58.92	0.9	1.00	0.98	2.5	0.73	6,437
M5X-12GEP	Cooler	18	37.88	145.69	0.9	1.00	0.98	2.5	2.46	21,544
RLN-2	Freezer	18	18.18	86.58	0.9	0.94	0.98	1.3	1.87	16,355
RLN-3	Freezer	18	18.18	86.58	0.9	0.94	0.98	1.3	1.87	16,355
RLN-5	Freezer	70	18.18	86.58	0.9	0.94	0.98	1.3	7.26	63,604
RLNI-5	Freezer	70	18.18	86.58	0.9	0.94	0.98	1.3	7.26	63,604
Total		459							40.64	355,970
Scaled		322							28.51	249,722

Savings for the anti-sweat heater controls were calculated using the following algorithm from the Indiana TRM:

$$\Delta kW_{peak} = 0$$

$$\Delta kWh = kW_{base} \times N \times ESF \times BF \times 8{,}760$$

Where:

kW_{base} = kW load for typical reach-in door and frame with heater

N = number of doors controlled

ESF = energy savings factor – fraction of time the heater is powered off by the controls

BF = bonus factor – increased savings due to reduction in case cooling load and building space cooling load

TRM-provided values were used for *ESF* based on the control type, *BF* based on case temperature, and *kW* based on typical values.

The table below presents expected and realized savings resulting from the anti-sweat heater controls:

Anti-Sweat Heater Controls Savings

kW_{base}	*N*	*ESF*	*BF*	*kW*	*kWh*
0.195	166	55%	1.36	0.00	209,579
Total				0.00	209,579

Savings for the refrigerated display case LED lighting were calculated using the following algorithm from the Indiana TRM:

$$\Delta kW_{peak} = \frac{(W_{base} - W_{ee})}{1{,}000} \times N \times (1 + WHF_d) \times DSF \times CF$$

$$\Delta kWh = \frac{(W_{base} - W_{ee})}{1{,}000} \times N \times Hours \times (1 + WHF_e) \times ESF$$

Where:

W_{base} = connected wattage per door for the baseline fixtures

W_{ee} = connected wattage per door for the new fixtures

N = number of doors

Hours = annual operating hours

WHF_d = waste heat factor for demand

WHF_e = waste heat factor for energy

DSF = demand savings factor

ESF = energy savings factor

CF = summer peak coincidence factor

The table below presents savings resulting from the refrigerated display case LED measures:

Refrigerated Display Case Lighting Savings

Case Type	W_{base}	W_{ee}	N	Hours	WHFe	ESF	kW	kWh
Freezer	36.48	20.00	100	6,546	0.52	1.00	0.79	16,397
Freezer	36.48	18.00	50	6,546	0.52	1.00	0.44	9,194
Freezer	40.53	20.67	6	6,546	0.52	1.00	0.06	1,186
Freezer	45.60	21.50	10	6,546	0.52	1.00	0.12	2,398
Cooler	76.00	38.00	8	6,546	0.41	1.00	0.11	2,806
Cooler	76.00	38.00	5	6,546	0.41	1.00	0.07	1,754
Total							1.59	33,735

LED case motion sensor energy savings are calculated as:

$$kWh_{savings} = \sum_{Area} \left[HCIF \times W \times N \times \left(t_{base} - t_{as-built} \right) / 1000 \right]$$

Where:

$kWh_{savings}$ =	Annual energy savings
N =	Number of case doors
W =	Controlled wattage per door
t =	Lighting operating hours
HCIF =	HVAC interactive factor = 1 + WHF, as given in the Indiana TRM

The table below presents savings resulting from motion sensors:

Display Case Motion Sensor Savings

Case Type	*N*	*W*	*Base Hours*	*As Built Hours*	*HCIF*	*kW*	*kWh*
Freezer	70	20.00	6,546	4,582	1.52	0.64	4,179
Freezer	50	18.00	6,546	4,582	1.52	0.41	2,686
Freezer	3	20.67	6,546	4,582	1.52	0.03	185
Freezer	10	21.50	6,546	4,582	1.52	0.10	642
Total						1.18	7,692

Savings for the auto door closers were calculated using the Illinois TRM, v3.0, Section 4.6.1 Automatic Door Closer for Walk-in Coolers and Freezers. The TRM references PG&E's Workpaper PGECOREF110.1 – Auto-Closers for Main Cooler or Freezer Doors.

The table below presents savings for the auto door closers:

Auto Door Closers Savings

Walk-in Space Type	*Quantity*	*kW Savings per unit*	*kWh Savings per Unit*	*kW*	*kWh*
Cooler	5	0.061	882	0.31	4,410
Freezer	3	0.142	2,351	0.43	7,053
Total				0.73	11,463

Savings for the HVAC fan VFDs are determined to be zero, as the equipment installations could not be verified during the site visit.

Savings for the Energy Star dishwashers were calculated using the Illinois TRM, v3.0, Section 4.2.6 Energy Star Dishwasher. The TRM provides savings based on the dishwasher type, building water heater fuel type, booster water heater fuel type, and whether the dishwasher operates at high- or low-temperature.

The table below presents savings resulting from the Energy Star Dishwasher measures:

Energy Star Dishwasher Savings

Quantity	*Bldg Water Heater*	*Booster Water Heater*	*Unit Type*	*Temperature*	*kW*	*kWh*
2	Gas	Electric	Door	High	1.81	10,538
Total					1.81	10,538

Results

Verified Gross Savings/Realization Rates By Custom Measure

Measure Category	*kWh Savings*			*Realized Peak kW Reduction*
	Expected	*Realized*	*Realization Rate*	
Lighting Retrofit	97,505	93,289	96%	13.40
Total	97,505	93,289	96%	13.40

The custom project realization rate is 96%. The following factors impacted the project gross realization rate:

- The ex post savings analysis hours of operation verified during the M&V site visit (ranging from 6,882 to 7,160) are greater than the hours of operation used to perform the ex ante energy savings estimate (5,840).
- The ex post savings analysis base wattage for the first and third measure (72w) used the EISA 2007 federal standard baseline wattage; where, the ex ante savings estimate used the actual lamp wattages.
- The ex post savings analysis of the interior store lighting fixtures accounted for heating and cooling interactive effects. A factor applicable to gas heated/air conditioned large retail facilities in Ft. Wayne was applied to the lighting energy savings (1.11); the interior store lighting fixture ex ante savings estimate did not account for heating and cooling interactive effects. The ex post savings analysis also applied a factor applicable to the lighting installed in the refrigerated and freezer areas (1.410 and 1.520 respectively).

- *Verified Gross Savings/Realization Rates By Prescriptive Measure*

Measure Category	*kWh Savings*			*Realized Peak kW Reduction*
	Expected	*Realized*	*Realization Rate*	
ECM Cooler Motors	265,328	249,722	94%	28.51
Anti-sweat Heater Controls	90,849	209,579	231%	0.00
Refrigerated Display Case Lighting	40,528	33,735	83%	1.59
LED Case Motion Sensors	85,386	7,692	9%	1.18
Auto Door Closers for Coolers	4,715	4,410	94%	0.31
Auto Door Closers for Freezers	6,921	7,053	102%	0.43
HVAC VFDs	1,560	0	0%	0.00
ENERGY STAR Dishwashers	16,377	10,538	64%	1.81
T8 High Bay Fixtures	110,031	149,474	136%	18.84
LED Exit Signs	3,489	5,800	166%	0.60

Measure Category	*kWh Savings*			*Realized Peak kW Reduction*
	Expected	*Realized*	*Realization Rate*	
CFL Lamps	6,255	2,119	34%	0.88
Occupancy Sensors	6,868	7,610	111%	1.34
Total	638,307	687,732	108%	55.48

The prescriptive project realization rate is 108%.

- For the ECM Cooler motors, the ex ante savings estimation applies a per-motor savings of 824 kWh. The 94% realization rate stem from the inclusion of motor sizes, case temperature, load factor, and duty cycle, which accounts for the defrost cycle, in the ex post analysis. The ex post analysis resulted in savings of 776 kWh per motor.
- For the anti-sweat heater controls, the realization rate is 231% even though the installation rate is less than 100%. The ex ante savings estimation applies savings of 541 kWh per door. It is unclear what assumptions were made in the ex ante calculation; however, the Indiana TRM has proven to be accurate with its energy savings factor based on monitoring performed by ADM at other sites. The ex post calculation results in savings of 1,263 kWh per door.
- For the refrigerated display case lighting, the realization rate is 83%. The realization rate is slightly attributable to a 99% installation rate. The ex ante estimation applies savings of 224 kWh per door, but the assumptions made for this estimation are unknown. The ex post analysis utilized refrigerated case specification sheets to determine the approximate lighting load for each case, and typical baseline case lighting loads were found in a PG&E spreadsheet for typical refrigerated case wattages, as referenced in the Indiana TRM. Hours were determined from a timer that is used to control the lighting. The ex post calculations result in savings of 188 kWh per door.
- For the LED case motion sensors, the 9% realization rate is due to several factors, including an installation rate of 79%. The ex ante estimation is based on per-door savings of 508 kWh, and likely assumes a higher connected load than what is actually installed. Additionally, the expected savings are more than the annual energy usage of the new LED case lighting. ADM utilized a savings factor of 0.7 (hours are reduced by 30%) for lighting controls. This savings factor is corroborated by monitored data from a similar site with the same store hours of operation. The ex post calculation resulted in savings of 58 kWh per door for the actual installation quantity.
- For the auto door closer measures, the realization is nearly 100%; however, a comparison of TMY3 weather data for Fort Wayne and the six Pennsylvania TRM regions was made. ADM determined that the weather most closely resembled Allentown’s, and savings for this zone were used, resulting in 94% and 102% realization for coolers and freezers, respectively.
- The HVAC VFD measure has a zero realized energy savings because the equipment was not installed.
- For the Energy Star dishwashers, the realization rate is 64%, likely because the building hot water heater uses natural gas, rather than electricity. This limits the electric energy savings to the booster water heater.

- For the T8 high bay fixtures, the realization rate is 136% due to longer verified hours of operation and a larger heating/cooling interactive factor than the values that were used in the ex calculation.
- For the LED exit signs, the 166% realization rate is high due to longer verified hours of operation and a larger heating/cooling interactive factor than the values that were used in the ex ante calculation.
- For the CFL lamps, the 34% realization rate is low due to an installation rate of 82%, and because the ex post analysis utilizes shorter hours of operation than those used in the ex ante calculation.
- For the occupancy sensors, the realization rate is 111%. The high realization is due to the inclusion of HCIF in the ex post analysis. The ex ante estimation neglected the interactive factor.

Project Number 1063

Executive Summary

Under project 1063, the customer received incentives from Indiana Michigan Power for the installation of (3) new forced air heated dryers on their compressed air system. The realization rate for this project is 144%.

Project Description

The facility is a manufacturing facility that relies on a large volume of compressed air for their manufacturing process. The system originally relied on (3) heatless air dryers require a large amount of purge air to properly dry the air. The air that is purged from the system add load on the compressed air system, and resulted in (3) of the (4) 4,160 volt air compressor to operate in order to meet the demand of the manufacturing process and purge air requirements.

In order to reduce the energy consumption of the compressed air system, (3) original heatless air dryers were replaced with (3) forced heated air dryers that do not require nearly as much purge air to complete the air drying process. With the installation of the new dryers, (1) of the 4,160 volt air dryers was able to be taken off line and the remaining (2) operating compressors load was also reduced.

Measurement and Verification Effort

During the M&V visit, ADM staff verified the installation of the air dryers and verified that only two compressors were needed to meet air consumption demands. Site contacts provided monthly production data for the last two years, as well as compressor amperage trending data for the three months prior to the installation of the air dryers and two month after installation of the dryers.

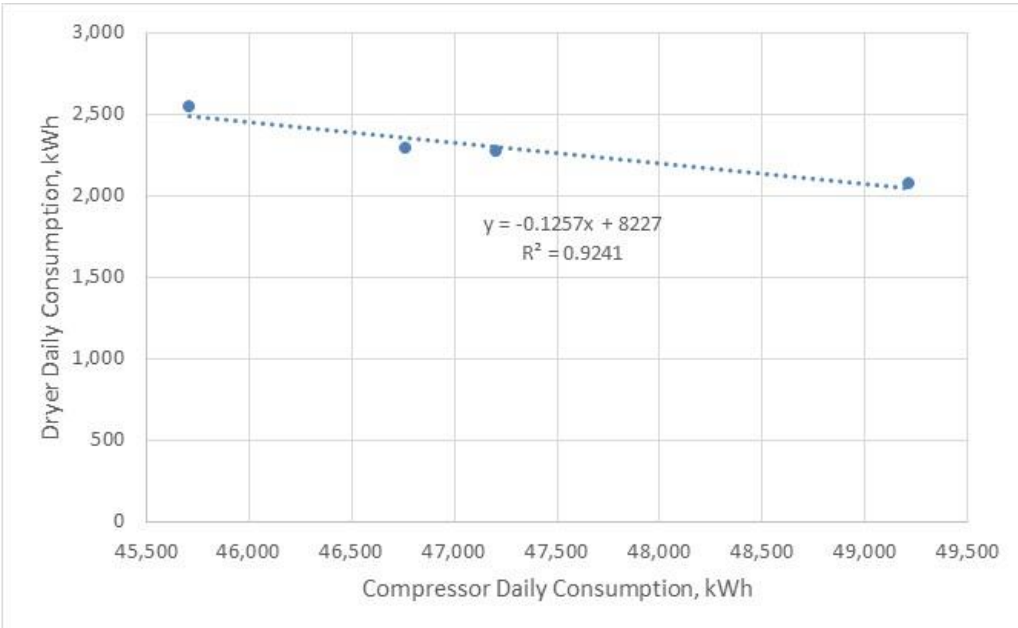
Annual energy savings for the installation of the new dryers were calculated through the use of the provided trending data and production data. The provided amperage data was used to calculate the monthly kWh consumption of the compressors for each of the pre- and post-retrofit months. The monthly kWh consumption was then compared against the provided production data in order to calculate an average kWh of compressor consumption per ton of production. The following table presents the effort and results of this exercise:

As-Built Vs. Baseline Average kWh/Ton

Month	*Tons*	*kWh*	*kWh/Ton*
Jan-14	213,317	2,213,252	10.375
Baseline			10.375
Jan-16	252,157	1,441,412	5.716
As-Built			5.716

Following the calculation of the pre- and post-retrofit system efficiencies, the provided production data was averaged to determine the typical monthly production and then extrapolated to a year. The annual energy savings for the installation of the forced air dryers is the difference in efficiency between the baseline and as-built system, multiplied by the annual production in tons. Because the new forced heated air dryers have a heating element and fan, there is a negative energy penalty. Trending data for the dryers was provided and compared against the consumption of the air compressors. Through this exercise, it was determined that there is a strong correlation between the total energy consumption of the dryers and the consumption of the air compressors. The graph below presents the regression equation used to calculate the daily dryer consumption based on the average daily consumption of the air compressors.

Daily Dryer Consumption vs. Compressor Consumption



The energy penalty of the new dryers was calculated by multiplying the calculated average daily consumption by 365. The overall annual energy savings is the total annual compressor savings less the annual consumption of the new blowers. The following table presents the results of the analysis:

Annual Energy Savings

Variable	*Value*	*Units*
Baseline Efficiency	10.375	kWh/ton
As-Built Efficiency	5.716	kWh/ton
Average Annual Production	2,992,012	Tons
Baseline Compressor	31,043,364	kWh
As-Built Compressor	17,103,349	kWh
Annual Compressor Savings	13,940,015	kWh
Average Dryer Consumption	2,337	kWh
Annual Dryer Consumption	853,005	kWh
Total Annual Savings	13,087,010	kWh
Peak Demand Reduction	1,493.95	kW

Results

Verified Gross Savings/Realization Rates By Measure

Measure Category	*kWh Savings*			*kW Savings*
	Expected	*Realized*	*Realization Rate*	*Realized*
Forced Air Heated Dryers	9,061,537	13,087,010	144%	1,493.95
Total	9,061,537	13,087,010	144%	1,493.95

The project-level realization rate is 144%. The difference in reported savings can be attributed to the difference in ex-ante and ex-post analysis methodology and the availability of data at the time of the analysis. The ex-ante analysis was based solely on pre-retrofit compressor demand data and used engineering calculations to estimate what the expected compressor demand would be following the installation of the new dryers. The ex-post analysis relied on both pre- and post-retrofit compressor data and normalized the analysis to available production data. Additionally, the ex-ante analysis did not incorporate the consumption of the new dryers into the annual energy savings.

Project Number 1064

Executive Summary

Under project 1064, the customer received incentives from Indiana Michigan Power for retrofitting lighting in the interior of their facility. The realization rate for this project is 100%.

Project Description

The customer retrofitted (180) 1000W metal halide fixtures with (180) LED fixtures in the warehouse area.

Measurement and Verification Effort

During the M&V visit, ADM staff verified equipment installation, baseline and post-retrofit connected load, and determined the lighting operating schedule. These data were used to calculate energy savings.

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*	*Expected kWh Savings*	*Realized kWh Savings*	*Heating Cooling Interaction Factor*	*Realization Rate*
	Old	*New*	*Old*	*New*					
MH to LED	180	180	1,080	76	8,736	1,584,684	1,578,335	1.00	100%
Total						1,584,684	1,578,335		100%

Results

Verified Gross Savings/Realization Rates By Measure

Measure Category	kWh Savings			Realized Peak kW Reduction
	Expected	Realized	Realization Rate	
Lighting Retrofit	1,584,684	1,578,335	100%	180.67
Total	1,584,684	1,578,335	100%	180.67

The project-level realization rate is 100%, which indicates a highly accurate ex ante savings estimation.

Project Number 1078

Executive Summary

Under project 1078, the customer received incentives from AEP Indiana Michigan Power for retrofitting lighting in the interior of their facility. The realization rate for this project is 66%.

Project Description

The customer retrofitted the following fixtures:

- (36) Incandescent lamps with (36) LED lamps

Measurement and Verification Effort

During the M&V visit, ADM staff verified equipment installation, baseline and post-retrofit connected load, and determined the lighting operating schedule. These data were used to calculate energy savings.

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*	*Expected kWh Savings*	*Realized kWh Savings*	*Heating Cooling Interaction Factor*	*Realization Rate*
	Old	*New*	*Old*	*New*					
75W Incan to 12W LED	36	36	75	12	2,107	8,256	5,414	1.13	66%
Total						8,256	5,414	1.13	66%

Results

Verified Gross Savings/Realization Rates By Measure

Measure Category	*kWh Savings*			*Realized Peak kW Reduction*
	Expected	*Realized*	*Realization Rate*	
Lighting Retrofit	8,256	5,414	66%	0.59
Total	8,256	5,414	66%	0.59

The project-level realization rate is 66%. The following factors impacted the project gross realization rate:

- The ex post savings analysis hours of operation verified during the M&V site visit (2,107) were less than the hours of operation used to perform he ex ante savings estimate (3,640).
- The ex post savings analysis accounted for heating and cooling interactive effects. A factor applicable to gas heated/electric air conditioned school facilities in Ft. Wayne was applied to the lighting energy savings (1.13); the ex ante savings estimate did not account for heating and cooling interactive effects.

Project Number 1088

Executive Summary

Under project 1088, the customer received incentives from Indiana Michigan Power for the installation of a new air compressor. The realization rate for this project is 118%

Project Description

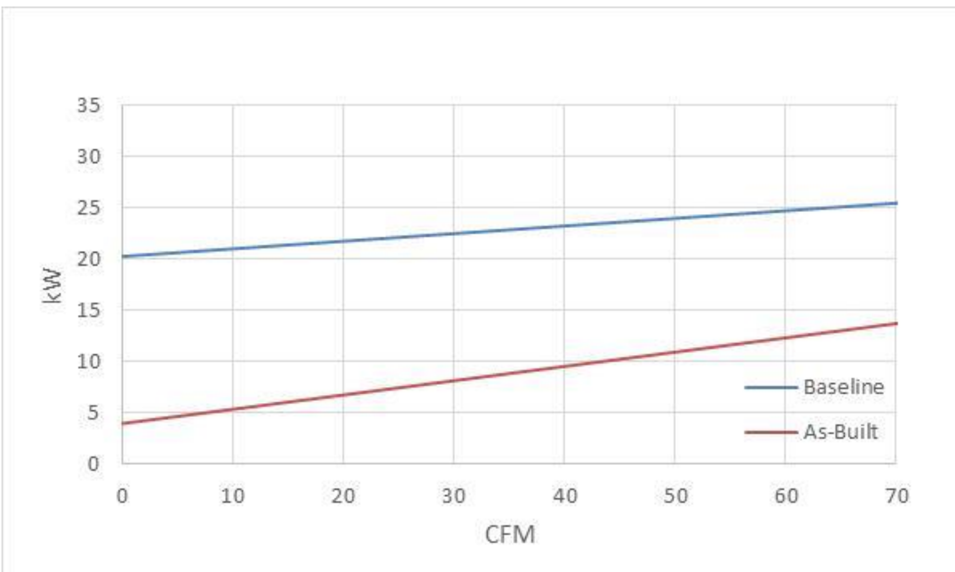
The facility previously relied on a 30 HP Quincy QMB30 air compressor with modulation control to provide compressed air for production. The original compressor was oversized and inefficient, so it was replaced with a 15 HP Kaeser SK15 air compressor.

Measurement and Verification Effort

During the M&V visit, ADM verified the installation of the new air compressor. Power monitoring equipment was deployed for a period of one month to collect data in 1 minute intervals. Using CAGI efficiency curves, the CFM output of the air compressor was determined for all data points. Under the assumption that baseline and as-built compressed air demand are the same, ADM determined the power demand of the original air compressor, using CAGI efficiency curves.

The CAGI compressor curves are shown in the figure below:

Baseline vs. As-Built Efficiency Curves



Weekly kW profiles were created for the baseline and as-built systems. These profiles were extrapolated to an entire year, taking holidays and typical weekend operation into consideration. The ex post energy savings are the difference between the baseline and as-built annual consumption.

Results

Verified Gross Savings/Realization Rates

Measure Category	*kWh Savings*			*kW Savings*
	Expected	*Realized*	*Realization Rate*	*Realized*
Air Compressor	82,760	97,840	118%	16.9
Total	82,760	97,840	118%	16.9

The overall project realization rate is 118%. The difference between ex post and ex ante savings can be attributed to a difference in methodology and the use of additional data. The ex ante calculations utilized CAGI data sheets, along with general, average system capacity demand over a 24-hr/5-day work week at a single system pressure. The actual system pressure and air demand fluctuate throughout the day, which is captured in the monitoring data. The ex post analysis provides a more accurate portrayal of typical air compressor operation.

Project Number 1089

Executive Summary

Under project 1089, the customer received incentives from Indiana Michigan Power for retrofitting lighting in the interior and exterior of their facility. The realization rate for this project is 104%.

Project Description

The customer retrofitted the following fixtures:

- (18) metal halide fixtures with (17) induction fixtures in the sales floor area
- (4) 4' 4-lamp T12 fixtures with (4) LED fixtures in the sales floor area
- (9) incandescent fixtures with (3) LED fixtures in the sales floor area
- (10) metal halide fixtures with (10) induction fixtures in the outside lights area
- (12) metal halide fixtures with (12) LED fixtures in the outside lights area
- (3) metal halide fixtures with (3) induction fixtures in the sales floor area
- (1) 4' 4-lamp T12 fixture with (4) LED fixtures in the outside lights area
- (1) incandescent fixture with (1) LED fixture in the sales floor area

Measurement and Verification Effort

During the M&V visit, ADM staff verified equipment installation, baseline and post-retrofit connected load, and determined the lighting operating schedule. These data were used to calculate energy savings.

Lighting retrofit energy savings are calculated as:

$$kWh_{savings} = \sum_{Area} \left[HCIF \times t \times \left(N_{base} \times W_{base} - N_{as\text{–}built} \times W_{as\text{–}built} \right) / 1000 \right]$$

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*	*Expected kWh Savings*	*Realized kWh Savings*	*Heating Cooling Interaction Factor*	*Realization Rate*
	Old	*New*	*Old*	*New*					
MH to induction	18	17	461	200	3,188	14,554	17,497	1.12	120%

Measure	Quantity (Fixtures)		Wattage		Hours	Expected kWh Savings	Realized kWh Savings	Heating Cooling Interaction Factor	Realization Rate
	Old	New	Old	New					
4' 4L T12 to LED	4	4	164	60	3,188	1,289	1,486	1.12	115%
Incand. to LED	9	3	65	9	3,188	1,561	1,993	1.12	128%
MH to induction	10	10	295	120	3,741	7,525	6,547	1.00	87%
MH to LED	12	12	127	20	3,741	5,521	4,804	1.00	87%
MH to induction	3	3	461	200	3,188	2,426	2,496	1.00	103%
4' 4L T12 to LED	1	4	164	60	3,741	322	(284)	1.00	-88%
Incand. to LED	1	1	65	9	3,188	173	179	1.00	103%
Total						33,372	34,718		104%

Results

Verified Gross Savings/Realization Rates By Measure

Measure Category	kWh Savings			Realized Peak kW Reduction
	Expected	Realized	Realization Rate	
Lighting Retrofit	33,372	34,718	104%	7.79
Total	33,372	34,718	104%	7.79

The project-level realization rate is 104%. For the lighting retrofit, the realization rate is high mainly because the verified interior lighting hours of operation (3,187) are greater than those used to perform ex ante estimation (3,098).

Project Number 1096

Executive Summary

Under project 1096, the customer received incentives from Indiana Michigan Power for retrofitting lighting in the interior of their facility and installing occupancy sensors. The realization rate for the Custom project is 97%. The realization rate for the Prescriptive project is 64%.

Project Description

The customer retrofitted the following Custom measures:

- (120) 6L T8 fixtures with (120) LED fixtures in the sales floor area
- (73) 4L T8 fixtures with (72) LED fixtures in the sales floor area
- (46) 4L T8 fixtures with (48) LED fixtures in the support area
- (5) 2L T8 fixtures with (5) LED fixtures in the support area

The customer retrofitted lighting controls as part of the Prescriptive project.

Measurement and Verification Effort

During the M&V visit, ADM staff verified equipment installation, baseline and post-retrofit connected load, and determined the lighting operating schedule. These data were used to calculate energy savings. The reduction of lighting operating hours associated with occupancy sensors is determined by multiplying the baseline hours by a Power Adjustment Factor of 0.7 (adapted from ASHRAE 90.1-1989).

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*

Lighting occupancy sensor energy savings are calculated as:

$$kWh_{savings} = \sum_{Area} \left[HCIF \times W \times N \times \left(t_{base} - t_{as-built} \right) / 1000 \right]$$

Where:

$kWh_{savings}$	= *Annual energy savings*
N	= *Number of occupancy sensors*

W = *Wattage controlled by each occupancy sensor*

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 Custom project.

Lighting Retrofit Savings Calculations

Measure	*Quantity (Fixtures)*		*Wattage*		*Hours*	*Expected kWh Savings*	*Realized kWh Savings*	*Heating Cooling Interaction Factor*	*Realization Rate*
	Old	*New*	*Old*	*New*					
6L T8 to LED	120	120	222	114	4,406	65,552	63,274	1.11	97%
4L T8 to LED	73	72	120	76	4,406	16,631	16,053	1.11	97%
4L T8 to LED	46	48	112	38	4,406	16,833	16,248	1.11	97%
2L T8 to LED	5	5	60	38	4,406	556	537	1.11	97%
Total						99,572	96,113		97%

The table shown below presents expected and realized energy savings for the lighting controls installed under the Prescriptive project.

Lighting Controls Savings Calculations

Measure	*Quantity*	*Controlled Wattage*	*Hours*		*Expected kWh Savings*	*Realized kWh Savings*	*Heating Cooling Interaction Factor*	*Realization Rate*
			Old	*New*				
Controls	5	38	4,406	3,084	610	278	1.11	46%
Controls	48	38	4,406	3,084	3,964	2,672	1.11	67%
Total					4,574	2,950		64%

Results

Verified Gross Savings/Realization Rates By Measure

Measure Category	*kWh Savings*			*Realized Peak kW Reduction*
	Expected	*Realized*	*Realization Rate*	
Lighting Retrofit – Custom	99,572	96,113	97%	22.46
Lighting Controls – Prescriptive	4,574	2,950	64%	0.69
Total	104,146	99,062	95%	23.15

For the Custom project, the ex post savings analysis hours of operation verified during the M&V site visit (4,406) are less than the hours of operation used to perform the ex ante savings estimate (5,058). The realization rate for the Custom lighting retrofit is 97%. For the Prescriptive project, the ex ante savings estimation assumes a greater impact on lighting hours than was measured and verified on-site. The realization rate for the Prescriptive lighting controls is 64%.

Project Number 1098

Executive Summary

Under project 1098, the customer received incentives from AEP Indiana Michigan Power for retrofitting lighting in the interior of their facility. The realization rate for this project is 56%.

Project Description

The customer retrofitted the following fixtures:

- (92) Incandescent lamps with (92) LED lamps

Measurement and Verification Effort

During the M&V visit, ADM staff verified equipment installation, baseline and post-retrofit connected load, and determined the lighting operating schedule. These data were used to calculate energy savings.

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*	*Expected kWh Savings*	*Realized kWh Savings*	*Heating Cooling Interaction Factor*	*Realization Rate*
	Old	*New*	*Old*	*New*					
75W Incan to 11W LED	92	92	75	11	2,413	27,968	15,671	1.103	56%
Total						27,968	15,671		56%

Results

Verified Gross Savings/Realization Rates By Measure

Measure Category	*kWh Savings*			*Realized Peak kW Reduction*
	Expected	*Realized*	*Realization Rate*	
Lighting Retrofit	27,968	15,671	56%	4.59
Total	27,968	15,671	56%	4.59

The project-level realization rate is 56%. The realization rate is low because the lighting hours of operation verified during the M&V site visit (2,413) are lower than those used to perform ex ante estimation (4,750).

Project Number 1104

Executive Summary

Under project 1104, the customer received incentives from Indiana Michigan Power for retrofitting lighting in the interior of their facility. The realization rate for this project is 46%.

Project Description

The customer retrofitted (1) Custom fixture with (18) 4-lampt T5HO fixtures in the manufacturing floor area.

Measurement and Verification Effort

During the M&V visit, ADM staff verified equipment installation, baseline and post-retrofit connected load, and placed three photo-sensor loggers at the site (from 10/1/15 to 10/14/15) to monitor lighting operation. These data were used to calculate energy savings.

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*	*Expected kWh Savings*	*Realized kWh Savings*	*Heating Cooling Interaction Factor*	*Realization Rate*
	Old	*New*	*Old*	*New*					
Custom to 4' 4L T5HO	1	18	8,710	230	2,486	24,577	11,359	1.00	46%
Total						24,577	11,359		46%

Results

Verified Gross Savings/Realization Rates By Measure

Measure Category	*kWh Savings*			*Realized Peak kW Reduction*
	Expected	*Realized*	*Realization Rate*	
Lighting Controls	24,577	11,359	46%	0.81
Total	24,577	11,359	46%	0.81

The project-level realization rate is 46%. For the lighting retrofit, the realization rate is low mainly because the verified lighting hours of operation (2,485) are less than those used to perform ex ante estimation (6,200).

Project Number 1109

Executive Summary

Under project 1109, the customer received incentives from Indiana Michigan Power for retrofitting lighting in the interior and exterior of their facility. The realization rate for this project is 119%.

Project Description

The customer retrofitted the following fixtures:

- (45) T12 Linear Fluorescent fixtures with (45) 2-lamp LED fixtures in the sales floor area
- (2) T12 Linear Fluorescent fixtures with (2) 1-lamp LED fixtures in the storage area
- (1) T12 Linear Fluorescent fixture with (1) 2-lamp LED fixture in the office area
- (2) T12 Linear Fluorescent fixtures with (2) 2-lamp LED fixtures in the bathroom area
- (16) T12 Linear Fluorescent fixtures with (16) 2-lamp LED fixtures in the exterior area

Measurement and Verification Effort

During the M&V visit, ADM staff verified equipment installation, baseline and post-retrofit connected load, and determined the lighting operating schedule. These data were used to calculate energy savings.

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*	*Expected kWh Savings*	*Realized kWh Savings*	*Heating Cooling Interaction Factor*	*Realization Rate*
	Old	*New*	*Old*	*New*					
4' 3L T12ES to 2L LED	45	45	144	32	8,760	39,312	48,362	1.10	123%
4' 2L T12ES to 1L LED	2	2	72	16	8,760	582	1,075	1.10	185%
4' 3L T12ES to 2L LED	1	1	144	32	8,760	312	1,075	1.10	344%
4' 3L T12ES to 2L LED	2	2	144	32	8,760	1,747	2,149	1.10	123%
8' 2L T12HO to 2L LED	16	16	207	44	4,305	11,715	11,213	1.00	96%
Total						53,668	63,874		119%

Results

Verified Gross Savings/Realization Rates By Measure

Measure Category	*kWh Savings*			*Realized Peak kW Reduction*
	Expected	*Realized*	*Realization Rate*	
Lighting Retrofit	53,668	63,874	119%	6.33
Total	53,668	63,874	119%	6.33

The project-level realization rate is 116%. For the lighting retrofit, the realization rate is high mainly because the verified lighting hours of operation (ranging from 4,304 to 8,760) are greater than those used to perform ex ante estimation (ranging from 3,120 to 8,736).

Project Number 1111

Executive Summary

Under project 1111, the customer received incentives from Indiana Michigan Power for retrofitting lighting in the interior of the facility. The realization rate for this project is 123%.

Project Description

The customer retrofitted the following fixtures:

- (41) 4' 4-lamp T12 fixtures with (41) LED036-FIXT fixtures
- (3) 4' 2-lamp T12 fixtures with (3) LED036-FIXT fixtures
- (2) 4' 4-lamp T12 fixtures with (2) LED036-FIXT fixtures

Measurement and Verification Effort

During the M&V visit, ADM staff verified equipment installation, baseline and post-retrofit connected load, and determined the lighting operating schedule. These data were used to calculate energy savings. The reduction of lighting operating hours associated with occupancy sensors is determined by multiplying the baseline hours by a Power Adjustment Factor of 0.7 (adapted from ASHRAE 90.1-1989).

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*	*Expected kWh Savings*	*Realized kWh Savings*	*Heating Cooling Interaction Factor*	*Realization Rate*
	Old	*New*	*Old*	*New*					
4' 4L T12 to LED036-FIXT	41	41	144	36	8,760	35,818	42,565	1.10	119%
4' 2L T12 to LED036-FIXT	3	3	72	36	8,760	599	1,038	1.10	173%
4' 4L T12 to LED036-FIXT	2	2	144	36	8,760	624	2,076	1.10	333%
Total						37,041	45,680		123%

Results

Verified Gross Savings/Realization Rates By Measure

Measure Category	*kWh Savings*			*Realized Peak kW Reduction*
	Expected	*Realized*	*Realization Rate*	
Lighting Retrofit	37,041	45,680	123%	5.37
Total	37,041	45,680	123%	5.37

The project-level realization rate is 123%. For the lighting retrofit, the realization rate is high mainly because the verified lighting hours of operation (8,760) are greater than those used to perform ex ante estimation (ranging from 3,120 to 8,736). The baseline wattages used in the ex ante estimation did not account for ballast factor. Adding ballast factors to the baseline wattage increases both kWh and kW savings.

Project Number 1133

Executive Summary

Under project 1133, the customer received incentives from Indiana Michigan Power for retrofitting lighting in the interior and exterior of their facility. The realization rate for this project is 113%.

Project Description

The customer retrofitted the following fixtures:

- (56) T8 Linear Fluorescent fixtures with (56) 30W LED fixtures in the sales floor area
- (9) T8 Linear Fluorescent fixtures with (9) 30W LED fixtures in the backroom area
- (40) T8 Linear Fluorescent fixtures with (40) 15W LED fixtures in the exterior

Measurement and Verification Effort

During the M&V visit, ADM staff verified equipment installation, baseline and post-retrofit connected load, and determined the lighting operating schedule. These data were used to calculate energy savings.

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*	*Expected kWh Savings*	*Realized kWh Savings*	*Heating Cooling Interaction Factor*	*Realization Rate*
	Old	*New*	*Old*	*New*					
4' 2L T8 to LED030-FIXT	56	56	58	30	8,738	12,720	15,036	1.10	118%
4' 4L T8 to LED030-FIXT	9	9	115	30	8,738	6,526	7,336	1.10	112%
4' 2L T8 to LED015-FIXT	40	40	58	15	4,304	6,989	7,403	1.00	106%
Total						26,235	29,774		113%

Results

Verified Gross Savings/Realization Rates By Measure

Measure Category	*kWh Savings*			*Realized Peak kW Reduction*
	Expected	*Realized*	*Realization Rate*	
Lighting Retrofit	26,235	29,774	113%	2.73
Total	26,235	29,774	113%	2.73

The project-level realization rate is 113%. For the lighting retrofit, the realization rate is high mainly because the verified lighting hours of operation (ranging from 4,304 to 8,738) are greater than those used to perform ex ante estimation (ranging from 4,160 to 8,736).

Project Number 1134

Executive Summary

Under project 1134, the customer received incentives from Indiana Michigan Power for retrofitting lighting in the interior and exterior of their facility. The realization rate for this project is 115%.

Project Description

The customer retrofitted the following fixtures:

- (66) T8 Linear Fluorescent fixtures with (66) 30W LED fixtures in the backroom area
- (26) T8 Linear Fluorescent fixtures with (26) 15W LED fixtures in the backroom area
- (5) T8 Linear Fluorescent fixtures with (5) 30W LED fixtures in the exterior area

Measurement and Verification Effort

During the M&V visit, ADM staff verified equipment installation, baseline and post-retrofit connected load, and determined the lighting operating schedule. These data were used to calculate energy savings. The reduction of lighting operating hours associated with occupancy sensors is determined by multiplying the baseline hours by a Power Adjustment Factor of 0.7 (adapted from ASHRAE 90.1-1989).

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*	*Expected kWh Savings*	*Realized kWh Savings*	*Heating Cooling Interaction Factor*	*Realization Rate*
	Old	*New*	*Old*	*New*					
4' 2L T8 to LED030-FIXT	66	66	58	30	8,736	14,991	17,716	1.10	118%
4' 2L T8 to LED015-FIXT	26	26	58	15	4,304	4,543	4,812	1.00	106%
4' 4L T8 to LED030-FIXT	5	5	115	30	8,736	3,625	4,074	1.10	112%
Total						23,159	26,602		115%

Results

Verified Gross Savings/Realization Rates By Measure

Measure Category	*kWh Savings*			*Realized Peak kW Reduction*
	Expected	*Realized*	*Realization Rate*	
Lighting Retrofit	23,159	26,602	115%	2.63
Total	23,159	26,602	115%	2.63

The project-level realization rate is 115%. For the lighting retrofit, the realization rate is high mainly because the verified lighting hours of operation (ranging from 4,304 to 8,736) are greater than those used to perform ex ante estimation (ranging from 4,160 to 8,736).

Project Number 1152

Executive Summary

Under project 1152 the customer received incentives from Indiana Michigan Power for retrofitting lighting in the interior of their facility. The realization rate for this project is 98%.

Project Description

The customer retrofitted (180) metal halide fixtures with (180) 4' 10-lamp T5HO fixtures in the warehouse area.

Measurement and Verification Effort

During the M&V visit, ADM staff verified equipment installation, baseline and post-retrofit connected load, and determined the lighting operating schedule. These data were used to calculate energy savings.

Lighting retrofit energy savings are calculated as:

$$kWh_{savings} = \sum_{Area}\left[HCIF \times t \times \left(N_{base} \times W_{base} - N_{as\text{–}built} \times W_{as\text{–}built}\right)/1000\right]$$

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*	*Expected kWh Savings*	*Realized kWh Savings*	*Heating Cooling Interaction Factor*	*Realization Rate*
	Old	*New*	*Old*	*New*					
MH to 4' 10L T5HO	180	180	1,078	585	2,959	267,300	262,591	1.00	98%
Total						267,300	262,591		98%

Results

Verified Gross Savings/Realization Rates By Measure

Measure Category	*kWh Savings*			*Realized Peak kW Reduction*
	Expected	*Realized*	*Realization Rate*	
Lighting Retrofit	267,300	262,591	98%	14.79
Total	267,300	262,591	98%	14.79

The project-level realization rate is 98%. For the lighting retrofit, the realization rate is lower mainly because the verified lighting hours of operation (2,959) are less than those used to perform ex ante estimation (3,000).

Project Number 1186

Executive Summary

Under project 1186, the customer received incentives from Indiana Michigan Power for retrofitting lighting in the exterior of their facility. The realization rate for this project is 48%.

Project Description

The customer retrofitted the following fixtures:

- (8) T12 Linear Fluorescent fixtures with (8) LED022-FIXT fixtures

Measurement and Verification Effort

During the M&V visit, ADM staff verified equipment installation, baseline and post-retrofit connected load, and determined the lighting operating schedule. These data were used to calculate energy savings.

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*	*Expected kWh Savings*	*Realized kWh Savings*	*Heating Cooling Interaction Factor*	*Realization Rate*
	Old	*New*	*Old*	*New*					
8' 1L T12HO to LED022-FIXT	8	8	121	22	2,114	3,523	1,674	1.00	48%
Total						3,523	1,674		48%

Results

Verified Gross Savings/Realization Rates By Measure

Measure Category	kWh Savings			Realized Peak kW Reduction
	Expected	Realized	Realization Rate	
Lighting Retrofit	3,523	1,674	48%	0.04
Total	3,523	1,674	48%	0.04

The project-level realization rate is 48%. For the lighting retrofit, the realization rate is low mainly because the verified lighting hours of operation (2,114) are less than those used to perform ex ante estimation (4,275).

Project Number 001199

Executive Summary

Under project 001199, the customer received incentives from Indiana Michigan Power for retrofitting lighting in the interior of their facility. The realization rate for this project is 70%.

Project Description

The customer retrofitted the following fixtures:

- (4) Incandescent lamps with (4) LED lamps

Measurement and Verification Effort

During the M&V visit, ADM staff verified equipment installation, baseline and post-retrofit connected load, and determined the lighting operating schedule. These data were used to calculate energy savings.

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*	*Expected kWh Savings*	*Realized kWh Savings*	*Heating Cooling Interaction Factor*	*Realization Rate*
	Old	*New*	*Old*	*New*					
75W Incan to 11W LED	4	4	75	11	2,867	1,185	832	1.133	70%
Total						1,185	832		70%

Results

Verified Gross Savings/Realization Rates By Measure

Measure Category	*kWh Savings*			*Realized Peak kW Reduction*
	Expected	*Realized*	*Realization Rate*	
Lighting Retrofit	1,185	832	70%	0.20
Total	**1,185**	**832**	**70%**	**0.20**

The project-level realization rate is 70%. The following factors impacted the project gross realization rate:

- The ex post savings analysis hours of operation utilized the TRM Public Assembly hours (2,867) which are less than the hours of operation used to perform the ex ante savings estimate (4,630).

Project Number 1210

Executive Summary

Under project 1210, the customer received incentives from Indiana Michigan Power for retrofitting lighting in the interior and exterior of their facility and installing occupancy sensors. The realization rate for the Custom project is 93%. The realization rate for the Prescriptive project is 76%.

Project Description

The customer retrofitted the following Custom measures:

- (4) incandescent fixtures with (4) 4' 2-lamp T8 fixtures and (1) occupancy sensor in the garage/upper mezzanine
- (1) incandescent fixture with (3) LED fixtures and (1) occupancy sensor in the office restroom
- (2) CFL fixtures with (2) LED fixtures and (1) occupancy sensor in the conference room
- (3) CFL fixtures with (3) Removal fixtures and (1) occupancy sensor in the conference room
- (28) Incandescent fixtures with (28) LED fixtures and (1) occupancy sensor in the conference room
- (3) 4' 2-lamp T12 fixtures with (3) LED fixtures and (1) occupancy sensor in the conference room
- (2) 4' 2-lamp T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the conference room
- (9) 4' 4-lamp T12 fixtures with (9) LED fixtures and (1) occupancy sensor in the conference room
- (7) 4' 3-lamp T8 fixtures with (7) LED fixtures and (2) occupancy sensors in the conference room
- (12) 4' 2-lamp T12 fixtures with (12) LED fixtures and (1) occupancy sensor in the conference room
- (3) 4' 4-lamp T12 fixtures with (3) LED fixtures and (1) occupancy sensor in the conference room
- (3) 4' 3-lamp T8 fixtures with (3) LED fixtures and (1) occupancy sensor in the conference room
- (1) 2' 2-lamp T12 fixture with (1) 2' 2-lamp T8 fixture and (1) occupancy sensor in the men’s restroom
- (6) 2' 2-lamp T12 fixtures with (6) 2' 2-lamp T8 fixtures and (5) occupancy sensors in the patient restroom
- (13) 2' 2-lamp T12 fixtures with (13) 2' 2-lamp T8 fixtures and (13) occupancy sensors in the patient room
- (13) 4' 2-lamp T12 fixtures with (13) LED fixtures and (7) occupancy sensors in the patient room
- (4) 4' 4-lamp T12 fixtures with (4) LED fixtures and (3) occupancy sensors in the patient room
- (1) 4' 2-lamp T8 fixture with (1) LED fixture and (1) occupancy sensor in the patient room

- (19) U-lamp T8 fixtures with (19) LED fixtures and (8) occupancy sensors in the patient room
- (1) U-lamp T8 fixture with (1) LED fixture and (1) occupancy sensor in the patient room
- (1) 2' 2-lamp T12 fixture with (1) 2' 2-lampT8 fixture and (1) occupancy sensor in the PR
- (2) 4' 3-lamp T8 fixtures with (2) LED fixtures and (2) occupancy sensors in the PR
- (3) incandescent fixtures with (3) LED fixtures and (3) occupancy sensors in the restroom
- (1) 2' 2-lamp T12 fixture with (1) LED fixture and (1) occupancy sensor in the restroom
- (14) 2' 2-lamp T12 fixtures with (14) 2' 2-lamp T8 fixtures and (14) occupancy sensors in the restroom
- (4) 3' 1-lamp T12 fixtures with (4) 3' 1-lamp T8 fixtures and (4) occupancy sensors in the restroom
- (5) 4' 2-lamp T12 fixtures with (5) LED fixtures and (5) occupancy sensors in the restroom
- (3) 4' 4-lamp T12 fixtures with (3) LED fixtures and (2) occupancy sensors in the restroom
- (2) 4' 4-lamp T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the restroom
- (1) 4' 2-lamp T8 fixture with (1) LED fixture and (1) occupancy sensor in the restroom
- (3) 4' 4-lamp T8 fixtures with (3) LED fixtures and (3) occupancy sensors in the restroom
- (1) incandescent fixture with (1) 4' 2-lamp T8 fixture and (1) occupancy sensor in the supplies/shop
- (5) 4' 2-lamp T8 fixtures with (5) LED fixtures and (2) occupancy sensors in the office
- (8) 4' 4-lamp T12 fixtures with (8) LED fixtures and (2) occupancy sensors in the exam
- (25) 4' 4-lamp T8 fixtures with (25) LED fixtures and (4) occupancy sensors in the exam
- (4) 4' 4-lamp T12 fixtures with (4) LED fixtures and (1) occupancy sensor in the exam room
- (9) 4' 4-lamp T8 fixtures with (9) LED fixtures and (1) occupancy sensor in the exam room
- (2) 2' 2-lamp T12 fixtures with (2) 2' 2-lamp T8 fixtures and (2) occupancy sensors in the office
- (14) 4' 2-lamp T12 fixtures with (14) LED fixtures and (4) occupancy sensors in the office
- (26) 4' 4-lamp T12 fixtures with (26) LED fixtures and (7) occupancy sensors in the office
- (2) 4' 3-lamp T8 fixtures with (2) LED fixtures and (1) occupancy sensor in the office
- (2) 4' 3-lamp T8 fixtures with (2) LED fixtures and (1) occupancy sensor in the office
- (23) 4' 4-lamp T8 fixtures with (23) LED fixtures and (7) occupancy sensors in the office
- (11) 4' 4-lamp T12 fixtures with (11) LED fixtures and (2) occupancy sensors in the rehab
- (3) 4' 2-lamp T12 fixtures with (3) LED fixtures and (1) occupancy sensor in the office
- (53) 4' 2-lamp T12 fixtures with (53) LED fixtures and (14) occupancy sensors in the office
- (1) 4' 4-lamp T12 fixture with (1) LED fixture and (1) occupancy sensor in the office
- (4) 4' 4-lamp T12 fixtures with (4) LED fixtures and (1) occupancy sensor in the blueprint
- (2) 4' 2-lamp T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the office

- (4) 4' 4-lamp T12 fixtures with (4) LED fixtures and (1) occupancy sensor in the office
- (2) 4' 2-lamp T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the office/conference
- (8) 4' 3-lamp T8 fixtures with (8) LED fixtures and (3) occupancy sensors in the office
- (14) 4' 2-lamp T12 fixtures with (14) LED fixtures and (1) occupancy sensor in the open office
- (5) 2' 2-lamp T12 fixtures with (5) 2' 2-lamp T8 fixtures and (1) occupancy sensor in the chapel
- (7) 2' 2-lamp T12 fixtures with (7) 2' 2-lamp T8 fixtures and (7) occupancy sensors in the exam
- (8) 3' 3-lamp T12 fixtures with (8) 3' 3-lamp T8 fixtures and (6) occupancy sensors in the exam
- (8) 4' 2-lamp T8 fixtures with (8) LED fixtures and (3) occupancy sensors in the exam
- (15) 4' 3-lamp T8 fixtures with (15) LED fixtures and (7) occupancy sensors in the exam
- (10) 4' 3-lamp T8 fixtures with (10) LED fixtures and (5) occupancy sensors in the exam
- (41) 4' 4-lamp T8 fixtures with (41) LED fixtures and (21) occupancy sensors in the exam
- (4) 2' 2-lamp T12 fixtures with (4) 2' 2-lamp T8 fixtures and (4) occupancy sensors in the exam room
- (3) 3' 3-lamp T12 fixtures with (3) 3' 3-lamp T8 fixtures and (1) occupancy sensor in the exam room
- (2) 4' 2-lamp T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the exam room
- (4) 4' 4-lamp T12 fixtures with (4) LED fixtures and (2) occupancy sensors in the exam room
- (1) 2' 2-lamp T8 fixture with (1) 2' 2-lamp T8 fixture and (1) occupancy sensor in the exam room
- (11) 4' 4-lamp T8 fixtures with (11) LED fixtures and (6) occupancy sensors in the exam room
- (6) 4' 4-lamp T12 fixtures with (6) LED fixtures and (1) occupancy sensor in the file room
- (1) 4' 2-lamp T8 fixture with (1) LED fixture and (1) occupancy sensor in the it
- (9) 4' 4-lamp T8 fixtures with (9) LED fixtures and (3) occupancy sensors in the it
- (3) 4' 4-lamp T12 fixtures with (3) LED fixtures and (3) occupancy sensors in the kitchen
- (1) 4' 2-lamp T8 fixture with (1) LED fixture and (1) occupancy sensor in the kitchen
- (5) 4' 4-lamp T8 fixtures with (5) LED fixtures and (1) occupancy sensor in the morgue
- (14) 2' 2-lamp T12 fixtures with (14) 2' 2-lamp T8 fixtures and (14) occupancy sensors in the office
- (2) 3' 3-lamp T12 fixtures with (2) 3' 3-lamp T8 fixtures and (1) occupancy sensor in the office
- (1) 4' 2-lamp T12 fixture with (1) LED fixture and (1) occupancy sensor in the office
- (12) 4' 2-lamp T12 fixtures with (12) LED fixtures and (8) occupancy sensors in the office
- (2) 4' 3-lamp T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the office
- (2) 4' 4-lamp T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the office

- (54) 4' 4-lamp T12 fixtures with (54) LED fixtures and (31) occupancy sensors in the office
- (2) 4' 2-lamp T8 fixtures with (2) LED fixtures and (2) occupancy sensors in the office
- (4) 4' 2-lamp T8 fixtures with (4) LED fixtures and (4) occupancy sensors in the office
- (2) 4' 3-lamp T8 fixtures with (2) LED fixtures and (1) occupancy sensor in the office
- (32) 4' 3-lamp T8 fixtures with (32) LED fixtures and (16) occupancy sensors in the office
- (60) 4' 4-lamp T8 fixtures with (60) LED fixtures and (34) occupancy sensors in the office
- (6) U-lamp T8 fixtures with (6) LED fixtures and (4) occupancy sensors in the office
- (5) U-lamp T8 fixtures with (5) LED fixtures and (3) occupancy sensors in the office
- (3) 4' 3-lamp T8 fixtures with (3) LED fixtures and (1) occupancy sensor in the reception
- (1) 2' 4-lamp T12 fixture with (1) LED fixture and (1) occupancy sensor in the repair area
- (2) incandescent fixtures with (2) 4' 2-lamp T8 fixtures and (1) occupancy sensor in the shop
- (6) 4' 4-lamp T8 fixtures with (6) LED fixtures and (1) occupancy sensor in the shop
- (2) 4' 2-lamp T12 fixtures with(2) LED fixtures and (1)occupancy sensor in the sterile rm
- (3) 4' 2-lamp T12 fixtures with (3) LED fixtures and (1) occupancy sensor in the sterilization
- (3) 4' 4-lamp T12 fixtures with (3) LED fixtures and (1) occupancy sensor in the sterilization
- (2) 4' 4-lamp T8 fixtures with (2) LED fixtures and (1) occupancy sensor in the sterilization
- (3) 4' 4-lamp T12 fixtures with (3) LED fixtures and (1) occupancy sensor in the x-ray
- (2) 2' 4-lamp T12 fixtures with (2) 4' 2-lamp T8 fixtures and (1) occupancy sensor in the garage/upper mezzanine
- (1) 4' 4-lamp T12 fixture with (1) LED fixture and (1) occupancy sensor in the office
- (3) 4' 2-lamp T12 fixtures with (3) LED fixtures and (2) occupancy sensors in the office
- (1) 4' 4-lamp T12 fixture with (1) LED fixture and (1) occupancy sensor in the office
- (1) 4' 4-lamp T12 fixture with (1) LED fixture and (1) occupancy sensor in the office
- (1) 4' 4-lamp T8 fixture with (1) LED fixture and (1) occupancy sensor in the kitchen
- (7) 4' 4-lamp T8 fixtures with (7) LED fixtures and (6) occupancy sensors in the office
- (2) 4' 3-lamp T8 fixtures with (2) LED fixtures and (1) occupancy sensor in the kitchen-x
- (16) 4' 3-lamp T8 fixtures with (16) LED fixtures and (9) occupancy sensors in the office
- (2) 2' 2-lamp T12 fixtures with (2) LED fixtures and (2) occupancy sensors in the kitchen
- (2) 2' 4-lamp T12 fixtures with (2) LED fixtures and (2) occupancy sensors in the kitchen
- (3) i240/1 fixtures with (3) LED fixtures and (3) occupancy sensors in the office
- (6) 4' 4-lamp T8 fixtures with (6) LED fixtures and (5) occupancy sensors in the office
- (12) 4' 2-lamp T12 fixtures with (12) LED fixtures and (4) occupancy sensors in the office
- (29) 4' 2-lamp T8 fixtures with (29) LED fixtures and (2) occupancy sensors in the lab
- (16) 4' 2-lamp T8 fixtures with (16) LED fixtures and (4) occupancy sensors in the lab
- (2) 4' 3-lamp T8 fixtures with (2) LED fixtures and (1) occupancy sensor in the x-ray proc room
- (3) U-lamp T8 fixtures with (3) LED fixtures and (1) occupancy sensor in the waiting room

- (4) 4' 2-lamp T12 fixtures with (4) LED fixtures and (1) occupancy sensor in the copy room
- (1) 4' 2-lamp T12 fixture with (1) LED fixture and (1) occupancy sensor in the copy
- (1) 4' 4-lamp T12 fixture with (1) LED fixture and (1) occupancy sensor in the copy
- (8) 4' 2-lamp T12 fixtures with (8) LED fixtures and (1) occupancy sensor in the office
- (8) 4' 4-lamp T12 fixtures with (8) LED fixtures and (1) occupancy sensor in the exam
- (19) 4' 4-lamp T12 fixtures with (19) LED fixtures and (1) occupancy sensor in the file room
- (7) 4' 4-lamp T12 fixtures with (7) LED fixtures and (1) occupancy sensor in the mail
- (9) 4' 4-lamp T12 fixtures with (9) LED fixtures and (2) occupancy sensors in the MRI
- (11) 4' 3-lamp T8 fixtures with (11) LED fixtures and (1) occupancy sensor in the office
- (3) 2' 2-lamp T12 fixtures with (3) 2' 2-lamp T8 fixtures and (3) occupancy sensors in the open office
- (1) 4' 2-lamp T12 fixture with (1) LED fixture and (1) occupancy sensor in the open office
- (14) 4' 2-lamp T12 fixtures with (14) LED fixtures and (4) occupancy sensors in the open office
- (1) 4' 2-lamp T8 fixture with (1) LED fixture and (1) occupancy sensor in the open office
- (3) 4' 4-lamp T8 fixtures with (3) LED fixtures and (1) occupancy sensor in the open office
- (7) 2' 4-lamp T12 fixtures with (7) LED fixtures and (1) occupancy sensor in the repair
- (8) 4' 2-lamp T12 fixtures with (8) LED fixtures and (1) occupancy sensor in the office
- (8) 2' 4-lamp T12 fixtures with (8) 4' 2-lamp T8 fixtures and (1) occupancy sensor in the wood shop
- (8) 4' 2-lamp T12 fixtures with (8) LED fixtures and (1) occupancy sensor in the office
- (3) CFL fixtures with (3) LED fixtures and (1) occupancy sensor in the exterior/main entrance
- (1) i140/1 fixture with (1) LED fixture and (1) occupancy sensor in the exterior/receiving
- (1) Incandescent fixture with (1) LED fixture and (1) occupancy sensor in the exterior
- (3) 2' 4-lamp T12 fixtures with (3) 4' 2-lamp T8 fixtures and (1) occupancy sensor in the wood shop under balcony
- (2) CFL fixtures with (2) LED fixtures and (1) occupancy sensor in the exterior
- (2) incandescent fixtures with (2) LED fixtures and (1) occupancy sensor in the exterior
- (5) 4' 4-lamp T8 fixtures with (5) LED fixtures and (1) occupancy sensor in the break
- (2) 4' 4-lamp T8 fixtures with (2) LED fixtures and (1) occupancy sensor in the break
- (4) 4' 4-lamp T12 fixtures with (4) LED fixtures and (1) occupancy sensor in the break room
- (5) 4' 4-lamp T12 fixtures with (5) LED fixtures and (2) occupancy sensors in the break room
- (2) 4' 4-lamp T8 fixtures with (2) LED fixtures and (1) occupancy sensor in the break room
- (2) 4' 2-lamp T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the cafe
- (1) 4' 4-lamp T8 fixture with (1) LED fixture and (1) occupancy sensor in the lounge
- (2) 4' 4-lamp T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the waiting
- (6) 4' 2-lamp T8 fixtures with (6) LED fixtures and (1) occupancy sensor in the waiting
- (4) 4' 4-lamp T8 fixtures with (4) LED fixtures and (1) occupancy sensor in the waiting

- (21) CFL fixtures with (21) LED fixtures and (4) occupancy sensors in the waiting
- (3) 4' 2-lamp T8 fixtures with (3) LED fixtures and (1) occupancy sensor in the waiting
- (3) 3' 3-lamp T12 fixtures with (3) 3' 3-lamp T8 fixtures and (1) occupancy sensor in the waiting room
- (1) 4' 2-lamp T8 fixture with (1) LED fixture and (1) occupancy sensor in the waiting room
- (3) 4' 4-lamp T8 fixtures with (3) LED fixtures and (2) occupancy sensors in the waiting room
- (2) 2' 2-lamp T12 fixtures with (2) 2' 2-lamp T8 fixtures and (1) occupancy sensor in the restroom
- (4) 4' 2-lamp T12 fixtures with (4) LED fixtures and (1) occupancy sensor in the restroom
- (3) 4' 2-lamp T12 fixtures with (3) LED fixtures and (1) occupancy sensor in the men's restroom
- (3) 4' 2-lamp T12 fixtures with (3) LED fixtures and (1) occupancy sensor in the women's restroom
- (2) incandescent fixtures with (2) LED fixtures and (2) occupancy sensors in the restroom
- (1) 4' 2-lamp T12 fixture with (1) LED fixture and (1) occupancy sensor in the men's restroom
- (2) 4' 4-lamp T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the men' restroom
- (1) 4' 4-lamp T8 fixture with (1) LED fixture and (1) occupancy sensor in the men's restroom
- (12) CFL fixtures with (12) LED fixtures and (2) occupancy sensors in the nurse station
- (4) 2' 2-lamp T12 fixtures with (4) 2' 2-lamp T8 fixtures and (3) occupancy sensors in the restroom
- (2) 4' 2-lamp T12 fixtures with (2) LED fixtures and (2) occupancy sensors in the restroom
- (2) 4' 4-lamp T12 fixtures with (2) LED fixtures and (2) occupancy sensors in the restroom
- (5) 4' 2-lamp T8 fixtures with (5) LED fixtures and (5) occupancy sensors in the restroom
- (3) 4' 4-lamp T8 fixtures with (3) LED fixtures and (3) occupancy sensors in the restroom
- (1) 4' 2-lamp T12 fixture with (1) LED fixture and (1) occupancy sensor in the women's restroom
- (2) 4' 4-lamp T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the women's restroom
- (1) 4' 2-lamp T8 fixture with (1) LED fixture and (1) occupancy sensor in the restroom
- (1) 4' 4-lamp T8 fixture with (1) LED fixture and (1) occupancy sensor in the restroom
- (1) incandescent fixture with (3) LED fixtures and (1) occupancy sensor in the restroom
- (1) U-lamp T8 fixture with (1) LED fixture and (1) occupancy sensor in the restroom
- (3) 2' 2-lamp T8 fixtures with (3) 2' 2-lamp T8 fixtures and (3) occupancy sensors in the restroom
- (1) 2' 1-lamp T12 fixture with (1) 2' 1-lamp T8 fixture and (1) occupancy sensor in the restroom
- (1) 2' 1-lamp T12 fixture with (1) 2' 1-lamp T8 fixture and (1) occupancy sensor in the restroom

- (2) 3' 1-lamp T12 fixtures with (2) 3' 1-lamp T8 fixtures and (2) occupancy sensors in the restroom
- (1) U-lamp T8 fixture with (1) LED fixture and (1) occupancy sensor in the restroom
- (7) 4' 4-lamp T12 fixtures with (7) LED fixtures and (1) occupancy sensor in the storage
- (13) 4' 2-lamp T12 fixtures with (13) LED fixtures and (2) occupancy sensors in the supplies
- (19) 4' 4-lamp T8 fixtures with (19) LED fixtures and (1) occupancy sensor in the supplies
- (4) 8' 2-lamp T12 fixtures with (4) 8' 2-lamp T8 fixtures and (1) occupancy sensor in the kitchen
- (3) 4' 4-lamp T8 fixtures with (3) LED fixtures and (1) occupancy sensor in the hall
- (2) 2' 3-lamp T5 fixtures with (2) LED fixtures and (1) occupancy sensor in the hallway
- (5) 4' 2-lamp T8 fixtures with (5) LED fixtures and (1) occupancy sensor in the hallway
- (1) 4' 3-lamp T8 fixture with (1) LED fixture and (1) occupancy sensor in the hallway
- (1) 4' 4-lamp T8 fixture with (1) LED fixture and (1) occupancy sensor in the hallway
- (1) U-lamp T8 fixture with (1) LED fixture and (1) occupancy sensor in the hallway area
- (31) 4' 2-lamp T8 fixtures with (31) LED fixtures and (2) occupancy sensors in the receiving
- (1) 4' 2-lamp T8 fixture with (1) LED fixture and (1) occupancy sensor in the reception
- (5) 4' 4-lamp T8 fixtures with (5) LED fixtures and (1) occupancy sensor in the reception
- (6) CFL fixtures with (6) LED fixtures and (1) occupancy sensor in the hallway
- (4) incandescent fixtures with (4) LED fixtures and (1) occupancy sensor in the hallway
- (1) 2' 2-lamp T12 fixture with (1) LED fixture and (1) occupancy sensor in the hallway
- (4) 4' 2-lamp T12 fixtures with (4) LED fixtures and (1) occupancy sensor in the hallway
- (2) 4' 2-lamp T8 fixtures with (2) LED fixtures and (1) occupancy sensor in the foyer
- (1) 2' 2-lamp T12 fixture with(1) 2' 2-lamp T8 fixture and(1) occupancy sensor in the hall
- (3) 4' 2-lamp T8 fixtures with (3) LED fixtures and (1) occupancy sensor in the hall
- (8) 4' 4-lamp T8 fixtures with (8) LED fixtures and (4) occupancy sensors in the hall
- (2) 4' 3-lamp T8 fixtures with (2) LED fixtures and (1) occupancy sensor in the hallway
- (1) 4' 4-lamp T8 fixture with (1) LED fixture and (1) occupancy sensor in the hallway
- (16) metal halide fixtures with (16) LED fixtures and (1) occupancy sensor in the lobby
- (4) 4' 2-lamp T8 fixtures with (4) LED fixtures and (1) occupancy sensor in the reception
- (1) 4' 4-lamp T8 fixture with (1) LED fixture and (1) occupancy sensor in the reception
- (6) CFL fixtures with (6) LED fixtures and (1) occupancy sensor in the hallway
- (1) 2' 2-lamp T12 fixture with (1) LED fixture and (1) occupancy sensor in the foyer
- (1) 4' 2-lamp T12 fixture with (1) LED fixture and (1) occupancy sensor in the foyer
- (3) incandescent fixtures with (3) LED fixtures and (2) occupancy sensors in the hall
- (1) i240/1 fixture with (1) LED fixture and (1) occupancy sensor in the hall
- (4) U-lamp T8 fixtures with (4) LED fixtures and (1) occupancy sensor in the foyer
- (1) CFL fixture with (1) LED fixture and (1) occupancy sensor in the hall
- (1) U-lamp T8 fixture with (1) LED fixture and (1) occupancy sensor in the hall
- (1) U-lamp T8 fixture with (1) LED fixture and (1) occupancy sensor in the hall/telecom
- (1) CFL fixture with (1) LED fixture and (1) occupancy sensor in the hallway
- (4) 4' 3-lamp T8 fixtures with (4) LED fixtures and (1) occupancy sensor in the hallway
- (1) U-lamp T8 fixture with (1) LED fixture and (1) occupancy sensor in the hallway
- (4) 4' 3-lamp T8 fixtures with (4) LED fixtures and (1) occupancy sensor in the reception

- (1) incandescent fixture with (1) LED fixture and (1) occupancy sensor in the foyer
- (2) 2' 2-lamp T12 fixtures with (2) LED fixtures and (2) occupancy sensors in the foyer
- (2) incandescent fixtures with (2) LED fixtures and (2) occupancy sensors in the hall
- (1) i240/1 fixture with (1) LED fixture and (1) occupancy sensor in the hall
- (1) i240/1 fixture with (1) LED fixture and (1) occupancy sensor in the hallway 2nd floor
- (2) U-lamp T8 fixtures with (2) LED fixtures and (1) occupancy sensor in the hall
- (4) 4' 2-lamp T12 fixtures with (4) LED fixtures and (1) occupancy sensor in the locker
- (5) 4' 2-lamp T8 fixtures with (5) LED fixtures and (2) occupancy sensors in the locker
- (1) 4' 4-lamp T8 fixture with (1) LED fixture and (1) occupancy sensor in the locker
- (3) U-lamp T8 fixtures with (3) LED fixtures and (1) occupancy sensor in the men’s locker room
- (2) 4' 4-lamp T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the women’s locker room
- (3) 4' 2-lamp T12 fixtures with (3) LED fixtures and (2) occupancy sensors in the lockers
- (1) 4' 2-lamp T8 fixture with (1) LED fixture and (1) occupancy sensor in the locker
- (2) 4' 2-lamp T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the lockers
- (1) 2' 2-lamp T12 fixture with (1) 2' 2-lamp T8 fixture and (1) occupancy sensor in the laundry chute
- (11) 4' 4-lamp T12 fixtures with (11) 4' 2-lamp T8 fixtures and (1) daylight control in the garage bay
- (2) 4' 3-lamp T8 fixtures with (2) LED fixtures and (1) occupancy sensor in the exit
- (1) Incandescent exit fixture with (1) LED exit fixture and (1) occupancy sensor in the laundry
- (13) CFL fixtures with (13) LED fixtures and (2) occupancy sensors in the nurse station
- (3) U-lamp T8 fixtures with (3) LED fixtures and (2) occupancy sensors in the pharma
- (1) 2' 2-lamp T12 fixture with (1) 2' 2-lamp T8 fixture and (1) occupancy sensor in the stairwell
- (1) 4' 2-lamp T12 fixture with (1) LED fixture and (1) occupancy sensor in the stairwell
- (2) 4' 2-lamp T8 fixtures with (2) LED fixtures and (1) occupancy sensor in the stairwell
- (2) 2' 4-lamp T12 fixtures with (2) 4' 2-lamp T8 fixtures and (1) occupancy sensor in the garage/lower mezzanine
- (6) 2' 4-lamp T12 fixtures with (6) 4' 2-lamp T8 fixtures and (1) occupancy sensor in the garage/shop
- (1) Incandescent exit fixture with (1) LED exit fixture and (1) occupancy sensor in the office
- (1) CFL fixture with (1) LED fixture and (1) occupancy sensor in the stairwell
- (1) incandescent fixture with (1) LED fixture and (1) occupancy sensor in the stairwell
- (1) 2' 4-lamp T12 fixture with (1) LED fixture and (1) occupancy sensor in the stairwell

The customer retrofitted the following Prescriptive measures:

- (1) 4' 3-lamp T12 fixture with (1) 4' 3-lamp T8 fixture in the storage
- (1) incandescent fixture with (1) LED fixture in the office restroom
- (2) 4' 3-lamp T12 fixtures with (2) 4' 3-lamp T8 fixtures in the conference room
- (5) incandescent fixtures with (5) LED fixtures in the patient room
- (1) 4' 2-lamp T12 fixture with (1) 4' 2-lamp T8 fixture in the patient room
- (3) 4' 2-lamp T12 fixtures with (3) 4' 2-lamp T8 fixtures in the patient room

- (17) 4' 3-lamp T12 fixtures with (17) 4' 3-lamp T8 fixtures in the patient room
- (2) 4' 3-lamp T12 fixtures with (2) 4' 3-lamp T8 fixtures in the PR
- (3) incandescent fixtures with (3) LED fixtures in the restroom
- (10) incandescent fixtures with (10) LED fixtures in the restroom
- (6) incandescent fixtures with (6) LED fixtures in the restroom
- (2) 4' 1-lamp T12 fixtures with (2) 4' 1-lamp T8 fixtures in the restroom
- (1) 4' 2-lamp T8 fixture with (1) 4' 2-lamp T8 fixture in the restroom
- (1) 4' 2-lamp T12 fixture with (1) 4' 2-lamp T8 fixture in the supplies/shop
- (1) incandescent fixture with (1) LED fixture in the it
- (4) 4' 3-lamp T12 fixtures with (4) 4' 3-lamp T8 fixtures in the office
- (5) 4' 2-lamp T12 fixtures with (5) 4' 2-lamp T8 fixtures in the chapel
- (1) incandescent fixture with (1) LED fixture in the exam
- (8) 4' 1-lamp T12 fixtures with (8) 4' 1-lamp T8 fixtures in the exam
- (12) 4' 3-lamp T12 fixtures with (12) 4' 3-lamp T8 fixtures in the exam
- (1) 4' 2-lamp T12 fixture with (1) 4' 2-lamp T8 fixture in the exam room
- (3) 4' 3-lamp T12 fixtures with (3) 4' 3-lamp T8 fixtures in the exam room
- (2) 4' 2-lamp T8 fixtures with (2) 4' 2-lamp T8 fixtures in the file room
- (2) incandescent fixtures with (2) LED fixtures in the office
- (25) 4' 3-lamp T12 fixtures with (25) 4' 3-lamp T8 fixtures in the office
- (1) 4' 2-lamp T8 fixture with (1) 4' 2-lamp T8 fixture in the office
- (4) 4' 3-lamp T8 fixtures with (4) 4' 3-lamp T8 fixtures in the office
- (2) 4' 2-lamp T8 fixtures with (2) 4' 2-lamp T8 fixtures in the oxygen
- (1) 4' 2-lamp T8 fixture with (1) 4' 2-lamp T8 fixture in the repair
- (1) incandescent fixture with (1) LED fixture in the server
- (1) incandescent fixture with (1) LED fixture in the server
- (1) 4' 2-lamp T8 fixture with (1) 4' 2-lamp T8 fixture in the server
- (1) 4' 2-lamp T12 fixture with (1) 4' 2-lamp T8 fixture in the entrance/sink
- (4) incandescent fixtures with (4) LED fixtures in the waiting room
- (1) incandescent fixture with (1) LED fixture in the copy room
- (10) 4' 2-lamp T12 fixtures with (10) 4' 2-lamp T8 fixtures in the chapel
- (9) 4' 2-lamp T12 fixtures with (9) 4' 2-lamp T8 fixtures in the kitchen
- (11) 4' 3-lamp T12 fixtures with (11) 4' 3-lamp T8 fixtures in the open office
- (2) 4' 1-lamp T12 fixtures with (2) 4' 1-lamp T8 fixtures in the shop bench
- (16) 4' 4-lamp T12 fixtures with (16) 4' 4-lamp T8 fixtures in the laundry
- (6) metal halide fixtures with (6) LED fixtures in the exterior
- (1) metal halide fixture with (1) LED fixture in the exterior
- (4) metal halide fixtures with (4) LED fixtures in the exterior/emergency entrance
- (2) metal halide fixtures with (2) LED fixtures in the exterior/flagpole
- (5) metal halide fixtures with (5) LED fixtures in the exterior/main entrance
- (3) metal halide fixtures with (3) LED fixtures in the exterior/receiving
- (1) 4' 2-lamp T12 fixture with (1) 4' 2-lamp T8 fixture in the wood shop balcony
- (1) incandescent fixture with (1) LED fixture in the exterior
- (2) incandescent fixtures with (2) LED fixtures in the exterior
- (1) metal halide fixture with (1) LED fixture in the exterior
- (1) incandescent fixture with (1) LED fixture in the exterior
- (4) metal halide fixtures with (4) LED fixtures in the pathway

- (14) metal halide fixtures with (14) LED fixtures in the upper parking lot
- (1) incandescent fixture with (1) LED fixture in the break room
- (4) incandescent fixtures with (4) LED fixtures in the cafe
- (2) 4' 1-lamp T12 fixtures with (2) 4' 1-lamp T8 fixtures in the waiting room
- (9) 4' 2-lamp T12 fixtures with (9) 4' 2-lamp T8 fixtures in the restroom
- (1) incandescent fixture with (1) LED fixture in the men's restroom
- (3) 4' 2-lamp T12 fixtures with (3) 4' 2-lamp T8 fixtures in the men's restroom
- (1) incandescent fixture with (1) LED fixture in the restroom
- (1) incandescent fixture with (1) LED fixture in the restroom
- (3) 4' 2-lamp T12 fixtures with (3) 4' 2-lamp T8 fixtures in the restroom
- (2) 4' 2-lamp T12 fixtures with (2) 4' 2-lamp T8 fixtures in the women's restroom
- (1) 4' 2-lamp T12 fixture with (1) 4' 2-lamp T8 fixture in the women's restroom
- (1) incandescent fixture with (1) LED fixture in the women's restroom
- (1) incandescent fixture with (1) LED fixture in the restroom
- (2) incandescent fixtures with (2) LED fixtures in the restroom
- (11) incandescent fixtures with (11) LED fixtures in the freezers/coolers
- (10) 4' 2-lamp T8 fixtures with (10) 4' 2-lamp T8 fixtures in the storage
- (18) 4' 4-lamp T12 fixtures with (18) 4' 4-lamp T8 fixtures in the kitchen
- (2) 4' 2-lamp T8 fixtures with (2) 4' 2-lamp T8 fixtures in the kitchen
- (23) 4' 4-lamp T8 fixtures with (23) 4' 4-lamp T8 fixtures in the kitchen
- (18) incandescent fixtures with (18) LED fixtures in the hallway
- (24) incandescent fixtures with (24) LED fixtures in the hallway
- (30) incandescent fixtures with (30) LED fixtures in the hallway
- (1) incandescent fixture with (1) LED fixture in the hallway/vestibule
- (2) incandescent fixtures with (2) LED fixtures in the hall
- (2) incandescent fixtures with (2) LED fixtures in the hall
- (1) 4' 2-lamp T8 fixture with (1) 4' 2-lamp T8 fixture in the hall
- (1) incandescent fixture with (1) LED fixture in the hallway
- (1) incandescent fixture with (1) LED fixture in the foyer
- (1) incandescent fixture with (1) LED fixture in the entry
- (1) incandescent fixture with (1) LED fixture in the entry
- (1) incandescent fixture with (1) LED fixture in the shower
- (1) 4' 2-lamp T8 fixture with (1) 4' 2-lamp T8 fixture in the locker/hall
- (2) 4' 2-lamp T8 fixtures with (2) 4' 2-lamp T8 fixtures in the garage
- (37) 4' 2-lamp T8 fixtures with (37) 4' 2-lamp T8 fixtures in the mechanical room
- (6) incandescent fixtures with (6) LED Exit Sign fixtures in the x-ray signs
- (1) incandescent fixture with (1) LED fixture in the garage
- (1) incandescent fixture with (1) LED fixture in the stairwell

Measurement and Verification Effort

During the M&V visit, ADM staff verified equipment installation, baseline and post-retrofit connected load, and placed ten photo-sensor loggers at the site (from 3/03/2016 to 3/15/2016) to monitor lighting operation. These data were used to calculate energy savings.

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*

Lighting occupancy sensor energy savings are calculated as:

$$kWh_{savings} = \sum_{Area}\left[HCIF \times W \times N \times \left(t_{base} - t_{as-built}\right)/1000\right]$$

Where:

$kWh_{savings}$	= *Annual energy savings*
N	= *Number of occupancy sensors*
W	= *Wattage controlled by each occupancy sensor*
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 Custom project.

Lighting Retrofit Savings Calculations

Measure	*Quantity (Fixtures)*		*Wattage*		*Hours*	*Expected kWh Savings*	*Realized kWh Savings*	*Heating Cooling Interaction Factor*	*Realization Rate*
	Old	*New*	*Old*	*New*					
2' 2L T12 to 2' 2L T8	1	1	56	24	4,057	280	130	1.00	46%
2' 4L T12 to 4' 2L T8	3	3	146	43	4,057	1,353	1,254	1.00	93%
2' 4L T12 to 4' 2L T9	8	8	146	58	4,057	2,643	2,856	1.00	108%
2' 4L T12 to LED	8	8	146	33	4,057	3,264	3,667	1.00	112%
4' 4L T12 to LED	7	7	146	22	4,057	4,594	3,521	1.00	77%
4' 4L T8 to LED	6	6	109	33	4,057	1,189	1,850	1.00	156%
Incand. Exit to LED exit	1	1	30	0	4,057	263	122	1.00	46%
Incand. to 4' 2L T8	2	2	300	43	4,057	1,340	2,085	1.00	156%
2' 4L T12 to 4' 2L T8	2	2	146	43	4,304	537	887	1.00	165%
4' 4L T12 to 4' 2L T8	11	11	146	43	4,304	9,925	4,877	1.00	49%
CFL to LED	3	3	45	20	4,304	329	323	1.00	98%
CFL to LED	2	2	54	28	4,304	228	224	1.00	98%
i140/1 to LED	1	1	150	28	4,304	534	525	1.00	98%
Incand. to 4' 2L T8	4	4	200	43	4,304	491	2,703	1.00	550%

Measure	*Quantity (Fixtures)*		*Wattage*		*Hours*	*Expected kWh Savings*	*Realized kWh Savings*	*Heating Cooling Interaction Factor*	*Realization Rate*
	Old	*New*	*Old*	*New*					
Incand. to LED	2	2	90	22	4,304	596	585	1.00	98%
Incandescent to LED	1	1	95	28	4,304	293	288	1.00	98%
2' 4L T12 to 4' 2L T8	8	8	146	43	8,760	7,218	7,218	1.00	100%
2' 2L T12 to 2' 2L T8	25	25	56	24	2,682	2,162	2,290	1.07	106%
2' 2L T12 to LED	2	2	56	14	2,682	219	240	1.07	110%
2' 4L T12 to LED	2	2	112	22	2,682	469	515	1.07	110%
3' 3L T12 to 3' 3L T8	2	2	78	50	2,682	146	160	1.07	110%
4' 2L T12 to LED	37	37	78	22	2,682	9,809	5,932	1.07	60%
4' 2L T12 to LED	162	162	78	33	2,682	20,227	20,871	1.07	103%
4' 2L T8 to LED	9	9	56	22	2,682	1,831	876	1.07	48%
4' 2L T8 to LED	10	10	56	33	2,682	540	658	1.07	122%
4' 3L T12 to LED	2	2	105	33	2,682	375	412	1.07	110%
4' 3L T8 to LED	2	2	88	22	2,682	344	378	1.07	110%
4' 3L T8 to LED	49	49	88	33	2,682	7,075	7,716	1.07	109%
4' 3L T8 to LED	38	38	90	33	2,682	5,534	6,201	1.07	112%
4' 4L T12 to LED	2	2	109	33	2,682	396	435	1.07	110%
4' 4L T12 to LED	41	41	146	22	2,682	19,302	14,555	1.07	75%
4' 4L T12 to LED	113	113	146	33	2,682	32,605	36,557	1.07	112%
4' 4L T8 to LED	29	29	109	22	2,682	12,901	7,223	1.07	56%
4' 4L T8 to LED	105	105	109	33	2,682	21,065	22,846	1.07	108%
8' 2L T12 to 8' 2L T8	4	4	123	58	2,682	1,424	744	1.07	52%
CFL to LED	2	2	40	22	2,682	52	103	1.07	200%
CFL to LED	12	12	54	20	2,682	2,122	1,168	1.07	55%
CFL to Removal	3	3	40	0	2,682	172	344	1.07	200%
i240/1 to LED	3	3	240	33	2,682	1,619	1,778	1.07	110%
Incand. to 4' 2L T8	1	1	150	43	2,682	167	306	1.07	183%
Incandescent to LED	28	28	95	40	2,682	2,208	4,409	1.07	200%
U-lamp T8 to LED	6	6	57	32	2,682	391	429	1.07	110%
U-lamp T8 to LED	3	3	79	22	2,682	1,280	490	1.07	38%
U-lamp T8 to LED	5	5	79	32	2,682	613	673	1.07	110%
2' 2L T12 to 2' 2L T8	11	11	56	24	2,390	918	898	1.07	98%
2' 2L T12 to LED	1	1	56	14	2,390	253	107	1.07	42%
2' 2L T12 to LED	2	2	56	22	2,390	410	173	1.07	42%
2' 2L T8 to 2' 2L T8	1	1	34	24	2,390	26	26	1.07	98%
3' 3L T12 to 3' 3L T8	14	14	78	50	2,390	1,217	1,000	1.07	82%
4' 2L T12 to LED	6	6	78	22	2,390	1,276	857	1.07	67%
4' 2L T12 to LED	4	4	78	33	2,390	469	459	1.07	98%
4' 2L T8 to LED	41	41	56	22	2,390	4,720	3,556	1.07	75%
4' 2L T8 to LED	24	24	56	33	2,390	1,463	1,408	1.07	96%
4' 3L T8 to LED	15	15	88	33	2,390	2,151	2,105	1.07	98%
4' 3L T8 to LED	13	13	90	33	2,390	1,932	1,890	1.07	98%
4' 4L T12 to LED	40	40	146	33	2,390	13,345	11,531	1.07	86%
4' 4L T8 to LED	7	7	109	22	2,390	3,001	1,554	1.07	52%
4' 4L T8 to LED	89	89	109	33	2,390	17,775	17,256	1.07	97%
CFL to LED	21	21	54	20	2,390	3,519	1,822	1.07	52%
Incand. to LED	1	1	120	14	2,390	638	270	1.07	42%

Measure	*Quantity (Fixtures)*		*Wattage*		*Hours*	*Expected kWh Savings*	*Realized kWh Savings*	*Heating Cooling Interaction Factor*	*Realization Rate*
	Old	*New*	*Old*	*New*					
MH to LED	16	16	120	22	2,390	9,444	4,000	1.07	42%
U-lamp T8 to LED	7	7	57	22	2,390	1,124	625	1.07	56%
4' 2L T8 to LED	1	1	56	33	2,441	60	60	1.07	100%
4' 4L T8 to LED	9	9	109	33	2,441	1,783	1,783	1.07	100%
2' 2L T12 to 2' 2L T8	13	13	56	24	2,686	645	1,193	1.07	185%
4' 2L T12 to LED	13	13	78	22	2,686	1,129	2,088	1.07	185%
4' 2L T8 to LED	32	32	56	22	2,686	6,401	3,120	1.07	49%
4' 2L T8 to LED	5	5	56	33	2,686	693	330	1.07	48%
4' 3L T8 to LED	4	4	88	33	2,686	1,325	631	1.07	48%
4' 4L T12 to LED	4	4	146	22	2,686	769	1,422	1.07	185%
4' 4L T12 to LED	9	9	146	33	2,686	3,818	2,917	1.07	76%
4' 4L T8 to LED	6	6	109	33	2,686	2,746	1,308	1.07	48%
U-lamp T8 to LED	19	19	57	22	2,686	1,031	1,907	1.07	185%
U-lamp T8 to LED	1	1	79	22	2,686	88	163	1.07	185%
U-lamp T8 to LED	161	165	79	22	5,713	42,419	55,839	1.07	132%
2' 2L T12 to 2' 2L T8	1	1	56	24	8,760	280	299	1.07	107%
2' 4L T12 to LED	1	1	112	22	8,760	788	842	1.07	107%
4' 2L T12 to LED	1	1	78	22	8,760	491	524	1.07	107%
4' 2L T8 to LED	2	2	56	22	8,760	596	636	1.07	107%
4' 3L T8 to LED	2	2	88	22	8,760	1,156	1,234	1.07	107%
CFL to LED	1	1	40	22	8,760	158	168	1.07	107%
CFL to LED	13	13	54	20	8,760	3,872	4,134	1.07	107%
Incand. Exit to LED exit	1	1	30	0	8,760	263	281	1.07	107%
Incand. to LED	1	1	120	22	8,760	858	916	1.07	107%
U-lamp T8 to LED	3	3	57	32	8,760	657	701	1.07	107%
Total						315,835	303,460		96%

The table shown below presents expected and realized energy savings for the lighting retrofit installed under the Prescriptive project.

Lighting Retrofit Savings Calculations

Measure	*Quantity (Fixtures)*		*Wattage*		*Hours*	*Realized kWh Savings*	*Heating Cooling Interaction Factor*
	Old	*New*	*Old*	*New*			
4' 3L T12 to 4' 3L T8	1	1	105	58	1,861	93	1.07
Incand. to LED	1	1	60	10	1,861	100	1.07
4' 3L T12 to 4' 3L T8	2	2	105	58	2,682	269	1.07
Incand. to LED	5	5	95	20	2,412	966	1.07
4' 2L T12 to 4' 2L T8	1	1	78	38	2,412	103	1.07
4' 2L T12 to 4' 2L T8	3	3	84	40	2,412	340	1.07
4' 3L T12 to 4' 3L T8	17	17	105	58	2,412	2,057	1.07
4' 3L T12 to 4' 3L T8	2	2	105	58	2,682	269	1.07
Incand. to LED	3	3	52	10	5,713	778	1.07
Incand. to LED	10	10	60	10	5,713	3,080	1.07

Measure	*Quantity (Fixtures)*		*Wattage*		*Hours*	*Realized kWh Savings*	*Heating Cooling Interaction Factor*
	Old	*New*	*Old*	*New*			
Incand. to LED	6	6	67	10	5,713	2,104	1.07
4' 1L T12 to 4' 1L T8	2	2	42	20	5,713	268	1.07
4' 2L T8 to 4' 2L T8	1	1	56	38	5,713	110	1.07
4' 2L T12 to 4' 2L T8	1	1	78	43	2,682	100	1.07
Incand. to LED	1	1	90	14	2,441	198	1.07
4' 3L T12 to 4' 3L T8	4	4	105	58	2,682	538	1.07
4' 2L T12 to 4' 2L T8	5	5	78	38	2,682	573	1.07
Incand. to LED	1	1	52	10	1,978	90	1.07
4' 1L T12 to 4' 1L T8	8	8	42	20	1,978	372	1.07
4' 3L T12 to 4' 3L T8	12	12	105	58	1,978	1,191	1.07
4' 2L T12 to 4' 2L T8	1	1	78	38	1,978	84	1.07
4' 3L T12 to 4' 3L T8	3	3	105	58	1,978	298	1.07
4' 2L T8 to 4' 2L T8	2	2	56	38	2,682	103	1.07
Incand. to LED	2	2	60	10	2,682	289	1.07
4' 3L T12 to 4' 3L T8	25	25	105	58	2,682	3,364	1.07
4' 2L T8 to 4' 2L T8	1	1	58	40	2,682	52	1.07
4' 3L T8 to 4' 3L T8	4	4	90	58	2,682	366	1.07
4' 2L T8 to 4' 2L T8	2	2	56	38	2,682	103	1.07
4' 2L T8 to 4' 2L T8	1	1	56	38	3,881	70	1.00
Incand. to LED	1	1	52	10	2,682	122	1.07
Incand. to LED	1	1	67	10	2,682	165	1.07
4' 2L T8 to 4' 2L T8	1	1	56	38	2,682	52	1.07
4' 2L T12 to 4' 2L T8	1	1	78	38	1,978	84	1.07
Incand. to LED	4	4	90	10	1,978	680	1.07
Incand. to LED	1	1	67	10	2,682	165	1.07
4' 2L T12 to 4' 2L T8	10	10	78	38	2,682	1,145	1.07
4' 2L T12 to 4' 2L T8	9	9	78	38	2,682	1,031	1.07
4' 3L T12 to 4' 3L T8	11	11	105	58	2,682	1,480	1.07
4' 1L T12 to 4' 1L T8	2	2	42	20	3,881	171	1.00
4' 4L T12 to 4' 4L T8	16	16	146	74	3,881	4,471	1.00
MH to LED	6	6	60	22	4,304	981	1.00
MH to LED	1	1	92	28	4,304	275	1.00
MH to LED	4	4	60	28	4,304	551	1.00
MH to LED	2	2	455	176	4,304	2,402	1.00
MH to LED	5	5	92	28	4,304	1,377	1.00
MH to LED	3	3	120	28	4,304	1,188	1.00
4' 2L T12 to 4' 2L T8	1	1	78	43	3,881	136	1.00
Incand. to LED	1	1	60	10	4,304	217	1.00
Incand. to LED	2	2	60	10	4,304	435	1.00
MH to LED	1	1	92	22	4,304	301	1.00
Incand. to LED	1	1	60	10	4,304	217	1.00
MH to LED	4	4	205	93	4,304	1,928	1.00
MH to LED	14	14	455	176	4,304	16,812	1.00
Incand. to LED	1	1	60	10	2,682	145	1.07
Incand. to LED	4	4	52	10	1,978	359	1.07
4' 1L T12 to 4' 1L T8	2	2	42	20	1,978	93	1.07

Measure	Quantity (Fixtures)		Wattage		Hours	Realized kWh Savings	Heating Cooling Interaction Factor
	Old	New	Old	New			
4' 2L T12 to 4' 2L T8	9	9	78	38	5,713	2,195	1.07
Incand. to LED	1	1	60	14	5,713	281	1.07
4' 2L T12 to 4' 2L T8	3	3	78	38	5,713	732	1.07
Incand. to LED	1	1	52	10	5,713	259	1.07
Incand. to LED	1	1	60	10	5,713	308	1.07
4' 2L T12 to 4' 2L T8	3	3	78	38	5,713	732	1.07
4' 2L T12 to 4' 2L T8	2	2	78	38	5,713	488	1.07
4' 2L T12 to 4' 2L T8	1	1	78	38	5,713	244	1.07
Incand. to LED	1	1	60	10	5,713	308	1.07
Incand. to LED	1	1	60	10	5,713	308	1.07
Incand. to LED	2	2	60	10	5,713	616	1.07
Incand. to LED	11	11	52	13	5,713	2,616	1.07
4' 2L T8 to 4' 2L T8	10	10	56	38	3,881	699	1.00
4' 4L T12 to 4' 4L T8	18	18	146	74	2,682	3,710	1.07
4' 2L T8 to 4' 2L T8	2	2	56	38	2,682	103	1.07
4' 4L T8 to 4' 4L T8	23	23	109	74	2,682	2,305	1.07
Incand. to LED	18	18	95	10	5,713	9,386	1.07
Incand. to LED	24	24	52	10	5,713	6,221	1.07
Incand. to LED	30	30	60	10	5,713	9,239	1.07
Incand. to LED	1	1	60	10	5,713	308	1.07
Incand. to LED	2	2	52	10	5,713	518	1.07
Incand. to LED	2	2	60	10	5,713	616	1.07
4' 2L T8 to 4' 2L T8	1	1	56	38	5,713	110	1.07
Incand. to LED	1	1	52	10	5,713	259	1.07
Incand. to LED	1	1	20	10	1,978	22	1.07
Incand. to LED	1	1	60	14	1,978	97	1.07
Incand. to LED	1	1	60	14	1,978	97	1.07
Incand. to LED	1	1	67	10	5,713	351	1.07
4' 2L T8 to 4' 2L T8	1	1	56	38	2,682	52	1.07
4' 2L T8 to 4' 2L T8	2	2	56	38	4,304	155	1.00
4' 2L T8 to 4' 2L T8	37	37	56	38	3,881	2,585	1.00
I30/1 to LED Exit Sign	6	6	30	2	8,760	1,571	1.07
Incand. to LED	1	1	60	10	8,760	442	1.00
Incand. to LED	1	1	90	14	8,760	711	1.07
Total						103,955	

The table shown below presents expected and realized energy savings for the lighting controls installed under the Custom project.

Lighting Controls Savings Calculations

Measure	Quantity	Controlled Wattage	Hours		Expected kWh Savings	Realized kWh Savings	Heating Cooling Interaction Factor	Realization Rate
			Old	New				
Controls	10	188.10	2,390	1,978	1,435	826	1.07	58%
Controls	4	220	2,686	2,412	1,697	258	1.07	15%
Controls	62	103	2,682	2,324	5,864	2,430	1.07	41%

Measure	Quantity	Controlled Wattage	Hours		Expected kWh Savings	Realized kWh Savings	Heating Cooling Interaction Factor	Realization Rate
			Old	New				
Controls	16	53	5,713	5,337	1,872	339	1.07	18%
Controls	1	24	4,057	3,881	105	4	1.00	4%
Controls	1	473	4,304	4,304	2,072	0	1.00	0%
Total					13,045	3,857		30%

The table shown below presents expected and realized energy savings for the lighting controls installed under the Prescriptive project.

Lighting Controls Savings Calculations

Measure	Quantity	Controlled Wattage	Hours		Realized kWh Savings	Heating Cooling Interaction Factor
			Old	New		
Controls	5	36	2,682	2,324	69	1.07
Controls	122	40	2,682	2,324	1,864	1.07
Controls	16	54	2,682	2,324	330	1.07
Controls	8	72	2,682	2,324	220	1.07
Controls	2	36	2,682	2,324	28	1.07
Controls	5	36	2,682	2,324	69	1.07
Controls	2	54	2,682	2,324	41	1.07
Controls	6	36	5,713	5,337	87	1.07
Controls	4	17	5,713	5,337	27	1.07
Controls	20	36	5,713	5,337	289	1.07
Controls	201	54	5,713	5,337	4,353	1.07
Controls	5	72	5,713	5,337	144	1.07
Controls	5	540	5,713	5,337	1,083	1.07
Total					8,603	

Results

Verified Gross Savings/Realization Rates By Custom Measure

Measure Category	kWh Savings			Realized Peak kW Reduction
	Expected	Realized	Realization Rate	
Lighting Retrofit	315,835	303,460	96%	54.83
Lighting Controls	13,045	3,857	30%	1.40
Total	328,880	307,317	93%	56.23

Verified Gross Savings/Realization Rates By Prescriptive Measure

Measure Category	kWh Savings			Realized Peak kW Reduction
	Expected	Realized	Realization Rate	
Lighting Retrofit	-	103,955	-	14.78
Lighting Controls	-	8,603	-	1.25
Total	148,641	112,558	76%	16.03

For the Custom project, the ex post savings analysis hours of operation verified during the M&V site visit (ranging from 2,389 to 8,760), not accounting for the effect of lighting controls, are less than the hours of operation used to perform the ex ante savings estimate (ranging from 782 to 8,760). The realization rate for the Custom lighting retrofit is 96%. The lighting controls ex ante energy savings estimate assumes a greater impact on lighting hours than calculated by the ex post energy savings analysis. The Custom lighting controls realization rate is 30%. The Prescriptive project-level realization rate is 76%.

Project Number 1213

Executive Summary

Under project 1213, the customer received incentives from Indiana Michigan Power for retrofitting lighting in the interior of their facility. The realization rate for this project is 123%.

Project Description

The customer retrofitted the following fixtures:

- (57) HID fixtures with (57) LED fixtures
- (54) HID fixtures with (54) LED fixtures

Measurement and Verification Effort

During the M&V visit, ADM staff verified equipment installation, baseline and post-retrofit connected load, and placed two photo-sensor loggers at the site (from 3/4/16 to 3/15/16) to monitor lighting operation. These data were used to calculate energy savings.

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*	*Expected kWh Savings*	*Realized kWh Savings*	*Heating Cooling Interaction Factor*	*Realization Rate*
	Old	*New*	*Old*	*New*					
HID to LED	57	57	1,080	218	4,319	186,649	229,197	1.08	123%
HID to LED	54	54	1,080	325	4,319	155,168	190,181	1.08	123%
Total						341,817	419,378		123%

Results

Verified Gross Savings/Realization Rates By Measure

Measure Category	kWh Savings			Realized Peak kW Reduction
	Expected	Realized	Realization Rate	
Lighting Retrofit	341,817	419,378	123%	99.88
Total	341,817	419,378	123%	99.88

The project-level realization rate is 123%. For the lighting retrofit, the realization rate is high mainly because the verified lighting hours of operation (4,319) are greater than those used to perform ex ante estimation (3,670).

Project Number 1222

Executive Summary

Under project 1222, the customer received incentives from Indiana Michigan Power for installing electronically commutative motors (ECMs) and LED case lighting for coolers and freezers. The realization rate for this project is 134%.

Project Description

The customer installed the following:

- (3) ECMs in reach-in coolers
- (6) ECMs in reach-in freezers
- (3) doors of 5' LED cooler case lighting
- (6) doors of 5' LED freezer case lighting

Measurement and Verification Effort

During the M&V visit, ADM staff verified equipment was installed and operational and determined the operating schedules.

Savings from the ECM motors were calculated using the algorithm from the 2015 Pennsylvania TRM, Section 3.5.2 High-Efficiency Evaporator Fan Motors for Reach-In Refrigerated Cases:

$$\Delta kW_{peak} = N \times \frac{W_{base} - W_{ee}}{1{,}000} \times LF \times DC \times (1 + \frac{1}{DG \times COP})$$

$$\Delta kWh = N \times \Delta kW_{peak\ per\ unit} \times 8{,}760$$

where

N =	number of motors replaced
W_{base} =	input wattage of existing motor
W_{ee} =	input wattage of new motor
LF =	load factor
DC =	duty cycle of fan motor
DG =	degradation factor of compressor COP
COP =	coefficient of performance of compressor

The algorithm accounts for the direct savings associated with replacement of the motor and the indirect savings of a reduced cooling load on the refrigeration unit due to less heat gain from the more efficient fan motor in the air-stream. Custom values were used for N, W_{base}, and W_{ee}, while default values were used for the remaining variables, based on the case temperature and a baseline shaded pole motor.

The table below presents expected and realized savings for the EC motors installed under the project:

ECM Savings Calculations

Application	*N*	*Wee*	*Wbase*	*DC*	*LF*	*DG*	*COP*	*kW*	*kWh*
Cooler	3	19.70	72.22	100%	0.9	0.98	2.5	0.20	1,749
Freezer	6	19.70	72.22	94.4%	0.9	0.98	1.3	0.48	4,187
Total								0.68	5,936

Savings for case lights are calculated using the Indiana TRM, as follows:

$$kWh_{savings} = \frac{(Watts_{base} - Watts_{ee}) \times N_{doors} \times Hours \times (1 + WHF_e) \times ESF_{MC}}{1000}$$

Where:

$kWh_{savings}$	= *Annual energy savings*
Watts	= *Connected wattage per door*
N	= *Number of doors with new lighting*
Hours	= *Annual operating hours*
WHF	=*Waste Heat Factor for cooling energy savings. Default is 0.41 for refrigerated space and 0.52 for freezer space*
ESF	=*Energy Savings Factor. Additional energy savings resulting from installation of a motion sensor. Assume 1.0 if no sensor installed, and 1.43 if a sensor is installed*
1000	=*conversion factor from W to kW*

The table below presents expected and realized energy savings for the lighting retrofit installed under the project:

Lighting Retrofit Savings Calculations

Measure	$Watts_{base}$	$Watts_{ee}$	*N*	*Hours*	*WHF*	*ESF*	*kWh Savings*
LED Cooler Case Lights	76	21.67	3	8,760	0.41	1.00	2,013
LED Freezer Case Lights	76	21.67	6	8,760	0.52	1.00	4,341
Total							6,354

Results

Verified Gross Savings/Realization Rates By Measure

Measure Category	*kWh Savings*			*Realized Peak kW Reduction*
	Expected	*Realized*	*Realization Rate*	
EC Motors for Coolers	2,472	1,749	71%	0.20
EC Motors for Freezers	4,944	4,187	85%	0.48
LED Case Lighting – Cooler	387	2,013	520%	0.21
LED Case Lighting - Freezer	1,343	4,341	323%	0.46
Total	9,146	12,290	134%	1.34

The project level realization rate is 134%.

For the EC motors, the overall realization rate is 80%. The ex ante calculation applies standard savings of 824 kWh per motor for both cooler and freezer applications, which is borrowed from the Michigan Energy Measures Database, for the replacement of an unknown motor type for both freezer and cooler applications. The ex post savings utilize the methodology set forth in the 2015 PA TRM, which allows for the input of custom values for motor size and temperature application, and results in average savings of 660 kWh per motor.

For the LED case lighting, the overall realization rate is 367%. The ex ante estimation applies deemed savings of 129 kWh per door and 224 kWh per door for cooler and freezer applications, respectively. It is likely that the deemed savings assume shorter hours of operation, higher installed wattages, and no interactive effects (waste heat factors). The ex post savings are calculated using the algorithm in the Indiana TRM with custom values for the new LED fixture wattage, annual hours of use, and waste heat factor – dependent on the case type. This results in energy savings of 671 kWh per door and 723 kWh per door for cooler and freezer applications, respectively.

Project Number 1227

Executive Summary

Under project 1227, the customer received incentives from Indiana Michigan Power for the installation of four variable speed drives (VSDs/VFDs). The realization rate for this project is 46%.

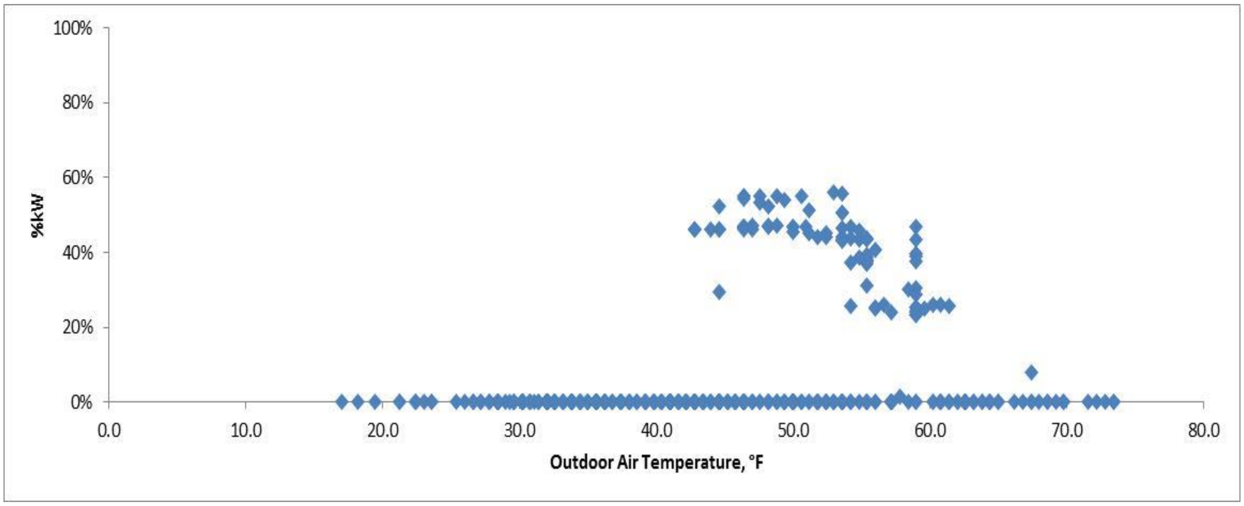
Project Description

The facility is a datacenter that utilizes (4) 15 hp supply fan motors. Originally, the facility used Inlet Guide Vanes (IGVs) to control the supply air flows. Two new 30 hp Variable Speed Drives (VSDs/VFDs) were installed. The project was submitted as four 15 hp VFDs, one VFD per fan motor. Each of the two air handlers has two fan motors, so during implementation, it was decided that only one VFD per air handler needed to be installed.

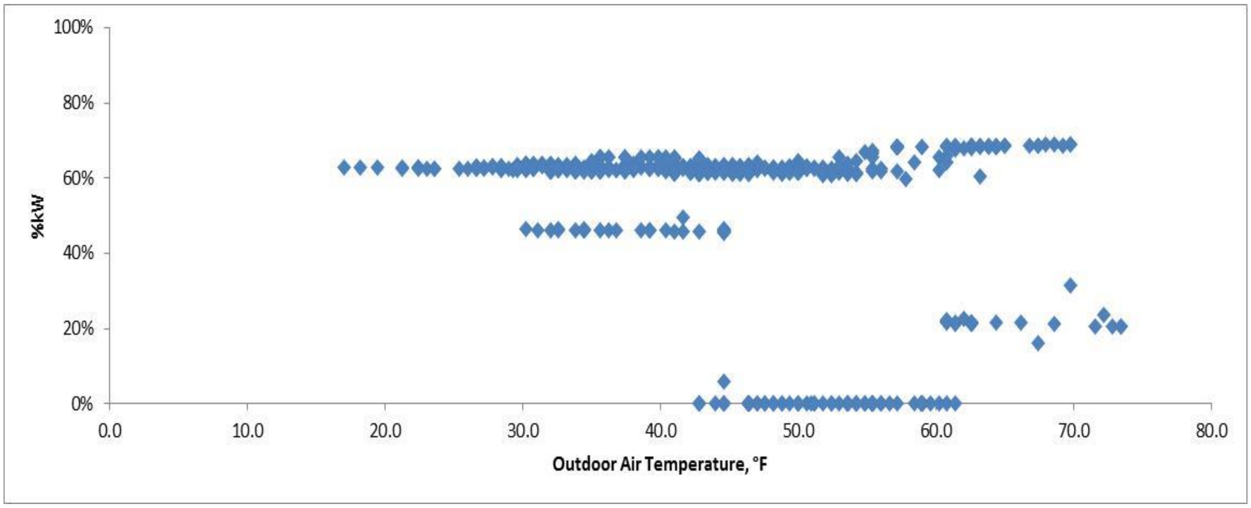
Measurement and Verification Effort

During the M&V visit, ADM verified the installation and operations of the new VFDs, installed power monitoring equipment, and obtained One-Time Power Measurements (OTPMs). The post power monitoring and OTPMs were used to develop typical operating profiles for the supply fans with VFDs. ADM monitored for approximately one month (11/4/15 – 12/2/15). The intention was to get a range of temperatures to determine if outdoor air (OA) temperature has a large effect on the supply fans' speeds. Only one of the air handlers (AHU #2) showed some consistent loading at specific outside air temperatures. See the following plots:

Air Handler #1: OA Temperature vs. Percent Loaded



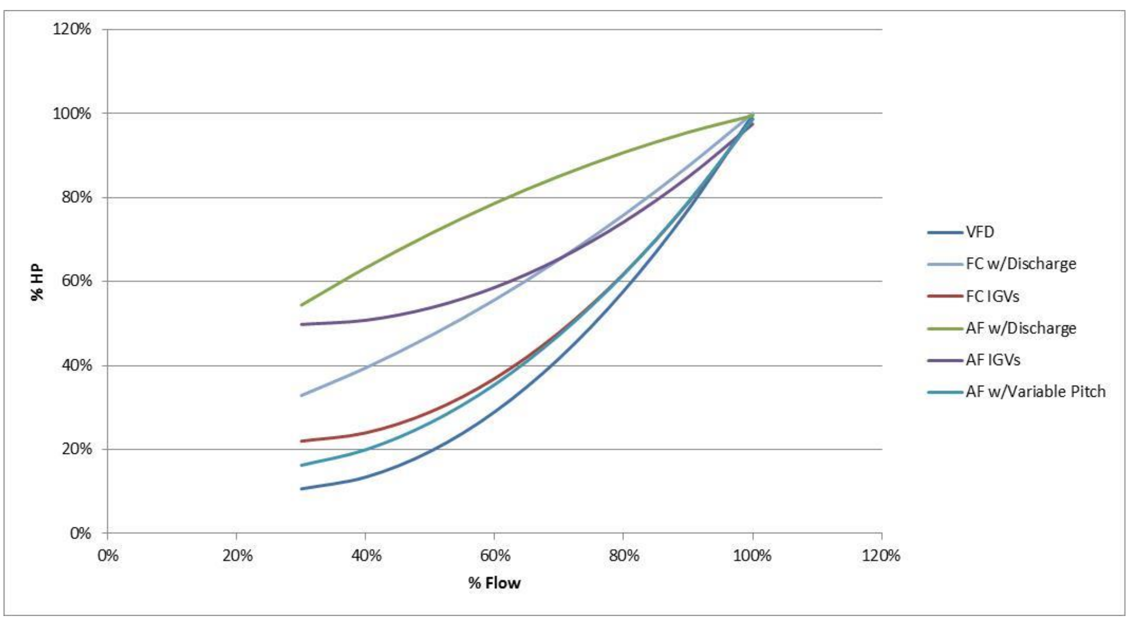
Air Handler #2: OA Temperature vs. Percent Loaded



Typical load profiles for each air handler were developed from the above data. For AHU #1, an individual average was found for all the times when the fans were on. For the other air handler (AHU #2), load averages were taken for specific temperature ranges since there was some relationship between outdoor temperature and the loading of the fans. The average demand values and typical fan runtimes were used to determine the post usage for each AHU.

Since IGVs were used in the baseline, typical flows had to be determined in order to derive the baseline usage. Typical flows were determined by using fan affinity laws, post monitored kW values, and the design flows. Assuming the flows are constant pre and post, Department of Energy (DOE) air foil IGV fan curves were used to determine what the baseline power usage would've been.

DOE Fan Curves



Energy savings were calculated as the difference between the post usage of the fans with VFDs and the derived baseline usage for the fans with IGVs. For the fans that showed weather dependency, typical weather data (TMY3) were used to extrapolate the savings to an entire year. Power averages from the monitoring data were used for the fans that didn't show weather dependency. The averages were extrapolated to an entire year to obtain typical savings.

Results

Verified Gross Savings/Realization Rates

Measure Category	*kWh Savings*			*kW Savings*
	Expected	*Realized*	*Realization Rate*	*Realized*
VFDs	93,600	42,988	46%	5.97
Total	93,600	42,988	46%	5.97

The overall project realization rate is 46%. The differences in ex post and ex ante savings can be attributed to the ex ante analysis utilizing prescriptive savings estimates. The limitation to this methodology is that it relies on averages of typical buildings and operations.

The ex post analysis used post data monitoring to derive VFD and baseline fan load profiles. This results in a more accurate estimate since actual site specific data is used.

Other factors in the ex ante prescriptive savings estimates that likely resulted in lower realized savings are: the assumed hours of operation and the building type. The air handlers in this facility don't operate at the same time. The facility contact said the air handlers should alternate day and night, so the maximum fan runtime for each air handler is 4,380 hours per year. The post data supported that the fans don't run at the same time.

This is a data center, so the HVAC system is driven by internal loads. Thus, the fan energy usage isn't as variable as other building types. Since the VFDs for the fans don't typically operate at lower speeds, the VFDs aren't able to save as much energy as expected.

Project Number 1228

Executive Summary

Under project 1228, the customer received incentives from Indiana Michigan Power for the installation of three variable speed drives (VSDs/VFDs). The realization rate for this project is 115%.

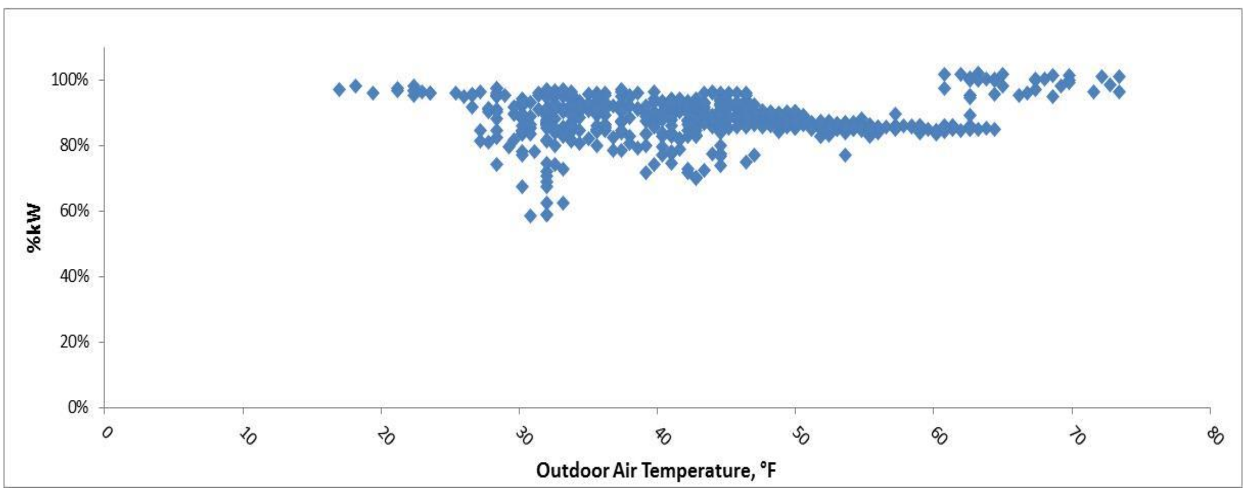
Project Description

The facility is a datacenter that utilizes (2) 15 hp and (1) 20 hp supply fan motors. Originally, the facility didn't have variable speed controls. Two new 15 hp and one 20 hp Variable Speed Drives (VSDs/VFDs) were installed.

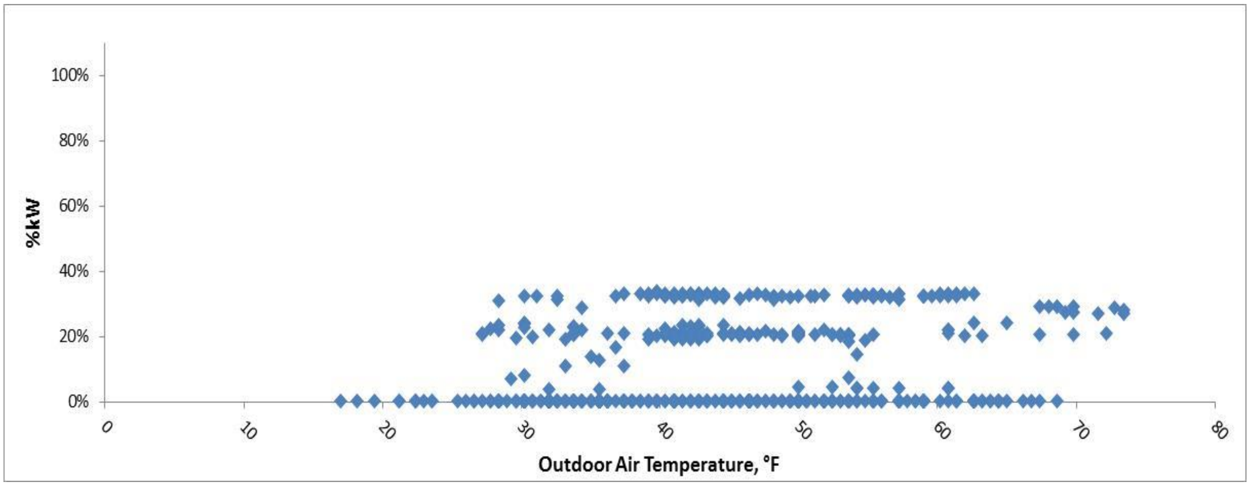
Measurement and Verification Effort

During the M&V visit, ADM verified the installation and operation of the new VFDs, installed power monitoring equipment, and obtained One-Time Power Measurements (OTPMs). The post power monitoring and OTPMs were used to develop typical operating profiles for the supply fans with VFDs. ADM monitored for approximately one month (11/4/15 – 12/2/15). The intention was to get a range of temperatures to determine if outdoor air (OA) temperature has a large effect on the supply fans' speeds. Only one of the air handlers (AHU #1) showed some consistent loading at specific outside air temperatures. See the following plots:

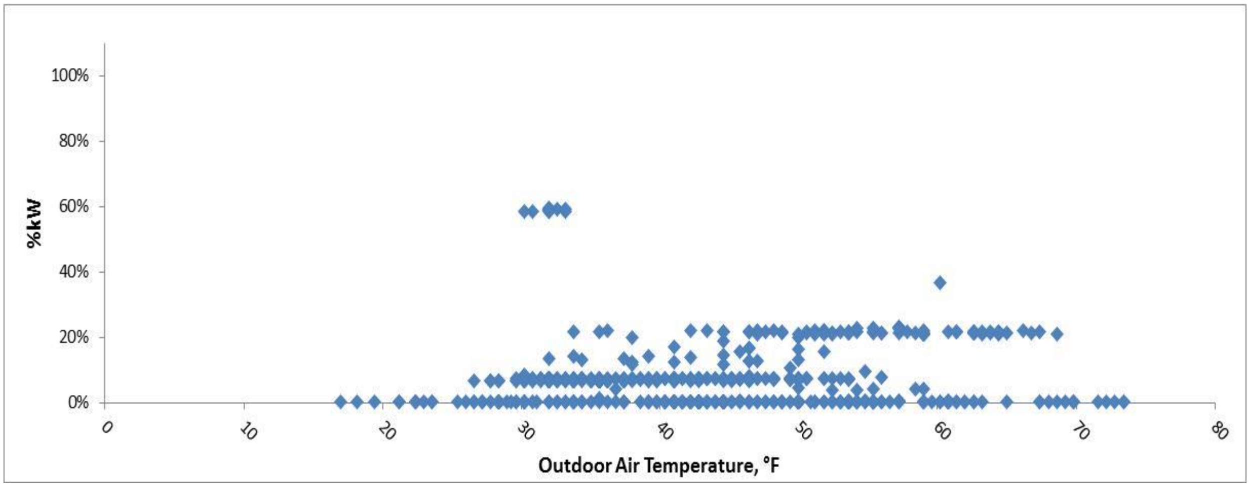
Air Handler #1: OA Temperature vs. Percent Loaded



Air Handler #2A: OA Temperature vs. Percent Loaded



Air Handler #2B: OA Temperature vs. Percent Loaded



Typical load profiles for each air handler were developed from the above data. For AHU #2A and AHU #2B, two individual averages were found for all the times when the fans were on. These averages and typical fan runtimes were used to determine the post usage for each AHU. For the other air handler (AHU #1), averages were taken for specific temperature ranges since there was some relationship between outdoor temperature and the loading of the fans. That average was multiplied by the typical fan runtime.

Energy savings were calculated as the difference between the post usage of the fans with VFDs and the derived baseline usage for the constant volume fans. For the fans that showed weather dependency, typical weather data (TMY3) were used to extrapolate the savings to an entire year. Power averages from the monitoring data were used for the fans that didn't show weather dependency. The averages were extrapolated to an entire year to obtain typical savings.

Results

Verified Gross Savings/Realization Rates

Measure Category	*kWh Savings*			*kW Savings*
	Expected	*Realized*	*Realization Rate*	*Realized*
VFDs	78,000	89,995	115%	23.36
Total	78,000	89,995	115%	23.36

The overall project realization rate is 115%. The difference in ex post and ex ante savings can be attributed to the ex ante analysis utilizing prescriptive savings estimates. The limitation to this methodology is that it relies on averages of typical buildings and operations.

The ex post analysis used post data monitoring to derive VFD load profiles. This results in a more accurate estimate since actual site specific data is used. Two of the AHUs were operating at rather low speeds, so this likely realized more savings than expected.

Project Number 1248

Executive Summary

Under project 1248, the customer received incentives from Indiana Michigan Power for retrofitting lighting in the interior of their facility. The realization rate for this project is 120%.

Project Description

The customer retrofitted the following fixtures:

- (30) High Pressure Sodium fixtures with (27) T5 Linear Fluorescent fixtures in the warehouse area

Measurement and Verification Effort

During the M&V visit, ADM staff verified equipment installation, baseline and post-retrofit connected load, and determined the lighting operating schedule. These data were used to calculate energy savings.

Lighting retrofit energy savings are calculated as:

$$kWh_{savings} = \sum_{Area} \left[HCIF \times t \times \left(N_{base} \times W_{base} - N_{as\text{-}built} \times W_{as\text{-}built} \right) / 1000 \right]$$

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*	*Expected kWh Savings*	*Realized kWh Savings*	*Heating Cooling Interaction Factor*	*Realization Rate*
	Old	*New*	*Old*	*New*					
400W HPS to 4' 6L T5HO	30	27	465	362	3,114	10,815	13,004	1.00	120%
Total						10,815	13,004		120%

Results

Verified Gross Savings/Realization Rates By Measure

Measure Category	*kWh Savings*			*Realized Peak kW Reduction*
	Expected	*Realized*	*Realization Rate*	
Lighting Retrofit	10,815	13,004	120%	1.63
Total	10,815	13,004	120%	1.63

The project-level realization rate is 133%. For the lighting retrofit, the realization rate is high mainly because the verified lighting hours of operation (3,113) are greater than those used to perform ex ante estimation (3,500). We also found that 3 less fixtures were used in the post retrofit, bringing the quantity down to 27 fixtures.

Project Number 1252

Executive Summary

Under project 1252, the customer received incentives from Indiana Michigan Power to retrofit lighting in the interior of their facility. The realization rate for this project is 41%.

Project Description

The customer retrofitted the following fixtures:

- (75)T12 2L fixtures with (75) 2L U-tubeT8 fixtures
- (382) T12 4' 4L fixtures with (382) T8 4' 4L fixtures

Measurement and Verification Effort

During the M&V visit, ADM staff verified equipment installation, baseline and post-retrofit connected load, and placed photo-sensor loggers at the site (from 10/2/2015 to 11/5/15) to monitor lighting operation. These data were used to calculate energy savings.

Lighting retrofit energy savings are calculated as:

$$kWh_{savings} = \sum_{Area} \left[HCIF \times t \times \left(N_{base} \times W_{base} - N_{as\text{-}built} \times W_{as\text{-}built} \right) / 1000 \right]$$

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*	*Expected kWh Savings*	*Realized kWh Savings*	*Heating Cooling Interaction Factor*	*Realization Rate*
	Old	*New*	*Old*	*New*					
T12 2L to 2L U-tube T8	75	75	100	56	3,805	17,361	13,309	1.06	77%
T12 4' 4L to T8 4' 4L	382	382	175	85	3,065	162,411	111,701	1.06	69%
Total						179,772	125,010		70%

Results

Verified Gross Savings/Realization Rates By Measure

Measure Category	*kWh Savings*			*Realized Peak kW Reduction*
	Expected	*Realized*	*Realization Rate*	
Lighting Retrofit	179,772	125,010	70%	31.50
Total	179,772	125,010	70%	31.50

The project-level realization rate is 70%. The following factors impacted the project gross realization rate:

- The ex post savings analysis hours of operation verified during the M&V site visit (ranging from 3,065 to 3,805) were less than the hours of operation used to perform the ex ante savings analysis (4,724).
- The ex post savings analysis wattage for the first measure (56) was greater than the ex ante savings estimate (51).
- The ex post savings analysis accounted for heating and cooling interactive effects. A factor applicable to gas heated/electric air conditioned hospital facilities in South Bend was applied to the lighting energy savings (1.06); the ex ante savings estimate did not account for heating and cooling interactive effects.

Project Number 1260

Executive Summary

Under project 1260, the customer received incentives from Indiana Michigan Power for retrofitting lighting in the interior of their facility and installing occupancy sensors. The realization rate for the Custom lighting project is 71%. The realization rate for the Prescriptive project is 106%.

Project Description

The customer retrofitted the following Custom measures:

- (70) 8' 2LT12 fixtures with (21) 4' 6LT8 fixtures with occupancy sensors

The customer retrofitted the following Prescriptive measures:

- (43) HID fixtures with (43) 4' 6LT8 fixtures, 28 with occupancy sensors

Measurement and Verification Effort

During the M&V visit, ADM staff verified equipment installation, baseline and post-retrofit connected load, and placed four photo-sensor loggers at the site (from 12/4/16 to 2/17/16) to monitor lighting operation. These data were used to calculate energy savings.

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*

Lighting occupancy sensor energy savings are calculated as:

$$kWh_{savings} = \sum_{Area} \left[HCIF \times W \times N \times \left(t_{base} - t_{as-built} \right) / 1000 \right]$$

Where:

$kWh_{savings}$	= *Annual energy savings*
N	= *Number of occupancy sensors*
W	= *Wattage controlled by each occupancy sensor*
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 Custom project.

Custom Lighting Retrofit Savings Calculations

Measure	Quantity (Fixtures)		Wattage		Hours	Expected kWh Savings	Realized kWh Savings	Heating Cooling Interaction Factor	Realization Rate
	Old	New	Old	New					
8' 2LT12 to 4' 6LT8	70	21	138	217	4,408	31,843	22,495	1.00	71%
Total						31,843	22,495	1.00	71%

The table shown below presents expected and realized energy savings for the lighting retrofit installed under the Prescriptive project.

Prescriptive Lighting Retrofit Savings Calculations

Measure	Quantity (Fixtures)		Wattage		Hours	Expected kWh Savings	Realized kWh Savings	Heating Cooling Interaction Factor	Realization Rate
	Old	New	Old	New					
MH to 4' 6LT8	43	43	450	217	4,340	62,519	43,487	1.00	70%
Total						62,519	43,487	1.00	70%

The table shown below presents expected and realized energy savings for the lighting controls installed under the Prescriptive project.

Prescriptive Lighting Controls Savings Calculations

Measure	Quantity	Controlled Wattage	Hours		Expected kWh Savings	Realized kWh Savings	Heating Cooling Interaction Factor	Realization Rate
			Old	New				
Controls	8	1,329	4,408	551	17,252	41,018	1.00	238%
Total					17,252	41,018		238%

Results

Verified Gross Savings/Realization Rates By Custom Measure

Measure Category	kWh Savings			Realized Peak kW Reduction
	Expected	Realized	Realization Rate	
Lighting Retrofit	31,843	22,495	71%	4.27
Total	31,843	22,495	71%	4.27

Verified Gross Savings/Realization Rates By Measure

Measure Category	kWh Savings			Realized Peak kW Reduction
	Expected	Realized	Realization Rate	
Lighting Retrofit	62,519	43,471	70%	8.14
Lighting Controls	17,252	41,046	238%	6.66
Total	79,771	84,517	106%	14.80

The ex post savings analysis hours of operation verified during the M&V site visit (4,408) are less than the hours of operation used to perform the ex ante savings estimate (6,240), resulting in a realized lighting retrofit energy savings lower than expected. The Custom lighting realization rate was 71%. The ex post savings analysis hours of operation verified during the M&V site visit (4,340), not accounting for the effect of lighting controls, are less than the hours of operation used to perform the ex ante savings estimate (6,240), resulting in a realized lighting retrofit energy savings lower than expected. The Prescriptive lighting realization rate was 70%. The ex post savings analysis for the controlled wattage for the occupancy sensors (1,329) was greater than the controlled wattage used to perform the ex ante savings estimate (1,152). The lighting controls ex ante energy savings estimate assumes a lesser impact on lighting hours than calculated by the ex post energy savings analysis. The Prescriptive lighting controls realization rate was 238%.

Project Number 1264

Executive Summary

Under project 1264, the customer received incentives from Indiana Michigan Power for retrofitting lighting in the interior of their facility. The realization rate for this project is 117%.

Project Description

The customer retrofitted the following fixtures:

- (24) 8' 2-lamp T12 fixtures with (48) LED fixtures in the interior area
- (7) 8' 2-lamp T12 fixtures with (14) LED fixtures in the interior area

Measurement and Verification Effort

During the M&V visit, ADM staff verified equipment installation, baseline and post-retrofit connected load, and determined the lighting operating schedule. These data were used to calculate energy savings.

Lighting retrofit energy savings are calculated as:

$$kWh_{savings} = \sum_{Area} \left[HCIF \times t \times \left(N_{base} \times W_{base} - N_{as\text{–}built} \times W_{as\text{–}built} \right) / 1000 \right]$$

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*	*Expected kWh Savings*	*Realized kWh Savings*	*Heating Cooling Interaction Factor*	*Realization Rate*
	Old	*New*	*Old*	*New*					
8' 2L T12 to LED	24	48	138	22	4,145	8,469	10,262	1.10	121%
8' 2L T12 to LED	7	14	138	22	8,760	5,764	6,325	1.10	110%
Total									

Results

Verified Gross Savings/Realization Rates By Measure

Measure Category	*kWh Savings*			*Realized Peak kW Reduction*
	Expected	*Realized*	*Realization Rate*	
Lighting Retrofit	14,233	16,588	117%	3.29
Total	14,233	16,588	117%	3.29

The project-level realization rate is 117%. For the lighting retrofit, the realization rate is high mainly because the verified lighting hours of operation (ranging from 4,145 to 8,760) are greater than those used to perform ex ante estimation (ranging from 3,754 to 8,760).

Project Number 1268

Executive Summary

Under project 1268, the customer received custom and prescriptive incentives from Indiana Michigan Power for retrofitting lighting in the interior of their facility and for the installation of VFDs on HVAC fans. The realization rate for the Custom project is 131%. The realization rate for the Prescriptive project is 93%.

Project Description

The customer retrofitted the following custom measure fixtures:

- (7) MH fixtures with (7) 4' 6LT5 HO fixtures in the high bay lighting
- (788) MH fixtures with (779) 4' 6LT5 HO fixtures in the high bay lighting
- (41) MH fixtures with (30) 4' 6LT5 HO fixtures in the high bay lighting
- (41) MH fixtures with (26) 4' 6LT8 fixtures in the high bay lighting
- (70) 4' 4LT12 fixtures with (70) 4' 6LT8 fixtures in the task lighting
- (397) 8' 2LT12 HO fixtures with (239) LED fixtures in the task lighting
- (54) 8' 2LT12 HO fixtures with (18) 4' 6LT5 HO fixtures in the task lighting
- (53) 8' 2LT12 HO fixtures with (53) 4' 4LT8 fixtures in the task lighting
- (77) 8' 2LT12 HO fixtures with (51) 4' 6LT8 fixtures in the task lighting

The customer retrofitted the following prescriptive measures:

- (3) MH fixtures with (3) 4' 6LT5 HO fixtures in the armour bldg
- (6) MH fixtures with (6) 4' 6L T8 fixtures in the north end body
- (4) MH fixtures with (4) 4' 6LT5 HO fixtures in the bonderite
- (5) MH fixtures with (5) 4' 6LT5 HO fixtures in the body paint
- (2) MH fixtures with (2) 4' 6LT5 HO fixtures in the footwell
- (10) MH fixtures with (10) 4' 6LT5 HO fixtures in the cargo box
- (2) MH fixtures with (2) 4' 6LT5 HO fixtures in the cma
- (3) MH fixtures with (3) 4' 6LT5 HO fixtures in the blast room
- (5) MH fixtures with (5) 4' 6LT5 HO fixtures in the 1st chassis
- (10) MH fixtures with (10) 4' 6LT5 HO fixtures in the process line
- (9) MH fixtures with (9) 4' 6LT5 HO fixtures in the camo prep
- (14) MH fixtures with (14) 4' 6LT5 HO fixtures in the tire assembly
- (21) MH fixtures with (21) 4' 6LT5 HO fixtures in the old tec
- (3) MH fixtures with (3) 4' 6L T8 fixtures in the engine subassembly
- (6) MH fixtures with (6) 4' 6L T8 fixtures in the salt shed
- (4) MH fixtures with (4) 4' 6L T8 fixtures in the frame rail storage
- Installation of HVAC fan VFD

Measurement and Verification Effort

During the M&V visit, ADM staff verified equipment installation, baseline and post-retrofit connected load, and placed nine photo-sensor loggers at the site (from 2/20/16 to 3/13/16) to monitor lighting operation. These data were used to calculate energy savings.

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.

Custom Lighting Retrofit Savings Calculations

Measure	*Quantity (Fixtures)*		*Wattage*		*Hours*	*Expected kWh Savings*	*Realized kWh Savings*	*Heating Cooling Interaction Factor*	*Realization Rate*
	Old	*New*	*Old*	*New*					
MH to 4' 6LT5 HO	7	7	1,080	358	4,355	8,592	22,012	1.00	256%
MH to 4' 6LT5 HO	788	779	1,080	358	4,355	1,957,925	2,491,958	1.00	127%
MH to 4' 6LT5 HO	41	30	461	358	4,355	27,927	35,544	1.00	127%
MH to 4' 6LT8	41	26	461	217	4,355	45,372	57,748	1.00	127%
4' 4LT12 to 4' 6LT8	70	70	263	217	4,979	11,019	16,032	1.00	145%
8' 2LT12 HO to LED	397	239	227	123	4,979	207,791	302,327	1.00	145%
8' 2LT12 HO to 4' 6LT5 HO	54	18	227	358	4,979	19,896	28,947	1.00	145%
8' 2LT12 HO to 4' 4LT8	53	53	227	106	4,979	21,945	31,930	1.00	145%
8' 2LT12 HO to 4' 6LT8	77	51	227	217	4,979	21,942	31,925	1.00	145%
Total						2,311,390	3,018,423		131%

Prescriptive Lighting Retrofit Savings Calculations

Measure	*Quantity (Fixtures)*		*Wattage*		*Hours*	*Expected kWh Savings*	*Realized kWh Savings*	*Heating Cooling Interaction Factor*	*Realization Rate*
	Old	*New*	*Old*	*New*					
MH to 4' 6LT5 HO	3	3	461	358	5,076	1,057	1,568	1.00	148%
MH to 4' 6L T8	6	6	461	217	4,355	5,010	6,376	1.00	127%
MH to 4' 6LT5 HO	4	4	461	358	4,355	1,410	1,794	1.00	127%
MH to 4' 6LT5 HO	5	5	461	358	4,355	1,762	2,243	1.00	127%
MH to 4' 6LT5 HO	2	2	461	358	4,355	705	897	1.00	127%
MH to 4' 6LT5 HO	10	10	461	358	4,355	3,525	4,486	1.00	127%
MH to 4' 6LT5 HO	2	2	461	358	4,355	705	897	1.00	127%
MH to 4' 6LT5 HO	3	3	461	358	4,355	1,057	1,346	1.00	127%
MH to 4' 6LT5 HO	5	5	461	358	4,355	1,762	2,243	1.00	127%
MH to 4' 6LT5 HO	10	10	461	358	5,662	3,525	5,832	1.00	165%
MH to 4' 6LT5 HO	9	9	461	358	7,307	3,172	6,773	1.00	214%

Measure	Quantity (Fixtures)		Wattage		Hours	Expected kWh Savings	Realized kWh Savings	Heating Cooling Interaction Factor	Realization Rate
	Old	New	Old	New					
MH to 4' 6LT5 HO	14	14	461	358	7,307	4,935	10,536	1.00	214%
MH to 4' 6LT5 HO	21	21	461	358	3,954	7,402	8,552	1.00	116%
MH to 4' 6L T8	3	3	461	217	7,307	2,505	5,349	1.00	214%
MH to 4' 6L T8	6	6	461	217	3,954	2,489	5,789	1.00	233%
MH to 4' 6L T8	4	4	461	217	3,954	1,659	3,859	1.00	233%
Total						42,680	68,541		161%

During the M&V visit, ADM found that the customer actually installed the VFD on a process fan motor, and the VFD was set to run the motor at full speed. Since there is no modulation of the motor speed, the measure has zero realized savings. Originally, the project was supposed to be a VFD on a HVAC fan.

Prescriptive VFD Savings Calculations

Measure Category	kWh Savings			kW Savings
	Expected	Realized	Realization Rate	Realized
HVAC Fan VFDs	34,320	0	0%	0.00
Total	34,320	0	0%	0.00

Results

Verified Gross Savings/Realization Rates By Measure

Measure Category	kWh Savings			Realized Peak kW Reduction
	Expected	Realized	Realization Rate	
Lighting Retrofit - Custom	2,311,390	3,018,423	131%	332.62
Lighting Retrofit - Prescriptive	42,680	68,541	161%	9.13
HVAC Fan VFDs - Prescriptive	31,200	0	0%	0.00
Total	2,396,289	3,086,964	129%	341.75

The project-level realization rate is 129%. The realization rate for the Custom measures is 131%. The realization rate for the Prescriptive measures is 93%.

The ex ante savings estimate recorded in the final application (2,322,409 kWh) is higher than the ex ante savings estimate posted in the project tracker (2,311,390 kWh).

The ex post savings analysis hours of operation verified during the M&V site visit (ranging from 3,953 to 7,306) are greater than the hours of operation used to perform the ex ante savings analysis (ranging from 1,700 to 3,422), resulting in a realized energy savings higher than expected. The custom lighting realization rate was 131%, and the prescriptive lighting realization rate was 161%.

The ex ante energy savings estimation for the prescriptive VFDs utilizes a deemed savings of 1,560 kWh per horsepower for HVAC fans, with no distinction between the type of fan, its application, motor efficiency, operating characteristics, or building type. During the M&V site visit it was found that the VFD was installed on a process exhaust fan, in which, the fan runs at full speed and no speed modulation is performed. Therefore, no savings were realized for this prescriptive VFD measure.

Project Number 1271

Executive Summary

Under project 1271, the customer received incentives from Indiana Michigan Power for the installation of a new air compressor. The realization rate for this project is 50%.

Project Description

The facility previously relied on (2) 25 hp Sullair compressors that had inlet modulation with blowdown control to provide the necessary compressed air. The original compressors were replaced with a 50 hp, variable speed Sullair Model 3709V.

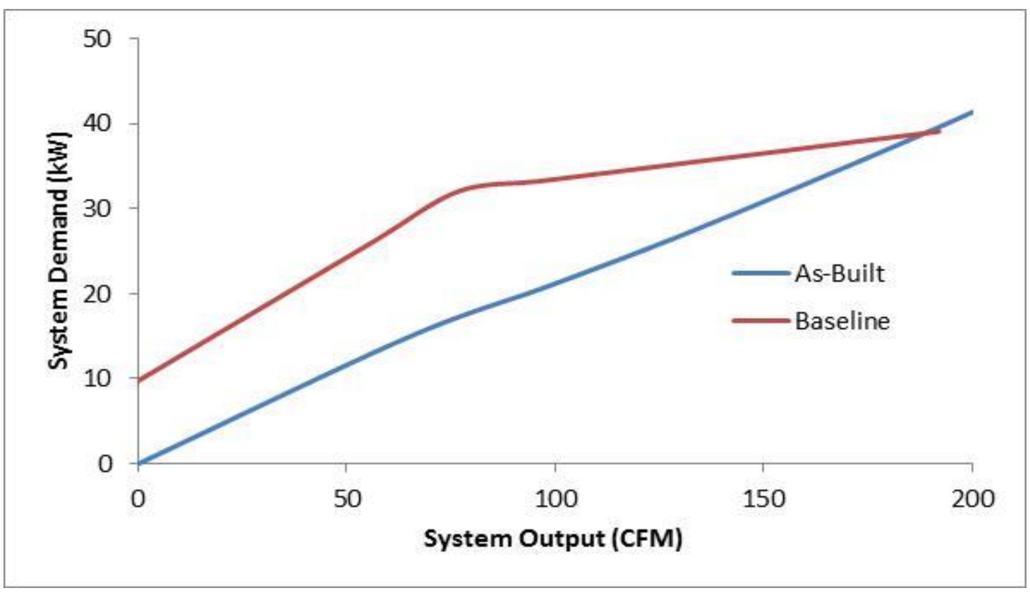
Measurement and Verification Effort

During the M&V visit, ADM verified the installation of the new air compressor and gathered site specific data. ADM was provided logged baseline ampere and CFM data. The data set encompassed approximately a week's worth of 15 second data.

Assuming that the CFM for the pre and post retrofit compressors remains the same, a combination of the new compressor's CAGI datasheet and baseline data were used to derive the necessary as-built system demand for all of the provided data points. The monitored baseline system consumption and the derived as-built system consumption were then used to determine a typical baseline and as-built weekly system kW demand profiles. These profiles were then extrapolated to an entire year; in which, the difference between the two profiles equates to the annual savings for the installation of the new air compressor.

A comparison of the as-built and baseline compressor overall system efficiencies can be seen below:

Baseline vs. As-Built Overall System Efficiency



Results

Verified Gross Savings/Realization Rates

Measure Category	*kWh Savings*			*kW Savings*
	Expected	*Realized*	*Realization Rate*	*Realized*
VSD Air Compressor	94,780	47,045	50%	6.18
Total	94,780	47,045	50%	6.18

The overall project realization rate is 50%. The difference in ex post and ex ante savings can be attributed to the ex ante analysis calculating the annual savings with amp bins. The limitation to this methodology is that the bins use average ampere values and hours. Additionally, the ampere values were not converted to kWh. The amp values were converted to kilowatts through the use of a three phase power equation in the ex post analysis.

The largest difference in realized savings was that the ex post analysis converted the amp data to kilowatts. This was done through the use of a phase power equation:

$$Three\ Phase\ Kilowatts = \frac{Volts \times Amperes \times Power\ Factor \times \sqrt{3}}{1000}$$

Power factor for each data point was found using the Motor Power Factor as a function of Percent Full-load Amperage plot in the US DOE Motor Handbook. This was necessary due to the baseline monitoring data only being recorded in amperes.

The ex post also used the baseline data to create typical hourly week demand profiles. This results in a more accurate estimate than the ex ante bin analysis since the compressed air demand varies significantly in short amounts of time.

Project Number 1275

Executive Summary

Under project 1275, the customer received incentives from Indiana Michigan Power for retrofitting lighting in the interior of their facility and installing occupancy sensors. The realization rate for the Custom project is 84%. The realization rate for the Prescriptive lighting retrofit is 111% and the Prescriptive occupancy sensor installation is 62%.

Project Description

The customer retrofitted the following fixtures:

- (626) HID fixtures with (539) 4' 4LT5 HO fixtures with Occupancy Sensors
- (20) HPS fixtures with (20) 4' 8LT5 HO fixtures with Occupancy Sensors

Measurement and Verification Effort

During the M&V visit, ADM staff verified equipment installation, baseline and post-retrofit connected load, and placed four photo-sensor loggers at the site (from 3/3/16 to 3/15/16) to monitor lighting operation. These data were used to calculate energy savings.

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*

Lighting occupancy sensor energy savings are calculated as:

$$kWh_{savings} = \sum_{Area} \left[HCIF \times W \times N \times \left(t_{base} - t_{as-built} \right) / 1000 \right]$$

Where:

$kWh_{savings}$	= *Annual energy savings*
N	= *Number of occupancy sensors*
W	= *Wattage controlled by each occupancy sensor*
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.

Custom Lighting Retrofit Savings Calculations

Measure	Quantity (Fixtures)		Wattage		Hours	Expected kWh Savings	Realized kWh Savings	Heating Cooling Interaction Factor	Realization Rate
	Old	New	Old	New					
HPS to 4' 8LT5 HO	20	20	1,090	468	4,187	62,100	52,080	1.00	84%
Total						62,100	52,080		84%

Prescriptive Lighting Retrofit Savings Calculations

Measure	Quantity (Fixtures)		Wattage		Hours	Expected kWh Savings	Realized kWh Savings	Heating Cooling Interaction Factor	Realization Rate
	Old	New	Old	New					
HID to 4' 4LT5 HO	626	539	461	234	4,187	610,786	680,140	1.00	111%
Total						610,786	680,140		111%

The table shown below presents expected and realized energy savings for the lighting controls installed under the project.

Prescriptive Lighting Controls Savings Calculations

Measure	Quantity	Controlled Wattage	Hours		Expected kWh Savings	Realized kWh Savings	Heating Cooling Interaction Factor	Realization Rate
			Old	New				
Controls	539	234	4,187	3,381	170,450	101,547	1.00	60%
Controls	20	468	4,187	3,381	6,098	7,536	1.00	124%
Total					176,548.00	109,083		62%

Results

Verified Gross Savings/Realization Rates By Measure

Measure Category	kWh Savings			Realized Peak kW Reduction
	Expected	Realized	Realization Rate	
Lighting Retrofit - **Custom**	**62,100**	**52,080**	**84%**	**8.85**
Lighting Retrofit - Prescriptive	610,786	680,140	111%	115.55
Occupancy Sensors - Prescriptive	176,548	109,083	62%	33.08
Total Prescriptive	787,334	789,223	100%	148.63
Total	849,434	841,303	99%	157.48

The project-level realization rate is 99%. The following factors impacted the project gross realization rate:

- The ex post savings analysis included the baseline quantity for the prescriptive lighting fixtures (626), which is higher than the ex ante savings estimate baseline quantity (539), resulting in a realized energy savings higher than expected for this measure. The final application corroborates the higher baseline quantity but was not included in the ex ante savings calculation.

- The ex post savings analysis hours of operation verified during the M&V site visit (4,187), not accounting for the effect of lighting controls, are less than the hours of operation used to perform the ex ante savings estimate (4,992). The realization rate for the custom lighting retrofit was 84%.
- The lighting controls ex ante energy savings estimate assumes a greater impact on lighting hours than calculated by the ex post energy savings analysis. The prescriptive occupancy sensor realization rate was 62%.

Project Number 1278

Executive Summary

Under project 1278, the customer received incentives from Indiana Michigan Power for retrofitting lighting in the interior and exterior of their facility. The realization rate for the Prescriptive project is 109%.

Project Description

The customer retrofitted the following (10) 4’ 4-lamp T12 fixtures with (20) LED fixtures in the gas station area.

Measurement and Verification Effort

During the M&V visit, ADM staff verified equipment installation, baseline and post-retrofit connected load, and determined the lighting operating schedule. These data were used to calculate energy savings.

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*	*Expected kWh Savings*	*Realized kWh Savings*	*Heating Cooling Interaction Factor*	*Realization Rate*
	Old	*New*	*Old*	*New*					
4' 4L T12 to LED016-FIXT	10	20	188	16	6,857		11,738	1.10	
Total						10,793	11,738		109%

Results

Verified Gross Savings/Realization Rates By Measure

Measure Category	*kWh Savings*			*Realized Peak kW Reduction*
	Expected	*Realized*	*Realization Rate*	
Lighting Retrofit	10,793	11,738	109%	1.76
Total	10,793	11,738	109%	1.76

The project-level realization rate is 109%. For the lighting retrofit, the realization rate is high mainly because the verified lighting hours of operation (6,856) are greater than those used to perform ex ante estimation (6,838) The kWh HCIF value used in the ex post is 1.097 and kWh HCIF value used in the ex ante is 1.000. This difference also contributed to the increase in kWh savings.

Project Number 1291

Executive Summary

Under project 1291, the customer received incentives from Indiana Michigan Power for retrofitting lighting in the interior of their facility. The realization rate for this project is 93%.

Project Description

The customer retrofitted the following fixtures in the store area:

- (9) 4' T8 lamps with (9) 4' T8 energy efficient lamps
- (12) Incandescent lamps with (12) LED lamps
- (36) Incandescent lamps with (36) LED lamps
- (27) Incandescent lamps with (27) LED lamps
- (4) Incandescent lamps with (4) LED lamps

Measurement and Verification Effort

During the M&V visit, ADM staff verified equipment installation, baseline and post-retrofit connected load, and determined the lighting operating schedule. These data were used to calculate energy savings.

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*	*Expected kWh Savings*	*Realized kWh Savings*	*Heating Cooling Interaction Factor*	*Realization Rate*
	Old	*New*	*Old*	*New*					
4' 1LT8 to 4' 1LT8	9	9	32	25	6,411	315	441	1.10	140%
Incandescent to LED	12	12	53	7	6,411	4,760	3,862	1.10	81%
Incandescent to LED	36	36	53	7	6,411	12,240	11,586	1.10	95%
Incandescent to LED	27	27	72	12	6,411	11,880	11,334	1.10	95%
Incandescent to LED	4	4	53	10	6,411	1,300	1,203	1.10	93%
Total						30,495	28,426		93%

Results

Verified Gross Savings/Realization Rates By Measure

Measure Category	*kWh Savings*			*Realized Peak kW Reduction*
	Expected	*Realized*	*Realization Rate*	
Lighting Retrofit	30,495	28,426	93%	4.59
Total	30,495	28,426	93%	4.59

The ex post savings analysis accounted for heating and cooling interactive effects. A factor applicable to gas heated/ electric air conditioned small retail facilities in Fort Wayne was applied to the lighting energy savings (1.10); the ex ante savings estimate did not account for heating and cooling interactive effects. The ex post savings analysis hours of operation verified during the M&V site visit (6,411) were greater than the hours of operation used to perform the ex ante energy savings estimate (5,000). The ex post savings analysis used the EISA 2007 federal standard baseline wattages for four measures, where the ex ante savings estimate used the actual lamp wattages. The Prescriptive lighting retrofit realization rate is 93%.

Project Number 1296

Executive Summary

Under project 1296, the customer received incentives from Indiana Michigan Power for retrofitting lighting in the interior and exterior of their facility. The realization rate for this project is 53%.

Project Description

The customer retrofitted (31) metal halide fixtures with (31) 4’ 4-lamp T5HO fixtures in the warehouse area.

Measurement and Verification Effort

During the M&V visit, ADM staff verified equipment installation, baseline and post-retrofit connected load, and determined the lighting operating schedule. These data were used to calculate energy savings.

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*	*Expected kWh Savings*	*Realized kWh Savings*	*Heating Cooling Interaction Factor*	*Realization Rate*
	Old	*New*	*Old*	*New*					
MH to 4' 4L T5HO	15	15	453	230	2,261	6,891	7,563	1.00	110%
MH to 4' 4L T5HO	16	16	453	230	-	7,350	-	-	0%
Total						14,241	7,563		53%

Results

Verified Gross Savings/Realization Rates By Measure

Measure Category	*kWh Savings*			*Realized Peak kW Reduction*
	Expected	*Realized*	*Realization Rate*	
Lighting Retrofit	14,241	7,563	53%	0.56
Total	14,241	7,563	53%	0.56

The project-level realization rate is 53%. For the lighting retrofit, the realization rate is low mainly because the verified lighting hours of operation (ranging from 0 to 2,260) are less than those used to perform ex ante estimation (2,006). The evaluators verified that only 15 of 31 lights are on at any given time, which decreases energy savings.

Project Number 1324

Executive Summary

Under project 1324, the customer received incentives from Indiana Michigan Power for retrofitting lighting in the interior of their facility. The realization rate for this project is 107%.

Project Description

The customer retrofitted (16) MH400/1 fixtures with (16) T5 Linear Fluorescent fixtures in the aquatics area.

Measurement and Verification Effort

During the M&V visit, ADM staff verified equipment installation, baseline and post-retrofit connected load, and determined the lighting operating schedule. These data were used to calculate energy savings.

Lighting retrofit energy savings are calculated as:

$$kWh_{savings} = \sum_{Area} \left[HCIF \times t \times \left(N_{base} \times W_{base} - N_{as\text{–}built} \times W_{as\text{–}built} \right) / 1000 \right]$$

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*	*Expected kWh Savings*	*Realized kWh Savings*	*Heating Cooling Interaction Factor*	*Realization Rate*
	Old	*New*	*Old*	*New*					
MH400/1 to 4' 4L T5HO	16	16	453	230	4,823	17,239	18,517	1.08	107%
Total						**17,239**	**18,517**		**107%**

Results

Verified Gross Savings/Realization Rates By Measure

Measure Category	*kWh Savings*			*Realized Peak kW Reduction*
	Expected	*Realized*	*Realization Rate*	
Lighting Retrofit	17,239	18,517	107%	3.92
Total	17,239	18,517	107%	3.92

The project-level realization rate is 107%. For the lighting retrofit, the realization rate is high mainly because the verified lighting hours of operation (4,823) are greater than those used to perform ex ante estimation (4,810).

Project Number 1325

Executive Summary

Under project 1325, the customer received incentives from Indiana Michigan Power for the installation of VFDs on HVAC fans. The realization rate for this project is 128%.

Project Description

The facility utilizes rooftop units to supply conditioned air to the store. Before the addition of VFDs, the supply fans would run with no air flow control. The VFDs modulate the speeds of the motors when full speed is not required.

Measurement and Verification Effort

During the M&V visit, ADM documented the rooftop units and nameplates. ADM also verified the installation of the new VFDs and the sizes of the motors on which the VFDs were installed.

ADM utilized the Illinois TRM, version 4.0, Section 4.4.26 Variable Speed Drives for HVAC Supply and Return Fans to calculate savings. The TRM provides the following algorithms:

$$kWh_{base} = (0.746 \times HP \times \frac{LF}{eff}) \times RHRS_{base} \times \sum_{0\%}^{100\%} (\%FF \times PLR_{base})$$

$$kWh_{retro} = (0.746 \times HP \times \frac{LF}{eff}) \times RHRS_{base} \times \sum_{0\%}^{100\%} (\%FF \times PLR_{retro})$$

$$\Delta kWh_{fan} = kWh_{base} - kWh_{retro}$$

$$\Delta kWh_{total} = kWh_{fan} \times (1 + IE_{energy})$$

Where:

kWh_{base}	= Baseline annual energy consumption
$kWh_{retrofit}$	= Retrofit annual energy consumption
ΔkWh_{fan}	= Fan-only annual energy savings
ΔkWh_{total}	= Total project annual energy savings
0.746	= Conversion factor for HP to kW
HP	= Nominal horsepower of controlled motor
LF	= Load Factor; motor load at fan design CFM (Default = 65%)
eff	= Installed nominal/nameplate motor efficiency
$RHRS_{Base}$	= Annual operating hours for fan motor based on building type
%FF	= Percentage of run-time spent within a given flow fraction range
PLR_{Base}	= Part Load Ratio for a given flow fraction range based on the baseline flow control type

$PLR_{Retrofit}$ = Part Load Ratio for a given flow fraction range based on the retrofit flow control type

IE_{energy} = HVAC interactive effects factor for energy (default = 15.7%)

Results

Verified Gross Savings/Realization Rates

Measure Category	*kWh Savings*			*kW Savings*
	Expected	*Realized*	*Realization Rate*	*Realized*
HVAC Fan VFDs	34,320	44,014	128%	5.02
Total	34,320	44,014	128%	5.02

The overall project realization rate is 128%. The ex ante savings estimation utilizes a deemed savings of 1,560 kWh per horsepower for HVAC fans, with no distinction between the type of fan, its application, motor efficiency, operating characteristics, and building type.

The ex post analysis accounts for all of these factors, as well as the interactive effects of the motor in the air stream, resulting in savings of 2,001 kWh per horsepower. The ex post analysis is more accurate since it uses site-specific information.

Project Number 1349

Executive Summary

Under project 1349, the customer received incentives from Indiana Michigan Power for retrofitting lighting in the interior of their facility and installing occupancy sensors. The realization rate for this project is 71%.

Project Description

The customer retrofitted the following fixtures:

- (44) HID fixtures with (44) 4' 4LT5 HO fixtures with (10) occupancy sensors

Measurement and Verification Effort

During the M&V visit, ADM staff verified equipment installation, baseline and post-retrofit connected load, and determined the lighting operating schedule. These data were used to calculate energy savings. The reduction of lighting operating hours associated with occupancy sensors is determined by multiplying the baseline hours by a Power Adjustment Factor of 0.7 (adapted from ASHRAE 90.1-1989).

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*

Lighting occupancy sensor energy savings are calculated as:

$$kWh_{savings} = \sum_{Area} \left[HCIF \times W \times N \times \left(t_{base} - t_{as-built} \right) / 1000 \right]$$

Where:

$kWh_{savings}$	= *Annual energy savings*
N	= *Number of occupancy sensors*
W	= *Wattage controlled by each occupancy sensor*
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*	*Expected kWh Savings*	*Realized kWh Savings*	*Heating Cooling Interaction Factor*	*Realization Rate*
	Old	*New*	*Old*	*New*					
HID to 4' 4LT5 HO	36	36	461	234	2,261	26,485	20,103	1.09	76%
HID to 4' 4LT5 HO	8	8	461	234	2,112	5,886	4,173	1.09	71%
Total						32,371	24,276		75%

The table shown below presents expected and realized energy savings for the lighting controls installed under the project.

Lighting Controls Savings Calculations

Measure	*Quantity*	*Controlled Wattage*	*Hours*		*Expected kWh Savings*	*Realized kWh Savings*	*Heating Cooling Interaction Factor*	*Realization Rate*
			Old	*New*				
Controls	10	1,030	2,112	1,478	11,668	7,097	1.09	61%
Total					11,668	7,097		61%

Results

Verified Gross Savings/Realization Rates By Measure

Measure Category	*kWh Savings*			*Realized Peak kW Reduction*
	Expected	*Realized*	*Realization Rate*	
Lighting Retrofit	32,371	24,276	75%	6.81
Lighting Controls	11,668	7,097	61%	1.97
Total	44,039	31,373	71%	8.78

The ex post savings analysis hours of operation verified during the M&V site visit (ranging from 2,111 to 2,261), not accounting for the effect of lighting controls, were less than the hours of operation used to perform the ex ante savings analysis. The ex post savings analysis accounted for heating and cooling interactive effects. A factor applicable to electric heated/electric cooled industrial facilities in Indianapolis was applied to the lighting energy savings (1.09); the ex ante savings estimate did not account for heating and cooling interactive effects. The Prescriptive lighting retrofit realization rate is 75%. The lighting controls ex ante energy savings estimate assumes a greater impact on lighting hours than calculated by the ex post energy savings analysis. The ex post savings analysis occupancy sensor controlled wattage (1,030) was less than the ex ante energy savings controlled wattage (1,200). The Prescriptive lighting controls realization rate is 50%.

Project Number 1377

Executive Summary

Under project 1377, the customer received incentives from Indiana Michigan Power for retrofitting lighting in the interior and exterior of their facility and installing occupancy sensors. The realization rate for the Custom project is 72%. The realization rate for the Prescriptive project is 92%.

Project Description

The customer retrofitted the following Custom measures:

- (1) MH fixture with (1) LED fixture in the storage area
- (1) 2' 2L T12 fixture with (1) 2' 2L T8 fixture in the restroom area
- (1) 3' 2L T12 fixture with (1) 3' T8 fixture in the restroom area
- (3) 4' 2L T12 fixtures with (3) LED fixtures in the restroom area
- (2) 4' 2L T12 fixtures with (2) LED fixtures in the restroom area
- (6) incandescent fixtures with (6) LED fixtures in the meeting room area
- (1) 4' 2L T12 fixture with (1) LED fixture in the conference room area
- (1) 4' 2L T8 fixture with (1) LED fixture in the conference room area
- (2) 4' 2L T12 fixtures with (2) LED fixtures in the conference room area
- (1) 4' 2L T12 fixture with (1) LED fixture in the conference room area
- (1) 2' 1L T12 fixture with (1) 2' 1L T8 fixture in the conference room area
- (1) 3' 1L T12 fixture with (1) 3' 1L T8 fixture in the conference room area
- (1) 4' 2L T12 fixture with (1) LED fixture in the a - consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the b - consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the a - consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the b - consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the a - consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the b - consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the a - consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the b - consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the a - consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the b - consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the a - consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the b - consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the consolidated area
- (10) incandescent fixtures with (10) LED fixtures in the catholic chapel area
- (1) Incand. exit sign fixture with (1) LED Exit Sign fixture in the protestant chapel area
- (4) incandescent fixtures with (4) LED fixtures in the protestant chapel area
- (2) 3' 2L T12 fixtures with (2) 3' T8 fixtures in the restroom area
- (1) 4' 2L T12 fixture with (1) LED fixture in the consolidated area
- (8) 3' 2L T12 fixtures with (8) 3' T8 fixtures in the patient restroom area
- (1) 2' 2L T12 fixture with (1) 2' 2L T8 fixture in the restroom area

- (6) 3' 2L T12 fixtures with (6) 3' T8 fixtures in the restroom area
- (1) incandescent fixture with (1) LED fixture and (1) occupancy sensor in the utility area
- (1) U-tube 2L T12 fixture with (1) U-tube 2L T8 fixture and (1) occupancy sensor in the utility area
- (3) 4' 2L T12 fixtures with (3) LED fixtures and (3) occupancy sensors in the clean utility area
- (3) incandescent fixtures with (3) LED fixtures in the large classroom area
- (3) 4' 2L T12 fixtures with (3) LED fixtures in the classroom area
- (1) U-tube 2L T12 fixture with (1) 2' 2L T8 fixture in the utility area
- (1) U-tube 2L T12 fixture with (1) 2' 2L T8 fixture in the supplies area
- (3) 4' 2L T12 fixtures with (3) LED fixtures in the classroom area
- (2) 4' 2L T12 fixtures with (2) LED fixtures in the soiled utility area
- (5) 4' 2L T12 fixtures with (5) LED fixtures in the soiled utility area
- (1) 4' 2L T12 fixture with (1) LED fixture in the supplies area
- (1) 4' 2L T12 fixture with (1) LED fixture in the shop area
- (8) 8' 4L T12 fixtures with (8) 8' 4L T8 fixtures in the shop area
- (4) 8' 4L T12 fixtures with (4) 8' 4L T8 fixtures in the shop area
- (9) MH fixtures with (9) 4' 3L T5HO fixtures and (1) occupancy sensor in the warehouse area
- (1) 8' 4L T12 fixture with (1) 8' 4L T8 fixture in the warehouse area
- (4) 4' 2L T12 fixtures with (4) LED fixtures and (1) occupancy sensor in the cardiac area
- (2) 3' 2L T12 fixtures with (2) 3' T8 fixtures and (1) occupancy sensor in the dental area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the dental area
- (17) incandescent fixtures with (17) LED fixtures and (1) occupancy sensor in the exam room area
- (1) 2' 1L T12 fixture with (1) 2' 1L T8 fixture and (1) occupancy sensor in the exam room area
- (3) 3' 1L T12 fixtures with (3) 3' 1L T8 fixtures and (1) occupancy sensor in the exam room area
- (6) 4' 2L T12 fixtures with (6) LED fixtures and (2) occupancy sensors in the exam room area
- (5) 4' 2L T12 fixtures with (5) LED fixtures and (1) occupancy sensor in the exam room area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the exam room area
- (4) 4' 2L T12 fixtures with (4) LED fixtures and (1) occupancy sensor in the office area
- (10) 4' 4L T12 fixtures with (10) LED fixtures and (3) occupancy sensors in the office area
- (5) 4' 2L T12 fixtures with (5) LED fixtures and (1) occupancy sensor in the office area
- (3) 4' 2L T12 fixtures with (3) LED fixtures and (3) occupancy sensors in the office area
- (2) 4' 2L T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the office area
- (13) 4' 2L T12 fixtures with (13) LED fixtures and (1) occupancy sensor in the office area
- (2) 4' 2L T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the office area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the office area
- (4) 2' 3L T5 fixtures with (4) LED fixtures and (4) occupancy sensors in the office area

- (2) 2' 2L T8 fixtures with (2) 2' 2L T8 fixtures and (1) occupancy sensor in the office area
- (15) 4' 2L T12 fixtures with (15) LED fixtures and (4) occupancy sensors in the office area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the office area
- (2) 4' 2L T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the office area
- (2) 4' 4L T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the office area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the office area
- (1) 4' 4L T12 fixture with (1) LED fixture and (1) occupancy sensor in the office area
- (6) 4' 2L T12 fixtures with (6) LED fixtures and (2) occupancy sensors in the office area
- (2) 4' 2L T12 fixtures with (2) LED fixtures and (2) occupancy sensors in the office area
- (6) 4' 2L T12 fixtures with (6) LED fixtures and (2) occupancy sensors in the office area
- (2) 4' 4L T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the office area
- (2) 4' 2L T8 fixtures with (2) LED fixtures and (2) occupancy sensors in the office area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the coffee area
- (2) incandescent fixtures with (2) LED fixtures and (1) occupancy sensor in the office area
- (6) 2' 1L T12 fixtures with (6) 2' 1L T8 fixtures and (1) occupancy sensor in the office area
- (1) 2' 2L T12 fixture with (1) 2' 2L T8 fixture and (1) occupancy sensor in the office area
- (11) 3' 1L T12 fixtures with (11) 3' 1L T8 fixtures and (1) occupancy sensor in the office area
- (2) 3' 1L T12 fixtures with (2) 3' 1L T8 fixtures and (1) occupancy sensor in the office area
- (3) 4' 2L T12 fixtures with (3) LED fixtures and (1) occupancy sensor in the office area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the office area
- (22) 4' 2L T12 fixtures with (22) LED fixtures and (11) occupancy sensors in the office area
- (1) 4' 2L T8 fixture with (1) LED fixture and (1) occupancy sensor in the office area
- (5) 4' 2L T12 fixtures with (5) LED fixtures and (3) occupancy sensors in the office area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the office area
- (82) CFL fixtures with (82) LED fixtures and (19) occupancy sensors in the office area
- (1) 3' 1L T12 fixture with (1) 3' 1L T8 fixture and (1) occupancy sensor in the office area
- (1) 8' 4L T12 fixture with (1) 8' 4L T8 fixture in the office area
- (1) T8 fixture with (1) 8' 2L T8 fixture in the office area
- (2) 8' 4L T12 fixtures with (2) 8' 4L T8 fixtures in the print area
- (1) 4' 2L T12 fixture with (1) LED fixture in the office area
- (2) 4' 2L T12 fixtures with (2) LED fixtures in the kitchenette area
- (1) 4' 2L T12 fixture with (1) LED fixture in the office area
- (6) 4' 2L T12 fixtures with (6) LED fixtures in the office area
- (2) 4' 4L T12 fixtures with (2) LED fixtures in the dispatch area
- (1) 4' 4L T12 fixture with (1) LED fixture in the evidence area
- (1) 4' 4L T12 fixture with (1) LED fixture in the office area
- (1) 4' 2L T12 fixture with (1) LED fixture in the office area
- (1) Incand. exit sign fixture with (1) LED Exit Sign fixture in the server room area
- (11) 4' 3L T8 fixtures with (11) LED fixtures in the clean room area
- (1) 4' 2L T12 fixture with (1) LED fixture in the itt area

- (1) 4' 2L T12 fixture with (1) LED fixture in the office area
- (11) 4' 2L T8 fixtures with (11) LED fixtures in the sleep study area
- (5) 4' 2L T12 fixtures with (5) LED fixtures in the supply area
- (1) incandescent fixture with (1) LED fixture in the supply area
- (1) 4' 1L T12 fixture with (1) LED fixture and (1) occupancy sensor in the copy area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the copy area
- (1) 4' 2L T8 fixture with (1) LED fixture and (1) occupancy sensor in the copy area
- (1) 4' 4L T12 fixture with (1) LED fixture and (1) occupancy sensor in the copy area
- (2) 4' 2L T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the copy area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the copy area
- (10) incandescent fixtures with (10) LED fixtures in the recreation clinic area
- (14) 4' 4L T12 fixtures with (14) LED fixtures and (1) occupancy sensor in the open office area
- (14) 4' 2L T12 fixtures with (14) LED fixtures and (1) occupancy sensor in the open area
- (2) 4' 2L T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the open office area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the computer room area
- (15) 4' 2L T12 fixtures with (15) LED fixtures and (2) occupancy sensors in the files area
- (19) 4' 2L T12 fixtures with (19) LED fixtures and (2) occupancy sensors in the open office area
- (12) 4' 4L T12 fixtures with (12) LED fixtures in the open office area
- (7) 4' 4L T12 fixtures with (7) LED fixtures in the print area
- (1) CFL fixture with (1) LED fixture in the restroom men's area
- (1) 2' 2L T12 fixture with (1) 2' 2L T8 fixture in the restroom men's area
- (2) 4' 2L T12 fixtures with (2) LED fixtures in the laundry area
- (6) 4' 2L T12 fixtures with (6) LED fixtures in the laundry area
- (2) 4' 2L T8 fixtures with (2) LED fixtures in the laundry area
- (3) incandescent fixtures with (3) LED fixtures in the perimeter - exterior area
- (2) incandescent fixtures with (2) LED fixtures in the exterior area
- (2) incandescent fixtures with (2) LED fixtures in the perimeter - exterior area
- (1) incandescent fixture with (1) LED fixture in the exterior area
- (1) incandescent fixture with (1) LED fixture in the consolidated exterior area
- (1) incandescent fixture with (1) LED fixture in the exterior area
- (6) incandescent fixtures with (6) LED fixtures in the exterior area
- (1) MH fixture with (1) LED fixture in the perimeter area
- (3) MH fixtures with (3) LED fixtures in the courtyard c area
- (4) MH fixtures with (4) LED fixtures in the courtyard d area
- (56) MH fixtures with (56) LED fixtures in the atrium area
- (26) MH fixtures with (26) LED fixtures in the atrium area
- (9) MH fixtures with (9) LED fixtures in the perimeter area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the break room area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the break room area

- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the break room area
- (2) 8' 4L T12 fixtures with (2) 8' 4L T8 fixtures and (1) occupancy sensor in the breakroom area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the kitchen area
- (2) 4' 2L T8 fixtures with (2) LED fixtures and (1) occupancy sensor in the break room area
- (1) 2' 1L T12 fixture with (1) 2' 1L T8 fixture and (1) occupancy sensor in the break room area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the break room area
- (6) 4' 2L T12 fixtures with (6) LED fixtures and (4) occupancy sensors in the break room area
- (14) 4' 2L T12 fixtures with (14) LED fixtures and (1) occupancy sensor in the game room area
- (7) 4' 2L T12 fixtures with (7) LED fixtures and (1) occupancy sensor in the waiting room area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the playroom area
- (64) 2' 3L T5 fixtures with (64) LED fixtures and (4) occupancy sensors in the day room area
- (3) 2' 1L T12 fixtures with (3) 2' 1L T8 fixtures and (1) occupancy sensor in the restroom area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the restroom area
- (2) incandescent fixtures with (2) LED fixtures and (2) occupancy sensors in the restroom area
- (3) 2' 1L T12 fixtures with (3) 2' 1L T8 fixtures and (1) occupancy sensor in the restroom area
- (1) 2' 2L T12 fixture with (1) 2' 2L T8 fixture and (1) occupancy sensor in the restroom area
- (5) 4' 2L T12 fixtures with (5) LED fixtures and (4) occupancy sensors in the restroom area
- (2) 2' 2L T12 fixtures with (2) 2' 2L T8 fixtures and (1) occupancy sensor in the restroom men's area
- (3) 4' 2L T12 fixtures with (3) LED fixtures and (1) occupancy sensor in the restroom men's area
- (2) 4' 2L T12 fixtures with (2) LED fixtures and (2) occupancy sensors in the restroom area
- (4) 2' 3L T5 fixtures with (4) LED fixtures and (4) occupancy sensors in the restroom men's area
- (2) 2' 2L T8 fixtures with (2) 2' 2L T8 fixtures and (1) occupancy sensor in the restroom men's area
- (4) 2' 3L T5 fixtures with (4) LED fixtures and (4) occupancy sensors in the restroom women's area
- (2) 2' 2L T8 fixtures with (2) 2' 2L T8 fixtures and (1) occupancy sensor in the restroom women's area

- (4) 2' 3L T5 fixtures with (4) LED fixtures and (4) occupancy sensors in the restroom men's area
- (2) 2' 2L T8 fixtures with (2) 2' 2L T8 fixtures and (1) occupancy sensor in the restroom men's area
- (4) 2' 3L T5 fixtures with (4) LED fixtures and (4) occupancy sensors in the restroom women's area
- (2) 2' 2L T8 fixtures with (2) 2' 2L T8 fixtures and (1) occupancy sensor in the restroom women's area
- (4) 2' 3L T5 fixtures with (4) LED fixtures and (4) occupancy sensors in the restroom men's area
- (1) 2' 2L T8 fixture with (1) 2' 2L T8 fixture and (1) occupancy sensor in the restroom men's area
- (4) 2' 3L T5 fixtures with (4) LED fixtures and (4) occupancy sensors in the restroom women's area
- (1) 2' 2L T8 fixture with (1) 2' 2L T8 fixture and (1) occupancy sensor in the restroom women's area
- (2) 2' 2L T12 fixtures with (2) 2' 2L T8 fixtures and (1) occupancy sensor in the restroom area
- (2) 4' 2L T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the restroom area
- (1) 2' 2L T12 fixture with (1) 2' 1L T8 fixture and (1) occupancy sensor in the restroom area
- (2) 4' 2L T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the restroom area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the restroom area
- (1) 2' 2L T12 fixture with (1) 2' 2L T8 fixture and (1) occupancy sensor in the restroom men's area
- (2) 4' 2L T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the restroom men's area
- (5) 2' 3L T5 fixtures with (5) LED fixtures and (2) occupancy sensors in the restroom men's area
- (2) 2' 2L T8 fixtures with (2) 2' 2L T8 fixtures and (1) occupancy sensor in the restroom men's area
- (9) 2' 3L T5 fixtures with (9) LED fixtures and (3) occupancy sensors in the restroom women's area
- (3) 2' 2L T8 fixtures with (3) 2' 2L T8 fixtures and (2) occupancy sensors in the restroom women's area
- (11) incandescent fixtures with (11) LED fixtures and (9) occupancy sensors in the restroom area
- (7) 2' 1L T12 fixtures with (7) 2' 1L T8 fixtures and (2) occupancy sensors in the restroom area
- (12) 2' 2L T12 fixtures with (12) 2' 2L T8 fixtures and (3) occupancy sensors in the restroom area
- (2) 3' 1L T12 fixtures with (2) 3' 1L T8 fixtures and (1) occupancy sensor in the restroom area

- (14) 4' 2L T12 fixtures with (14) LED fixtures and (7) occupancy sensors in the restroom area
- (2) 4' 2L T12 fixtures with (2) LED fixtures and (2) occupancy sensors in the restroom area
- (3) 4' 2L T12 fixtures with (3) LED fixtures and (2) occupancy sensors in the restroom area
- (2) 4' 4L T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the restroom area
- (5) 2' 2L T8 fixtures with (5) LED fixtures and (5) occupancy sensors in the restroom area
- (1) MH fixture with (1) LED fixture in the storage area
- (1) 2' 2L T12 fixture with (1) 2' 2L T8 fixture in the restroom area
- (1) 3' 2L T12 fixture with (1) 3' T8 fixture in the restroom area
- (3) 4' 2L T12 fixtures with (3) LED fixtures in the restroom area
- (2) 4' 2L T12 fixtures with (2) LED fixtures in the restroom area
- (6) incandescent fixtures with (6) LED fixtures in the meeting room area
- (1) 4' 2L T12 fixture with (1) LED fixture in the conference room area
- (1) 4' 2L T8 fixture with (1) LED fixture in the conference room area
- (2) 4' 2L T12 fixtures with (2) LED fixtures in the conference room area
- (1) 4' 2L T12 fixture with (1) LED fixture in the conference room area
- (1) 2' 1L T12 fixture with (1) 2' 1L T8 fixture in the conference room area
- (1) 3' 1L T12 fixture with (1) 3' 1L T8 fixture in the conference room area
- (1) 4' 2L T12 fixture with (1) LED fixture in the a - consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the b - consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the a - consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the b - consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the a - consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the b - consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the a - consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the b - consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the a - consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the b - consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the a - consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the b - consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the consolidated area
- (10) incandescent fixtures with (10) LED fixtures in the catholic chapel area
- (1) Incand. exit sign fixture with (1) LED Exit Sign fixture in the protestant chapel area
- (4) incandescent fixtures with (4) LED fixtures in the protestant chapel area
- (2) 3' 2L T12 fixtures with (2) 3' T8 fixtures in the restroom area
- (1) 4' 2L T12 fixture with (1) LED fixture in the consolidated area
- (8) 3' 2L T12 fixtures with (8) 3' T8 fixtures in the patient restroom area
- (1) 2' 2L T12 fixture with (1) 2' 2L T8 fixture in the restroom area
- (6) 3' 2L T12 fixtures with (6) 3' T8 fixtures in the restroom area

- (1) incandescent fixture with (1) LED fixture and (1) occupancy sensor in the utility area
- (1) U-tube 2L T12 fixture with (1) U-tube 2L T8 fixture and (1) occupancy sensor in the utility area
- (3) 4' 2L T12 fixtures with (3) LED fixtures and (3) occupancy sensors in the clean utility area
- (3) incandescent fixtures with (3) LED fixtures in the large classroom area
- (3) 4' 2L T12 fixtures with (3) LED fixtures in the classroom area
- (1) U-tube 2L T12 fixture with (1) 2' 2L T8 fixture in the utility area
- (1) U-tube 2L T12 fixture with (1) 2' 2L T8 fixture in the supplies area
- (3) 4' 2L T12 fixtures with (3) LED fixtures in the classroom area
- (2) 4' 2L T12 fixtures with (2) LED fixtures in the soiled utility area
- (5) 4' 2L T12 fixtures with (5) LED fixtures in the soiled utility area
- (1) 4' 2L T12 fixture with (1) LED fixture in the supplies area
- (1) 4' 2L T12 fixture with (1) LED fixture in the shop area
- (8) 8' 4L T12 fixtures with (8) 8' 4L T8 fixtures in the shop area
- (4) 8' 4L T12 fixtures with (4) 8' 4L T8 fixtures in the shop area
- (9) MH fixtures with (9) 4' 3L T5HO fixtures and (1) occupancy sensor in the warehouse area
- (1) 8' 4L T12 fixture with (1) 8' 4L T8 fixture in the warehouse area
- (4) 4' 2L T12 fixtures with (4) LED fixtures and (1) occupancy sensor in the cardiac area
- (2) 3' 2L T12 fixtures with (2) 3' T8 fixtures and (1) occupancy sensor in the dental area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the dental area
- (17) incandescent fixtures with (17) LED fixtures and (1) occupancy sensor in the exam room area
- (1) 2' 1L T12 fixture with (1) 2' 1L T8 fixture and (1) occupancy sensor in the exam room area
- (3) 3' 1L T12 fixtures with (3) 3' 1L T8 fixtures and (1) occupancy sensor in the exam room area
- (6) 4' 2L T12 fixtures with (6) LED fixtures and (2) occupancy sensors in the exam room area
- (5) 4' 2L T12 fixtures with (5) LED fixtures and (1) occupancy sensor in the exam room area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the exam room area
- (4) 4' 2L T12 fixtures with (4) LED fixtures and (1) occupancy sensor in the office area
- (10) 4' 4L T12 fixtures with (10) LED fixtures and (3) occupancy sensors in the office area
- (5) 4' 2L T12 fixtures with (5) LED fixtures and (1) occupancy sensor in the office area
- (3) 4' 2L T12 fixtures with (3) LED fixtures and (3) occupancy sensors in the office area
- (2) 4' 2L T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the office area
- (13) 4' 2L T12 fixtures with (13) LED fixtures and (1) occupancy sensor in the office area
- (2) 4' 2L T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the office area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the office area
- (4) 2' 3L T5 fixtures with (4) LED fixtures and (4) occupancy sensors in the office area
- (2) 2' 2L T8 fixtures with (2) 2' 2L T8 fixtures and (1) occupancy sensor in the office area

- (15) 4' 2L T12 fixtures with (15) LED fixtures and (4) occupancy sensors in the office area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the office area
- (2) 4' 2L T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the office area
- (2) 4' 4L T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the office area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the office area
- (1) 4' 4L T12 fixture with (1) LED fixture and (1) occupancy sensor in the office area
- (6) 4' 2L T12 fixtures with (6) LED fixtures and (2) occupancy sensors in the office area
- (2) 4' 2L T12 fixtures with (2) LED fixtures and (2) occupancy sensors in the office area
- (6) 4' 2L T12 fixtures with (6) LED fixtures and (2) occupancy sensors in the office area
- (2) 4' 4L T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the office area
- (2) 4' 2L T8 fixtures with (2) LED fixtures and (2) occupancy sensors in the office area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the coffee area
- (2) incandescent fixtures with (2) LED fixtures and (1) occupancy sensor in the office area
- (6) 2' 1L T12 fixtures with (6) 2' 1L T8 fixtures and (1) occupancy sensor in the office area
- (1) 2' 2L T12 fixture with (1) 2' 2L T8 fixture and (1) occupancy sensor in the office area
- (11) 3' 1L T12 fixtures with (11) 3' 1L T8 fixtures and (1) occupancy sensor in the office area
- (2) 3' 1L T12 fixtures with (2) 3' 1L T8 fixtures and (1) occupancy sensor in the office area
- (3) 4' 2L T12 fixtures with (3) LED fixtures and (1) occupancy sensor in the office area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the office area
- (22) 4' 2L T12 fixtures with (22) LED fixtures and (11) occupancy sensors in the office area
- (1) 4' 2L T8 fixture with (1) LED fixture and (1) occupancy sensor in the office area
- (5) 4' 2L T12 fixtures with (5) LED fixtures and (3) occupancy sensors in the office area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the office area
- (82) CFL fixtures with (82) LED fixtures and (19) occupancy sensors in the office area
- (1) 3' 1L T12 fixture with (1) 3' 1L T8 fixture and (1) occupancy sensor in the office area
- (1) 8' 4L T12 fixture with (1) 8' 4L T8 fixture in the office area
- (1) T8 fixture with (1) 8' 2L T8 fixture in the office area
- (2) 8' 4L T12 fixtures with (2) 8' 4L T8 fixtures in the print area
- (1) 4' 2L T12 fixture with (1) LED fixture in the office area
- (2) 4' 2L T12 fixtures with (2) LED fixtures in the kitchenette area
- (1) 4' 2L T12 fixture with (1) LED fixture in the office area
- (6) 4' 2L T12 fixtures with (6) LED fixtures in the office area
- (2) 4' 4L T12 fixtures with (2) LED fixtures in the dispatch area
- (1) 4' 4L T12 fixture with (1) LED fixture in the evidence area
- (1) 4' 4L T12 fixture with (1) LED fixture in the office area
- (1) 4' 2L T12 fixture with (1) LED fixture in the office area
- (1) Incand. exit sign fixture with (1) LED Exit Sign fixture in the server room area
- (11) 4' 3L T8 fixtures with (11) LED fixtures in the clean room area
- (1) 4' 2L T12 fixture with (1) LED fixture in the itt area
- (1) 4' 2L T12 fixture with (1) LED fixture in the office area

- (11) 4' 2L T8 fixtures with (11) LED fixtures in the sleep study area
- (5) 4' 2L T12 fixtures with (5) LED fixtures in the supply area
- (1) incandescent fixture with (1) LED fixture in the supply area
- (1) 4' 1L T12 fixture with (1) LED fixture and (1) occupancy sensor in the copy area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the copy area
- (1) 4' 2L T8 fixture with (1) LED fixture and (1) occupancy sensor in the copy area
- (1) 4' 4L T12 fixture with (1) LED fixture and (1) occupancy sensor in the copy area
- (2) 4' 2L T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the copy area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the copy area
- (10) incandescent fixtures with (10) LED fixtures in the recreation clinic area
- (14) 4' 4L T12 fixtures with (14) LED fixtures and (1) occupancy sensor in the open office area
- (14) 4' 2L T12 fixtures with (14) LED fixtures and (1) occupancy sensor in the open area
- (2) 4' 2L T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the open office area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the computer room area
- (15) 4' 2L T12 fixtures with (15) LED fixtures and (2) occupancy sensors in the files area
- (19) 4' 2L T12 fixtures with (19) LED fixtures and (2) occupancy sensors in the open office area
- (12) 4' 4L T12 fixtures with (12) LED fixtures in the open office area
- (7) 4' 4L T12 fixtures with (7) LED fixtures in the print area
- (1) CFL fixture with (1) LED fixture in the restroom men's area
- (1) 2' 2L T12 fixture with (1) 2' 2L T8 fixture in the restroom men's area
- (2) 4' 2L T12 fixtures with (2) LED fixtures in the laundry area
- (6) 4' 2L T12 fixtures with (6) LED fixtures in the laundry area
- (2) 4' 2L T8 fixtures with (2) LED fixtures in the laundry area
- (3) incandescent fixtures with (3) LED fixtures in the perimeter - exterior area
- (2) incandescent fixtures with (2) LED fixtures in the exterior area
- (2) incandescent fixtures with (2) LED fixtures in the perimeter - exterior area
- (1) incandescent fixture with (1) LED fixture in the exterior area
- (1) incandescent fixture with (1) LED fixture in the consolidated exterior area
- (1) incandescent fixture with (1) LED fixture in the exterior area
- (6) incandescent fixtures with (6) LED fixtures in the exterior area
- (1) MH fixture with (1) LED fixture in the perimeter area
- (3) MH fixtures with (3) LED fixtures in the courtyard c area
- (4) MH fixtures with (4) LED fixtures in the courtyard d area
- (56) MH fixtures with (56) LED fixtures in the atrium area
- (26) MH fixtures with (26) LED fixtures in the atrium area
- (9) MH fixtures with (9) LED fixtures in the perimeter area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the break room area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the break room area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the break room area

- (2) 8' 4L T12 fixtures with (2) 8' 4L T8 fixtures and (1) occupancy sensor in the breakroom area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the kitchen area
- (2) 4' 2L T8 fixtures with (2) LED fixtures and (1) occupancy sensor in the break room area
- (1) 2' 1L T12 fixture with (1) 2' 1L T8 fixture and (1) occupancy sensor in the break room area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the break room area
- (6) 4' 2L T12 fixtures with (6) LED fixtures and (4) occupancy sensors in the break room area
- (14) 4' 2L T12 fixtures with (14) LED fixtures and (1) occupancy sensor in the game room area
- (7) 4' 2L T12 fixtures with (7) LED fixtures and (1) occupancy sensor in the waiting room area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the playroom area
- (64) 2' 3L T5 fixtures with (64) LED fixtures and (4) occupancy sensors in the day room area
- (3) 2' 1L T12 fixtures with (3) 2' 1L T8 fixtures and (1) occupancy sensor in the restroom area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the restroom area
- (2) incandescent fixtures with (2) LED fixtures and (2) occupancy sensors in the restroom area
- (3) 2' 1L T12 fixtures with (3) 2' 1L T8 fixtures and (1) occupancy sensor in the restroom area
- (1) 2' 2L T12 fixture with (1) 2' 2L T8 fixture and (1) occupancy sensor in the restroom area
- (5) 4' 2L T12 fixtures with (5) LED fixtures and (4) occupancy sensors in the restroom area
- (2) 2' 2L T12 fixtures with (2) 2' 2L T8 fixtures and (1) occupancy sensor in the restroom men's area
- (3) 4' 2L T12 fixtures with (3) LED fixtures and (1) occupancy sensor in the restroom men's area
- (2) 4' 2L T12 fixtures with (2) LED fixtures and (2) occupancy sensors in the restroom area
- (4) 2' 3L T5 fixtures with (4) LED fixtures and (4) occupancy sensors in the restroom men's area
- (2) 2' 2L T8 fixtures with (2) 2' 2L T8 fixtures and (1) occupancy sensor in the restroom men's area
- (4) 2' 3L T5 fixtures with (4) LED fixtures and (4) occupancy sensors in the restroom women's area
- (2) 2' 2L T8 fixtures with (2) 2' 2L T8 fixtures and (1) occupancy sensor in the restroom women's area
- (4) 2' 3L T5 fixtures with (4) LED fixtures and (4) occupancy sensors in the restroom men's area

- (2) 2' 2L T8 fixtures with (2) 2' 2L T8 fixtures and (1) occupancy sensor in the restroom men's area
- (4) 2' 3L T5 fixtures with (4) LED fixtures and (4) occupancy sensors in the restroom women's area
- (2) 2' 2L T8 fixtures with (2) 2' 2L T8 fixtures and (1) occupancy sensor in the restroom women's area
- (4) 2' 3L T5 fixtures with (4) LED fixtures and (4) occupancy sensors in the restroom men's area
- (1) 2' 2L T8 fixture with (1) 2' 2L T8 fixture and (1) occupancy sensor in the restroom men's area
- (4) 2' 3L T5 fixtures with (4) LED fixtures and (4) occupancy sensors in the restroom women's area
- (1) 2' 2L T8 fixture with (1) 2' 2L T8 fixture and (1) occupancy sensor in the restroom women's area
- (2) 2' 2L T12 fixtures with (2) 2' 2L T8 fixtures and (1) occupancy sensor in the restroom area
- (2) 4' 2L T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the restroom area
- (1) 2' 2L T12 fixture with (1) 2' 1L T8 fixture and (1) occupancy sensor in the restroom area
- (2) 4' 2L T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the restroom area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the restroom area
- (1) 2' 2L T12 fixture with (1) 2' 2L T8 fixture and (1) occupancy sensor in the restroom men's area
- (2) 4' 2L T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the restroom men's area
- (5) 2' 3L T5 fixtures with (5) LED fixtures and (2) occupancy sensors in the restroom men's area
- (2) 2' 2L T8 fixtures with (2) 2' 2L T8 fixtures and (1) occupancy sensor in the restroom men's area
- (9) 2' 3L T5 fixtures with (9) LED fixtures and (3) occupancy sensors in the restroom women's area
- (3) 2' 2L T8 fixtures with (3) 2' 2L T8 fixtures and (2) occupancy sensors in the restroom women's area
- (11) incandescent fixtures with (11) LED fixtures and (9) occupancy sensors in the restroom area
- (7) 2' 1L T12 fixtures with (7) 2' 1L T8 fixtures and (2) occupancy sensors in the restroom area
- (12) 2' 2L T12 fixtures with (12) 2' 2L T8 fixtures and (3) occupancy sensors in the restroom area
- (2) 3' 1L T12 fixtures with (2) 3' 1L T8 fixtures and (1) occupancy sensor in the restroom area
- (14) 4' 2L T12 fixtures with (14) LED fixtures and (7) occupancy sensors in the restroom area

- (2) 4' 2L T12 fixtures with (2) LED fixtures and (2) occupancy sensors in the restroom area
- (3) 4' 2L T12 fixtures with (3) LED fixtures and (2) occupancy sensors in the restroom area
- (2) 4' 4L T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the restroom area
- (5) 2' 2L T8 fixtures with (5) LED fixtures and (5) occupancy sensors in the restroom area
- (1) MH fixture with (1) LED fixture in the storage area
- (1) 2' 2L T12 fixture with (1) 2' 2L T8 fixture in the restroom area
- (1) 3' 2L T12 fixture with (1) 3' T8 fixture in the restroom area
- (3) 4' 2L T12 fixtures with (3) LED fixtures in the restroom area
- (2) 4' 2L T12 fixtures with (2) LED fixtures in the restroom area
- (6) incandescent fixtures with (6) LED fixtures in the meeting room area
- (1) 4' 2L T12 fixture with (1) LED fixture in the conference room area
- (1) 4' 2L T8 fixture with (1) LED fixture in the conference room area
- (2) 4' 2L T12 fixtures with (2) LED fixtures in the conference room area
- (1) 4' 2L T12 fixture with (1) LED fixture in the conference room area
- (1) 2' 1L T12 fixture with (1) 2' 1L T8 fixture in the conference room area
- (1) 3' 1L T12 fixture with (1) 3' 1L T8 fixture in the conference room area
- (1) 4' 2L T12 fixture with (1) LED fixture in the a - consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the b - consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the a - consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the b - consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the a - consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the b - consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the a - consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the b - consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the a - consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the b - consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the a - consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the b - consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the consolidated area
- (10) incandescent fixtures with (10) LED fixtures in the catholic chapel area
- (1) Incand. exit sign fixture with (1) LED Exit Sign fixture in the protestant chapel area
- (4) incandescent fixtures with (4) LED fixtures in the protestant chapel area
- (2) 3' 2L T12 fixtures with (2) 3' T8 fixtures in the restroom area
- (1) 4' 2L T12 fixture with (1) LED fixture in the consolidated area
- (8) 3' 2L T12 fixtures with (8) 3' T8 fixtures in the patient restroom area
- (1) 2' 2L T12 fixture with (1) 2' 2L T8 fixture in the restroom area
- (6) 3' 2L T12 fixtures with (6) 3' T8 fixtures in the restroom area
- (1) incandescent fixture with (1) LED fixture and (1) occupancy sensor in the utility area

- (1) U-tube 2L T12 fixture with (1) U-tube 2L T8 fixture and (1) occupancy sensor in the utility area
- (3) 4' 2L T12 fixtures with (3) LED fixtures and (3) occupancy sensors in the clean utility area
- (3) incandescent fixtures with (3) LED fixtures in the large classroom area
- (3) 4' 2L T12 fixtures with (3) LED fixtures in the classroom area
- (1) U-tube 2L T12 fixture with (1) 2' 2L T8 fixture in the utility area
- (1) U-tube 2L T12 fixture with (1) 2' 2L T8 fixture in the supplies area
- (3) 4' 2L T12 fixtures with (3) LED fixtures in the classroom area
- (2) 4' 2L T12 fixtures with (2) LED fixtures in the soiled utility area
- (5) 4' 2L T12 fixtures with (5) LED fixtures in the soiled utility area
- (1) 4' 2L T12 fixture with (1) LED fixture in the supplies area
- (1) 4' 2L T12 fixture with (1) LED fixture in the shop area
- (8) 8' 4L T12 fixtures with (8) 8' 4L T8 fixtures in the shop area
- (4) 8' 4L T12 fixtures with (4) 8' 4L T8 fixtures in the shop area
- (9) MH fixtures with (9) 4' 3L T5HO fixtures and (1) occupancy sensor in the warehouse area
- (1) 8' 4L T12 fixture with (1) 8' 4L T8 fixture in the warehouse area
- (4) 4' 2L T12 fixtures with (4) LED fixtures and (1) occupancy sensor in the cardiac area
- (2) 3' 2L T12 fixtures with (2) 3' T8 fixtures and (1) occupancy sensor in the dental area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the dental area
- (17) incandescent fixtures with (17) LED fixtures and (1) occupancy sensor in the exam room area
- (1) 2' 1L T12 fixture with (1) 2' 1L T8 fixture and (1) occupancy sensor in the exam room area
- (3) 3' 1L T12 fixtures with (3) 3' 1L T8 fixtures and (1) occupancy sensor in the exam room area
- (6) 4' 2L T12 fixtures with (6) LED fixtures and (2) occupancy sensors in the exam room area
- (5) 4' 2L T12 fixtures with (5) LED fixtures and (1) occupancy sensor in the exam room area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the exam room area
- (4) 4' 2L T12 fixtures with (4) LED fixtures and (1) occupancy sensor in the office area
- (10) 4' 4L T12 fixtures with (10) LED fixtures and (3) occupancy sensors in the office area
- (5) 4' 2L T12 fixtures with (5) LED fixtures and (1) occupancy sensor in the office area
- (3) 4' 2L T12 fixtures with (3) LED fixtures and (3) occupancy sensors in the office area
- (2) 4' 2L T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the office area
- (13) 4' 2L T12 fixtures with (13) LED fixtures and (1) occupancy sensor in the office area
- (2) 4' 2L T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the office area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the office area
- (4) 2' 3L T5 fixtures with (4) LED fixtures and (4) occupancy sensors in the office area
- (2) 2' 2L T8 fixtures with (2) 2' 2L T8 fixtures and (1) occupancy sensor in the office area

- (15) 4' 2L T12 fixtures with (15) LED fixtures and (4) occupancy sensors in the office area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the office area
- (2) 4' 2L T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the office area
- (2) 4' 4L T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the office area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the office area
- (1) 4' 4L T12 fixture with (1) LED fixture and (1) occupancy sensor in the office area
- (6) 4' 2L T12 fixtures with (6) LED fixtures and (2) occupancy sensors in the office area
- (2) 4' 2L T12 fixtures with (2) LED fixtures and (2) occupancy sensors in the office area
- (6) 4' 2L T12 fixtures with (6) LED fixtures and (2) occupancy sensors in the office area
- (2) 4' 4L T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the office area
- (2) 4' 2L T8 fixtures with (2) LED fixtures and (2) occupancy sensors in the office area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the coffee area
- (2) incandescent fixtures with (2) LED fixtures and (1) occupancy sensor in the office area
- (6) 2' 1L T12 fixtures with (6) 2' 1L T8 fixtures and (1) occupancy sensor in the office area
- (1) 2' 2L T12 fixture with (1) 2' 2L T8 fixture and (1) occupancy sensor in the office area
- (11) 3' 1L T12 fixtures with (11) 3' 1L T8 fixtures and (1) occupancy sensor in the office area
- (2) 3' 1L T12 fixtures with (2) 3' 1L T8 fixtures and (1) occupancy sensor in the office area
- (3) 4' 2L T12 fixtures with (3) LED fixtures and (1) occupancy sensor in the office area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the office area
- (22) 4' 2L T12 fixtures with (22) LED fixtures and (11) occupancy sensors in the office area
- (1) 4' 2L T8 fixture with (1) LED fixture and (1) occupancy sensor in the office area
- (5) 4' 2L T12 fixtures with (5) LED fixtures and (3) occupancy sensors in the office area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the office area
- (82) CFL fixtures with (82) LED fixtures and (19) occupancy sensors in the office area
- (1) 3' 1L T12 fixture with (1) 3' 1L T8 fixture and (1) occupancy sensor in the office area
- (1) 8' 4L T12 fixture with (1) 8' 4L T8 fixture in the office area
- (1) T8 fixture with (1) 8' 2L T8 fixture in the office area
- (2) 8' 4L T12 fixtures with (2) 8' 4L T8 fixtures in the print area
- (1) 4' 2L T12 fixture with (1) LED fixture in the office area
- (2) 4' 2L T12 fixtures with (2) LED fixtures in the kitchenette area
- (1) 4' 2L T12 fixture with (1) LED fixture in the office area
- (6) 4' 2L T12 fixtures with (6) LED fixtures in the office area
- (2) 4' 4L T12 fixtures with (2) LED fixtures in the dispatch area
- (1) 4' 4L T12 fixture with (1) LED fixture in the evidence area
- (1) 4' 4L T12 fixture with (1) LED fixture in the office area
- (1) 4' 2L T12 fixture with (1) LED fixture in the office area
- (1) Incand. exit sign fixture with (1) LED Exit Sign fixture in the server room area
- (11) 4' 3L T8 fixtures with (11) LED fixtures in the clean room area
- (1) 4' 2L T12 fixture with (1) LED fixture in the itt area
- (1) 4' 2L T12 fixture with (1) LED fixture in the office area

- (11) 4' 2L T8 fixtures with (11) LED fixtures in the sleep study area
- (5) 4' 2L T12 fixtures with (5) LED fixtures in the supply area
- (1) incandescent fixture with (1) LED fixture in the supply area
- (1) 4' 1L T12 fixture with (1) LED fixture and (1) occupancy sensor in the copy area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the copy area
- (1) 4' 2L T8 fixture with (1) LED fixture and (1) occupancy sensor in the copy area
- (1) 4' 4L T12 fixture with (1) LED fixture and (1) occupancy sensor in the copy area
- (2) 4' 2L T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the copy area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the copy area
- (10) incandescent fixtures with (10) LED fixtures in the recreation clinic area
- (14) 4' 4L T12 fixtures with (14) LED fixtures and (1) occupancy sensor in the open office area
- (14) 4' 2L T12 fixtures with (14) LED fixtures and (1) occupancy sensor in the open area
- (2) 4' 2L T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the open office area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the computer room area
- (15) 4' 2L T12 fixtures with (15) LED fixtures and (2) occupancy sensors in the files area
- (19) 4' 2L T12 fixtures with (19) LED fixtures and (2) occupancy sensors in the open office area
- (12) 4' 4L T12 fixtures with (12) LED fixtures in the open office area
- (7) 4' 4L T12 fixtures with (7) LED fixtures in the print area
- (1) CFL fixture with (1) LED fixture in the restroom men's area
- (1) 2' 2L T12 fixture with (1) 2' 2L T8 fixture in the restroom men's area
- (2) 4' 2L T12 fixtures with (2) LED fixtures in the laundry area
- (6) 4' 2L T12 fixtures with (6) LED fixtures in the laundry area
- (2) 4' 2L T8 fixtures with (2) LED fixtures in the laundry area
- (3) incandescent fixtures with (3) LED fixtures in the perimeter - exterior area
- (2) incandescent fixtures with (2) LED fixtures in the exterior area
- (2) incandescent fixtures with (2) LED fixtures in the perimeter - exterior area
- (1) incandescent fixture with (1) LED fixture in the exterior area
- (1) incandescent fixture with (1) LED fixture in the consolidated exterior area
- (1) incandescent fixture with (1) LED fixture in the exterior area
- (6) incandescent fixtures with (6) LED fixtures in the exterior area
- (1) MH fixture with (1) LED fixture in the perimeter area
- (3) MH fixtures with (3) LED fixtures in the courtyard c area
- (4) MH fixtures with (4) LED fixtures in the courtyard d area
- (56) MH fixtures with (56) LED fixtures in the atrium area
- (26) MH fixtures with (26) LED fixtures in the atrium area
- (9) MH fixtures with (9) LED fixtures in the perimeter area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the break room area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the break room area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the break room area

- (2) 8' 4L T12 fixtures with (2) 8' 4L T8 fixtures and (1) occupancy sensor in the breakroom area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the kitchen area
- (2) 4' 2L T8 fixtures with (2) LED fixtures and (1) occupancy sensor in the break room area
- (1) 2' 1L T12 fixture with (1) 2' 1L T8 fixture and (1) occupancy sensor in the break room area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the break room area
- (6) 4' 2L T12 fixtures with (6) LED fixtures and (4) occupancy sensors in the break room area
- (14) 4' 2L T12 fixtures with (14) LED fixtures and (1) occupancy sensor in the game room area
- (7) 4' 2L T12 fixtures with (7) LED fixtures and (1) occupancy sensor in the waiting room area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the playroom area
- (64) 2' 3L T5 fixtures with (64) LED fixtures and (4) occupancy sensors in the day room area
- (3) 2' 1L T12 fixtures with (3) 2' 1L T8 fixtures and (1) occupancy sensor in the restroom area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the restroom area
- (2) incandescent fixtures with (2) LED fixtures and (2) occupancy sensors in the restroom area
- (3) 2' 1L T12 fixtures with (3) 2' 1L T8 fixtures and (1) occupancy sensor in the restroom area
- (1) 2' 2L T12 fixture with (1) 2' 2L T8 fixture and (1) occupancy sensor in the restroom area
- (5) 4' 2L T12 fixtures with (5) LED fixtures and (4) occupancy sensors in the restroom area
- (2) 2' 2L T12 fixtures with (2) 2' 2L T8 fixtures and (1) occupancy sensor in the restroom men's area
- (3) 4' 2L T12 fixtures with (3) LED fixtures and (1) occupancy sensor in the restroom men's area
- (2) 4' 2L T12 fixtures with (2) LED fixtures and (2) occupancy sensors in the restroom area
- (4) 2' 3L T5 fixtures with (4) LED fixtures and (4) occupancy sensors in the restroom men's area
- (2) 2' 2L T8 fixtures with (2) 2' 2L T8 fixtures and (1) occupancy sensor in the restroom men's area
- (4) 2' 3L T5 fixtures with (4) LED fixtures and (4) occupancy sensors in the restroom women's area
- (2) 2' 2L T8 fixtures with (2) 2' 2L T8 fixtures and (1) occupancy sensor in the restroom women's area
- (4) 2' 3L T5 fixtures with (4) LED fixtures and (4) occupancy sensors in the restroom men's area

- (2) 2' 2L T8 fixtures with (2) 2' 2L T8 fixtures and (1) occupancy sensor in the restroom men's area
- (4) 2' 3L T5 fixtures with (4) LED fixtures and (4) occupancy sensors in the restroom women's area
- (2) 2' 2L T8 fixtures with (2) 2' 2L T8 fixtures and (1) occupancy sensor in the restroom women's area
- (4) 2' 3L T5 fixtures with (4) LED fixtures and (4) occupancy sensors in the restroom men's area
- (1) 2' 2L T8 fixture with (1) 2' 2L T8 fixture and (1) occupancy sensor in the restroom men's area
- (4) 2' 3L T5 fixtures with (4) LED fixtures and (4) occupancy sensors in the restroom women's area
- (1) 2' 2L T8 fixture with (1) 2' 2L T8 fixture and (1) occupancy sensor in the restroom women's area
- (2) 2' 2L T12 fixtures with (2) 2' 2L T8 fixtures and (1) occupancy sensor in the restroom area
- (2) 4' 2L T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the restroom area
- (1) 2' 2L T12 fixture with (1) 2' 1L T8 fixture and (1) occupancy sensor in the restroom area
- (2) 4' 2L T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the restroom area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the restroom area
- (1) 2' 2L T12 fixture with (1) 2' 2L T8 fixture and (1) occupancy sensor in the restroom men's area
- (2) 4' 2L T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the restroom men's area
- (5) 2' 3L T5 fixtures with (5) LED fixtures and (2) occupancy sensors in the restroom men's area
- (2) 2' 2L T8 fixtures with (2) 2' 2L T8 fixtures and (1) occupancy sensor in the restroom men's area
- (9) 2' 3L T5 fixtures with (9) LED fixtures and (3) occupancy sensors in the restroom women's area
- (3) 2' 2L T8 fixtures with (3) 2' 2L T8 fixtures and (2) occupancy sensors in the restroom women's area
- (11) incandescent fixtures with (11) LED fixtures and (9) occupancy sensors in the restroom area
- (7) 2' 1L T12 fixtures with (7) 2' 1L T8 fixtures and (2) occupancy sensors in the restroom area
- (12) 2' 2L T12 fixtures with (12) 2' 2L T8 fixtures and (3) occupancy sensors in the restroom area
- (2) 3' 1L T12 fixtures with (2) 3' 1L T8 fixtures and (1) occupancy sensor in the restroom area
- (14) 4' 2L T12 fixtures with (14) LED fixtures and (7) occupancy sensors in the restroom area

- (2) 4' 2L T12 fixtures with (2) LED fixtures and (2) occupancy sensors in the restroom area
- (3) 4' 2L T12 fixtures with (3) LED fixtures and (2) occupancy sensors in the restroom area
- (2) 4' 4L T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the restroom area
- (5) 2' 2L T8 fixtures with (5) LED fixtures and (5) occupancy sensors in the restroom area
- (1) MH fixture with (1) LED fixture in the storage area
- (1) 2' 2L T12 fixture with (1) 2' 2L T8 fixture in the restroom area
- (1) 3' 2L T12 fixture with (1) 3' T8 fixture in the restroom area
- (3) 4' 2L T12 fixtures with (3) LED fixtures in the restroom area
- (2) 4' 2L T12 fixtures with (2) LED fixtures in the restroom area
- (6) incandescent fixtures with (6) LED fixtures in the meeting room area
- (1) 4' 2L T12 fixture with (1) LED fixture in the conference room area
- (1) 4' 2L T8 fixture with (1) LED fixture in the conference room area
- (2) 4' 2L T12 fixtures with (2) LED fixtures in the conference room area
- (1) 4' 2L T12 fixture with (1) LED fixture in the conference room area
- (1) 2' 1L T12 fixture with (1) 2' 1L T8 fixture in the conference room area
- (1) 3' 1L T12 fixture with (1) 3' 1L T8 fixture in the conference room area
- (1) 4' 2L T12 fixture with (1) LED fixture in the a - consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the b - consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the a - consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the b - consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the a - consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the b - consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the a - consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the b - consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the a - consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the b - consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the a - consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the b - consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the consolidated area
- (10) incandescent fixtures with (10) LED fixtures in the catholic chapel area
- (1) Incand. exit sign fixture with (1) LED Exit Sign fixture in the protestant chapel area
- (4) incandescent fixtures with (4) LED fixtures in the protestant chapel area
- (2) 3' 2L T12 fixtures with (2) 3' T8 fixtures in the restroom area
- (1) 4' 2L T12 fixture with (1) LED fixture in the consolidated area
- (8) 3' 2L T12 fixtures with (8) 3' T8 fixtures in the patient restroom area
- (1) 2' 2L T12 fixture with (1) 2' 2L T8 fixture in the restroom area
- (6) 3' 2L T12 fixtures with (6) 3' T8 fixtures in the restroom area
- (1) incandescent fixture with (1) LED fixture and (1) occupancy sensor in the utility area

- (1) U-tube 2L T12 fixture with (1) U-tube 2L T8 fixture and (1) occupancy sensor in the utility area
- (3) 4' 2L T12 fixtures with (3) LED fixtures and (3) occupancy sensors in the clean utility area
- (3) incandescent fixtures with (3) LED fixtures in the large classroom area
- (3) 4' 2L T12 fixtures with (3) LED fixtures in the classroom area
- (1) U-tube 2L T12 fixture with (1) 2' 2L T8 fixture in the utility area
- (1) U-tube 2L T12 fixture with (1) 2' 2L T8 fixture in the supplies area
- (3) 4' 2L T12 fixtures with (3) LED fixtures in the classroom area
- (2) 4' 2L T12 fixtures with (2) LED fixtures in the soiled utility area
- (5) 4' 2L T12 fixtures with (5) LED fixtures in the soiled utility area
- (1) 4' 2L T12 fixture with (1) LED fixture in the supplies area
- (1) 4' 2L T12 fixture with (1) LED fixture in the shop area
- (8) 8' 4L T12 fixtures with (8) 8' 4L T8 fixtures in the shop area
- (4) 8' 4L T12 fixtures with (4) 8' 4L T8 fixtures in the shop area
- (9) MH fixtures with (9) 4' 3L T5HO fixtures and (1) occupancy sensor in the warehouse area
- (1) 8' 4L T12 fixture with (1) 8' 4L T8 fixture in the warehouse area
- (4) 4' 2L T12 fixtures with (4) LED fixtures and (1) occupancy sensor in the cardiac area
- (2) 3' 2L T12 fixtures with (2) 3' T8 fixtures and (1) occupancy sensor in the dental area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the dental area
- (17) incandescent fixtures with (17) LED fixtures and (1) occupancy sensor in the exam room area
- (1) 2' 1L T12 fixture with (1) 2' 1L T8 fixture and (1) occupancy sensor in the exam room area
- (3) 3' 1L T12 fixtures with (3) 3' 1L T8 fixtures and (1) occupancy sensor in the exam room area
- (6) 4' 2L T12 fixtures with (6) LED fixtures and (2) occupancy sensors in the exam room area
- (5) 4' 2L T12 fixtures with (5) LED fixtures and (1) occupancy sensor in the exam room area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the exam room area
- (4) 4' 2L T12 fixtures with (4) LED fixtures and (1) occupancy sensor in the office area
- (10) 4' 4L T12 fixtures with (10) LED fixtures and (3) occupancy sensors in the office area
- (5) 4' 2L T12 fixtures with (5) LED fixtures and (1) occupancy sensor in the office area
- (3) 4' 2L T12 fixtures with (3) LED fixtures and (3) occupancy sensors in the office area
- (2) 4' 2L T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the office area
- (13) 4' 2L T12 fixtures with (13) LED fixtures and (1) occupancy sensor in the office area
- (2) 4' 2L T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the office area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the office area
- (4) 2' 3L T5 fixtures with (4) LED fixtures and (4) occupancy sensors in the office area
- (2) 2' 2L T8 fixtures with (2) 2' 2L T8 fixtures and (1) occupancy sensor in the office area

- (15) 4' 2L T12 fixtures with (15) LED fixtures and (4) occupancy sensors in the office area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the office area
- (2) 4' 2L T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the office area
- (2) 4' 4L T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the office area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the office area
- (1) 4' 4L T12 fixture with (1) LED fixture and (1) occupancy sensor in the office area
- (6) 4' 2L T12 fixtures with (6) LED fixtures and (2) occupancy sensors in the office area
- (2) 4' 2L T12 fixtures with (2) LED fixtures and (2) occupancy sensors in the office area
- (6) 4' 2L T12 fixtures with (6) LED fixtures and (2) occupancy sensors in the office area
- (2) 4' 4L T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the office area
- (2) 4' 2L T8 fixtures with (2) LED fixtures and (2) occupancy sensors in the office area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the coffee area
- (2) incandescent fixtures with (2) LED fixtures and (1) occupancy sensor in the office area
- (6) 2' 1L T12 fixtures with (6) 2' 1L T8 fixtures and (1) occupancy sensor in the office area
- (1) 2' 2L T12 fixture with (1) 2' 2L T8 fixture and (1) occupancy sensor in the office area
- (11) 3' 1L T12 fixtures with (11) 3' 1L T8 fixtures and (1) occupancy sensor in the office area
- (2) 3' 1L T12 fixtures with (2) 3' 1L T8 fixtures and (1) occupancy sensor in the office area
- (3) 4' 2L T12 fixtures with (3) LED fixtures and (1) occupancy sensor in the office area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the office area
- (22) 4' 2L T12 fixtures with (22) LED fixtures and (11) occupancy sensors in the office area
- (1) 4' 2L T8 fixture with (1) LED fixture and (1) occupancy sensor in the office area
- (5) 4' 2L T12 fixtures with (5) LED fixtures and (3) occupancy sensors in the office area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the office area
- (82) CFL fixtures with (82) LED fixtures and (19) occupancy sensors in the office area
- (1) 3' 1L T12 fixture with (1) 3' 1L T8 fixture and (1) occupancy sensor in the office area
- (1) 8' 4L T12 fixture with (1) 8' 4L T8 fixture in the office area
- (1) T8 fixture with (1) 8' 2L T8 fixture in the office area
- (2) 8' 4L T12 fixtures with (2) 8' 4L T8 fixtures in the print area
- (1) 4' 2L T12 fixture with (1) LED fixture in the office area
- (2) 4' 2L T12 fixtures with (2) LED fixtures in the kitchenette area
- (1) 4' 2L T12 fixture with (1) LED fixture in the office area
- (6) 4' 2L T12 fixtures with (6) LED fixtures in the office area
- (2) 4' 4L T12 fixtures with (2) LED fixtures in the dispatch area
- (1) 4' 4L T12 fixture with (1) LED fixture in the evidence area
- (1) 4' 4L T12 fixture with (1) LED fixture in the office area
- (1) 4' 2L T12 fixture with (1) LED fixture in the office area
- (1) Incand. exit sign fixture with (1) LED Exit Sign fixture in the server room area
- (11) 4' 3L T8 fixtures with (11) LED fixtures in the clean room area
- (1) 4' 2L T12 fixture with (1) LED fixture in the itt area
- (1) 4' 2L T12 fixture with (1) LED fixture in the office area

- (11) 4' 2L T8 fixtures with (11) LED fixtures in the sleep study area
- (5) 4' 2L T12 fixtures with (5) LED fixtures in the supply area
- (1) incandescent fixture with (1) LED fixture in the supply area
- (1) 4' 1L T12 fixture with (1) LED fixture and (1) occupancy sensor in the copy area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the copy area
- (1) 4' 2L T8 fixture with (1) LED fixture and (1) occupancy sensor in the copy area
- (1) 4' 4L T12 fixture with (1) LED fixture and (1) occupancy sensor in the copy area
- (2) 4' 2L T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the copy area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the copy area
- (10) incandescent fixtures with (10) LED fixtures in the recreation clinic area
- (14) 4' 4L T12 fixtures with (14) LED fixtures and (1) occupancy sensor in the open office area
- (14) 4' 2L T12 fixtures with (14) LED fixtures and (1) occupancy sensor in the open area
- (2) 4' 2L T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the open office area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the computer room area
- (15) 4' 2L T12 fixtures with (15) LED fixtures and (2) occupancy sensors in the files area
- (19) 4' 2L T12 fixtures with (19) LED fixtures and (2) occupancy sensors in the open office area
- (12) 4' 4L T12 fixtures with (12) LED fixtures in the open office area
- (7) 4' 4L T12 fixtures with (7) LED fixtures in the print area
- (1) CFL fixture with (1) LED fixture in the restroom men's area
- (1) 2' 2L T12 fixture with (1) 2' 2L T8 fixture in the restroom men's area
- (2) 4' 2L T12 fixtures with (2) LED fixtures in the laundry area
- (6) 4' 2L T12 fixtures with (6) LED fixtures in the laundry area
- (2) 4' 2L T8 fixtures with (2) LED fixtures in the laundry area
- (3) incandescent fixtures with (3) LED fixtures in the perimeter - exterior area
- (2) incandescent fixtures with (2) LED fixtures in the exterior area
- (2) incandescent fixtures with (2) LED fixtures in the perimeter - exterior area
- (1) incandescent fixture with (1) LED fixture in the exterior area
- (1) incandescent fixture with (1) LED fixture in the consolidated exterior area
- (1) incandescent fixture with (1) LED fixture in the exterior area
- (6) incandescent fixtures with (6) LED fixtures in the exterior area
- (1) MH fixture with (1) LED fixture in the perimeter area
- (3) MH fixtures with (3) LED fixtures in the courtyard c area
- (4) MH fixtures with (4) LED fixtures in the courtyard d area
- (56) MH fixtures with (56) LED fixtures in the atrium area
- (26) MH fixtures with (26) LED fixtures in the atrium area
- (9) MH fixtures with (9) LED fixtures in the perimeter area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the break room area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the break room area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the break room area

- (2) 8' 4L T12 fixtures with (2) 8' 4L T8 fixtures and (1) occupancy sensor in the breakroom area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the kitchen area
- (2) 4' 2L T8 fixtures with (2) LED fixtures and (1) occupancy sensor in the break room area
- (1) 2' 1L T12 fixture with (1) 2' 1L T8 fixture and (1) occupancy sensor in the break room area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the break room area
- (6) 4' 2L T12 fixtures with (6) LED fixtures and (4) occupancy sensors in the break room area
- (14) 4' 2L T12 fixtures with (14) LED fixtures and (1) occupancy sensor in the game room area
- (7) 4' 2L T12 fixtures with (7) LED fixtures and (1) occupancy sensor in the waiting room area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the playroom area
- (64) 2' 3L T5 fixtures with (64) LED fixtures and (4) occupancy sensors in the day room area
- (3) 2' 1L T12 fixtures with (3) 2' 1L T8 fixtures and (1) occupancy sensor in the restroom area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the restroom area
- (2) incandescent fixtures with (2) LED fixtures and (2) occupancy sensors in the restroom area
- (3) 2' 1L T12 fixtures with (3) 2' 1L T8 fixtures and (1) occupancy sensor in the restroom area
- (1) 2' 2L T12 fixture with (1) 2' 2L T8 fixture and (1) occupancy sensor in the restroom area
- (5) 4' 2L T12 fixtures with (5) LED fixtures and (4) occupancy sensors in the restroom area
- (2) 2' 2L T12 fixtures with (2) 2' 2L T8 fixtures and (1) occupancy sensor in the restroom men's area
- (3) 4' 2L T12 fixtures with (3) LED fixtures and (1) occupancy sensor in the restroom men's area
- (2) 4' 2L T12 fixtures with (2) LED fixtures and (2) occupancy sensors in the restroom area
- (4) 2' 3L T5 fixtures with (4) LED fixtures and (4) occupancy sensors in the restroom men's area
- (2) 2' 2L T8 fixtures with (2) 2' 2L T8 fixtures and (1) occupancy sensor in the restroom men's area
- (4) 2' 3L T5 fixtures with (4) LED fixtures and (4) occupancy sensors in the restroom women's area
- (2) 2' 2L T8 fixtures with (2) 2' 2L T8 fixtures and (1) occupancy sensor in the restroom women's area
- (4) 2' 3L T5 fixtures with (4) LED fixtures and (4) occupancy sensors in the restroom men's area

- (2) 2' 2L T8 fixtures with (2) 2' 2L T8 fixtures and (1) occupancy sensor in the restroom men's area
- (4) 2' 3L T5 fixtures with (4) LED fixtures and (4) occupancy sensors in the restroom women's area
- (2) 2' 2L T8 fixtures with (2) 2' 2L T8 fixtures and (1) occupancy sensor in the restroom women's area
- (4) 2' 3L T5 fixtures with (4) LED fixtures and (4) occupancy sensors in the restroom men's area
- (1) 2' 2L T8 fixture with (1) 2' 2L T8 fixture and (1) occupancy sensor in the restroom men's area
- (4) 2' 3L T5 fixtures with (4) LED fixtures and (4) occupancy sensors in the restroom women's area
- (1) 2' 2L T8 fixture with (1) 2' 2L T8 fixture and (1) occupancy sensor in the restroom women's area
- (2) 2' 2L T12 fixtures with (2) 2' 2L T8 fixtures and (1) occupancy sensor in the restroom area
- (2) 4' 2L T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the restroom area
- (1) 2' 2L T12 fixture with (1) 2' 1L T8 fixture and (1) occupancy sensor in the restroom area
- (2) 4' 2L T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the restroom area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the restroom area
- (1) 2' 2L T12 fixture with (1) 2' 2L T8 fixture and (1) occupancy sensor in the restroom men's area
- (2) 4' 2L T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the restroom men's area
- (5) 2' 3L T5 fixtures with (5) LED fixtures and (2) occupancy sensors in the restroom men's area
- (2) 2' 2L T8 fixtures with (2) 2' 2L T8 fixtures and (1) occupancy sensor in the restroom men's area
- (9) 2' 3L T5 fixtures with (9) LED fixtures and (3) occupancy sensors in the restroom women's area
- (3) 2' 2L T8 fixtures with (3) 2' 2L T8 fixtures and (2) occupancy sensors in the restroom women's area
- (11) incandescent fixtures with (11) LED fixtures and (9) occupancy sensors in the restroom area
- (7) 2' 1L T12 fixtures with (7) 2' 1L T8 fixtures and (2) occupancy sensors in the restroom area
- (12) 2' 2L T12 fixtures with (12) 2' 2L T8 fixtures and (3) occupancy sensors in the restroom area
- (2) 3' 1L T12 fixtures with (2) 3' 1L T8 fixtures and (1) occupancy sensor in the restroom area
- (14) 4' 2L T12 fixtures with (14) LED fixtures and (7) occupancy sensors in the restroom area

- (2) 4' 2L T12 fixtures with (2) LED fixtures and (2) occupancy sensors in the restroom area
- (3) 4' 2L T12 fixtures with (3) LED fixtures and (2) occupancy sensors in the restroom area
- (2) 4' 4L T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the restroom area
- (5) 2' 2L T8 fixtures with (5) LED fixtures and (5) occupancy sensors in the restroom area
- (1) MH fixture with (1) LED fixture in the storage area
- (1) 2' 2L T12 fixture with (1) 2' 2L T8 fixture in the restroom area
- (1) 3' 2L T12 fixture with (1) 3' T8 fixture in the restroom area
- (3) 4' 2L T12 fixtures with (3) LED fixtures in the restroom area
- (2) 4' 2L T12 fixtures with (2) LED fixtures in the restroom area
- (6) incandescent fixtures with (6) LED fixtures in the meeting room area
- (1) 4' 2L T12 fixture with (1) LED fixture in the conference room area
- (1) 4' 2L T8 fixture with (1) LED fixture in the conference room area
- (2) 4' 2L T12 fixtures with (2) LED fixtures in the conference room area
- (1) 4' 2L T12 fixture with (1) LED fixture in the conference room area
- (1) 2' 1L T12 fixture with (1) 2' 1L T8 fixture in the conference room area
- (1) 3' 1L T12 fixture with (1) 3' 1L T8 fixture in the conference room area
- (1) 4' 2L T12 fixture with (1) LED fixture in the a - consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the b - consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the a - consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the b - consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the a - consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the b - consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the a - consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the b - consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the a - consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the b - consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the a - consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the b - consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the consolidated area
- (1) 4' 2L T12 fixture with (1) LED fixture in the consolidated area
- (10) incandescent fixtures with (10) LED fixtures in the catholic chapel area
- (1) Incand. exit sign fixture with (1) LED Exit Sign fixture in the protestant chapel area
- (4) incandescent fixtures with (4) LED fixtures in the protestant chapel area
- (2) 3' 2L T12 fixtures with (2) 3' T8 fixtures in the restroom area
- (1) 4' 2L T12 fixture with (1) LED fixture in the consolidated area
- (8) 3' 2L T12 fixtures with (8) 3' T8 fixtures in the patient restroom area
- (1) 2' 2L T12 fixture with (1) 2' 2L T8 fixture in the restroom area
- (6) 3' 2L T12 fixtures with (6) 3' T8 fixtures in the restroom area
- (1) incandescent fixture with (1) LED fixture and (1) occupancy sensor in the utility area

- (1) U-tube 2L T12 fixture with (1) U-tube 2L T8 fixture and (1) occupancy sensor in the utility area
- (3) 4' 2L T12 fixtures with (3) LED fixtures and (3) occupancy sensors in the clean utility area
- (3) incandescent fixtures with (3) LED fixtures in the large classroom area
- (3) 4' 2L T12 fixtures with (3) LED fixtures in the classroom area
- (1) U-tube 2L T12 fixture with (1) 2' 2L T8 fixture in the utility area
- (1) U-tube 2L T12 fixture with (1) 2' 2L T8 fixture in the supplies area
- (3) 4' 2L T12 fixtures with (3) LED fixtures in the classroom area
- (2) 4' 2L T12 fixtures with (2) LED fixtures in the soiled utility area
- (5) 4' 2L T12 fixtures with (5) LED fixtures in the soiled utility area
- (1) 4' 2L T12 fixture with (1) LED fixture in the supplies area
- (1) 4' 2L T12 fixture with (1) LED fixture in the shop area
- (8) 8' 4L T12 fixtures with (8) 8' 4L T8 fixtures in the shop area
- (4) 8' 4L T12 fixtures with (4) 8' 4L T8 fixtures in the shop area
- (9) MH fixtures with (9) 4' 3L T5HO fixtures and (1) occupancy sensor in the warehouse area
- (1) 8' 4L T12 fixture with (1) 8' 4L T8 fixture in the warehouse area
- (4) 4' 2L T12 fixtures with (4) LED fixtures and (1) occupancy sensor in the cardiac area
- (2) 3' 2L T12 fixtures with (2) 3' T8 fixtures and (1) occupancy sensor in the dental area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the dental area
- (17) incandescent fixtures with (17) LED fixtures and (1) occupancy sensor in the exam room area
- (1) 2' 1L T12 fixture with (1) 2' 1L T8 fixture and (1) occupancy sensor in the exam room area
- (3) 3' 1L T12 fixtures with (3) 3' 1L T8 fixtures and (1) occupancy sensor in the exam room area
- (6) 4' 2L T12 fixtures with (6) LED fixtures and (2) occupancy sensors in the exam room area
- (5) 4' 2L T12 fixtures with (5) LED fixtures and (1) occupancy sensor in the exam room area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the exam room area
- (4) 4' 2L T12 fixtures with (4) LED fixtures and (1) occupancy sensor in the office area
- (10) 4' 4L T12 fixtures with (10) LED fixtures and (3) occupancy sensors in the office area
- (5) 4' 2L T12 fixtures with (5) LED fixtures and (1) occupancy sensor in the office area
- (3) 4' 2L T12 fixtures with (3) LED fixtures and (3) occupancy sensors in the office area
- (2) 4' 2L T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the office area
- (13) 4' 2L T12 fixtures with (13) LED fixtures and (1) occupancy sensor in the office area
- (2) 4' 2L T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the office area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the office area
- (4) 2' 3L T5 fixtures with (4) LED fixtures and (4) occupancy sensors in the office area
- (2) 2' 2L T8 fixtures with (2) 2' 2L T8 fixtures and (1) occupancy sensor in the office area

- (15) 4' 2L T12 fixtures with (15) LED fixtures and (4) occupancy sensors in the office area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the office area
- (2) 4' 2L T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the office area
- (2) 4' 4L T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the office area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the office area
- (1) 4' 4L T12 fixture with (1) LED fixture and (1) occupancy sensor in the office area
- (6) 4' 2L T12 fixtures with (6) LED fixtures and (2) occupancy sensors in the office area
- (2) 4' 2L T12 fixtures with (2) LED fixtures and (2) occupancy sensors in the office area
- (6) 4' 2L T12 fixtures with (6) LED fixtures and (2) occupancy sensors in the office area
- (2) 4' 4L T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the office area
- (2) 4' 2L T8 fixtures with (2) LED fixtures and (2) occupancy sensors in the office area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the coffee area
- (2) incandescent fixtures with (2) LED fixtures and (1) occupancy sensor in the office area
- (6) 2' 1L T12 fixtures with (6) 2' 1L T8 fixtures and (1) occupancy sensor in the office area
- (1) 2' 2L T12 fixture with (1) 2' 2L T8 fixture and (1) occupancy sensor in the office area
- (11) 3' 1L T12 fixtures with (11) 3' 1L T8 fixtures and (1) occupancy sensor in the office area
- (2) 3' 1L T12 fixtures with (2) 3' 1L T8 fixtures and (1) occupancy sensor in the office area
- (3) 4' 2L T12 fixtures with (3) LED fixtures and (1) occupancy sensor in the office area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the office area
- (22) 4' 2L T12 fixtures with (22) LED fixtures and (11) occupancy sensors in the office area
- (1) 4' 2L T8 fixture with (1) LED fixture and (1) occupancy sensor in the office area
- (5) 4' 2L T12 fixtures with (5) LED fixtures and (3) occupancy sensors in the office area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the office area
- (82) CFL fixtures with (82) LED fixtures and (19) occupancy sensors in the office area
- (1) 3' 1L T12 fixture with (1) 3' 1L T8 fixture and (1) occupancy sensor in the office area
- (1) 8' 4L T12 fixture with (1) 8' 4L T8 fixture in the office area
- (1) T8 fixture with (1) 8' 2L T8 fixture in the office area
- (2) 8' 4L T12 fixtures with (2) 8' 4L T8 fixtures in the print area
- (1) 4' 2L T12 fixture with (1) LED fixture in the office area
- (2) 4' 2L T12 fixtures with (2) LED fixtures in the kitchenette area
- (1) 4' 2L T12 fixture with (1) LED fixture in the office area
- (6) 4' 2L T12 fixtures with (6) LED fixtures in the office area
- (2) 4' 4L T12 fixtures with (2) LED fixtures in the dispatch area
- (1) 4' 4L T12 fixture with (1) LED fixture in the evidence area
- (1) 4' 4L T12 fixture with (1) LED fixture in the office area
- (1) 4' 2L T12 fixture with (1) LED fixture in the office area
- (1) Incand. exit sign fixture with (1) LED Exit Sign fixture in the server room area
- (11) 4' 3L T8 fixtures with (11) LED fixtures in the clean room area
- (1) 4' 2L T12 fixture with (1) LED fixture in the itt area
- (1) 4' 2L T12 fixture with (1) LED fixture in the office area

- (11) 4' 2L T8 fixtures with (11) LED fixtures in the sleep study area
- (5) 4' 2L T12 fixtures with (5) LED fixtures in the supply area
- (1) incandescent fixture with (1) LED fixture in the supply area
- (1) 4' 1L T12 fixture with (1) LED fixture and (1) occupancy sensor in the copy area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the copy area
- (1) 4' 2L T8 fixture with (1) LED fixture and (1) occupancy sensor in the copy area
- (1) 4' 4L T12 fixture with (1) LED fixture and (1) occupancy sensor in the copy area
- (2) 4' 2L T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the copy area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the copy area
- (10) incandescent fixtures with (10) LED fixtures in the recreation clinic area
- (14) 4' 4L T12 fixtures with (14) LED fixtures and (1) occupancy sensor in the open office area
- (14) 4' 2L T12 fixtures with (14) LED fixtures and (1) occupancy sensor in the open area
- (2) 4' 2L T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the open office area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the computer room area
- (15) 4' 2L T12 fixtures with (15) LED fixtures and (2) occupancy sensors in the files area
- (19) 4' 2L T12 fixtures with (19) LED fixtures and (2) occupancy sensors in the open office area
- (12) 4' 4L T12 fixtures with (12) LED fixtures in the open office area
- (7) 4' 4L T12 fixtures with (7) LED fixtures in the print area
- (1) CFL fixture with (1) LED fixture in the restroom men's area
- (1) 2' 2L T12 fixture with (1) 2' 2L T8 fixture in the restroom men's area
- (2) 4' 2L T12 fixtures with (2) LED fixtures in the laundry area
- (6) 4' 2L T12 fixtures with (6) LED fixtures in the laundry area
- (2) 4' 2L T8 fixtures with (2) LED fixtures in the laundry area
- (3) incandescent fixtures with (3) LED fixtures in the perimeter - exterior area
- (2) incandescent fixtures with (2) LED fixtures in the exterior area
- (2) incandescent fixtures with (2) LED fixtures in the perimeter - exterior area
- (1) incandescent fixture with (1) LED fixture in the exterior area
- (1) incandescent fixture with (1) LED fixture in the consolidated exterior area
- (1) incandescent fixture with (1) LED fixture in the exterior area
- (6) incandescent fixtures with (6) LED fixtures in the exterior area
- (1) MH fixture with (1) LED fixture in the perimeter area
- (3) MH fixtures with (3) LED fixtures in the courtyard c area
- (4) MH fixtures with (4) LED fixtures in the courtyard d area
- (56) MH fixtures with (56) LED fixtures in the atrium area
- (26) MH fixtures with (26) LED fixtures in the atrium area
- (9) MH fixtures with (9) LED fixtures in the perimeter area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the break room area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the break room area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the break room area

- (2) 8' 4L T12 fixtures with (2) 8' 4L T8 fixtures and (1) occupancy sensor in the breakroom area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the kitchen area
- (2) 4' 2L T8 fixtures with (2) LED fixtures and (1) occupancy sensor in the break room area
- (1) 2' 1L T12 fixture with (1) 2' 1L T8 fixture and (1) occupancy sensor in the break room area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the break room area
- (6) 4' 2L T12 fixtures with (6) LED fixtures and (4) occupancy sensors in the break room area
- (14) 4' 2L T12 fixtures with (14) LED fixtures and (1) occupancy sensor in the game room area
- (7) 4' 2L T12 fixtures with (7) LED fixtures and (1) occupancy sensor in the waiting room area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the playroom area
- (64) 2' 3L T5 fixtures with (64) LED fixtures and (4) occupancy sensors in the day room area
- (3) 2' 1L T12 fixtures with (3) 2' 1L T8 fixtures and (1) occupancy sensor in the restroom area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the restroom area
- (2) incandescent fixtures with (2) LED fixtures and (2) occupancy sensors in the restroom area
- (3) 2' 1L T12 fixtures with (3) 2' 1L T8 fixtures and (1) occupancy sensor in the restroom area
- (1) 2' 2L T12 fixture with (1) 2' 2L T8 fixture and (1) occupancy sensor in the restroom area
- (5) 4' 2L T12 fixtures with (5) LED fixtures and (4) occupancy sensors in the restroom area
- (2) 2' 2L T12 fixtures with (2) 2' 2L T8 fixtures and (1) occupancy sensor in the restroom men's area
- (3) 4' 2L T12 fixtures with (3) LED fixtures and (1) occupancy sensor in the restroom men's area
- (2) 4' 2L T12 fixtures with (2) LED fixtures and (2) occupancy sensors in the restroom area
- (4) 2' 3L T5 fixtures with (4) LED fixtures and (4) occupancy sensors in the restroom men's area
- (2) 2' 2L T8 fixtures with (2) 2' 2L T8 fixtures and (1) occupancy sensor in the restroom men's area
- (4) 2' 3L T5 fixtures with (4) LED fixtures and (4) occupancy sensors in the restroom women's area
- (2) 2' 2L T8 fixtures with (2) 2' 2L T8 fixtures and (1) occupancy sensor in the restroom women's area
- (4) 2' 3L T5 fixtures with (4) LED fixtures and (4) occupancy sensors in the restroom men's area

- (2) 2' 2L T8 fixtures with (2) 2' 2L T8 fixtures and (1) occupancy sensor in the restroom men's area
- (4) 2' 3L T5 fixtures with (4) LED fixtures and (4) occupancy sensors in the restroom women's area
- (2) 2' 2L T8 fixtures with (2) 2' 2L T8 fixtures and (1) occupancy sensor in the restroom women's area
- (4) 2' 3L T5 fixtures with (4) LED fixtures and (4) occupancy sensors in the restroom men's area
- (1) 2' 2L T8 fixture with (1) 2' 2L T8 fixture and (1) occupancy sensor in the restroom men's area
- (4) 2' 3L T5 fixtures with (4) LED fixtures and (4) occupancy sensors in the restroom women's area
- (1) 2' 2L T8 fixture with (1) 2' 2L T8 fixture and (1) occupancy sensor in the restroom women's area
- (2) 2' 2L T12 fixtures with (2) 2' 2L T8 fixtures and (1) occupancy sensor in the restroom area
- (2) 4' 2L T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the restroom area
- (1) 2' 2L T12 fixture with (1) 2' 1L T8 fixture and (1) occupancy sensor in the restroom area
- (2) 4' 2L T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the restroom area
- (1) 4' 2L T12 fixture with (1) LED fixture and (1) occupancy sensor in the restroom area
- (1) 2' 2L T12 fixture with (1) 2' 2L T8 fixture and (1) occupancy sensor in the restroom men's area
- (2) 4' 2L T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the restroom men's area
- (5) 2' 3L T5 fixtures with (5) LED fixtures and (2) occupancy sensors in the restroom men's area
- (2) 2' 2L T8 fixtures with (2) 2' 2L T8 fixtures and (1) occupancy sensor in the restroom men's area
- (9) 2' 3L T5 fixtures with (9) LED fixtures and (3) occupancy sensors in the restroom women's area
- (3) 2' 2L T8 fixtures with (3) 2' 2L T8 fixtures and (2) occupancy sensors in the restroom women's area
- (11) incandescent fixtures with (11) LED fixtures and (9) occupancy sensors in the restroom area
- (7) 2' 1L T12 fixtures with (7) 2' 1L T8 fixtures and (2) occupancy sensors in the restroom area
- (12) 2' 2L T12 fixtures with (12) 2' 2L T8 fixtures and (3) occupancy sensors in the restroom area
- (2) 3' 1L T12 fixtures with (2) 3' 1L T8 fixtures and (1) occupancy sensor in the restroom area
- (14) 4' 2L T12 fixtures with (14) LED fixtures and (7) occupancy sensors in the restroom area

- (2) 4' 2L T12 fixtures with (2) LED fixtures and (2) occupancy sensors in the restroom area
- (3) 4' 2L T12 fixtures with (3) LED fixtures and (2) occupancy sensors in the restroom area
- (2) 4' 4L T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the restroom area
- (5) 2' 2L T8 fixtures with (5) LED fixtures and (5) occupancy sensors in the restroom area

The customer retrofitted the following Prescriptive measures:

- (4) 4' 4-lamp T12 fixtures with (4) LED fixtures in the conference area
- (4) 4' 4-lamp T12 fixtures with (4) LED fixtures in the conference area
- (20) 4' 4-lamp T12 fixtures with (20) LED fixtures in the meeting room area
- (9) 4' 4-lamp T12 fixtures with (9) LED fixtures in the conference area
- (10) 4' 4-lamp T12 fixtures with (10) LED fixtures in the conference room area
- (2) 4' 4-lamp T8 fixtures with (2) LED fixtures in the conference room area
- (9) 4' 4-lamp T8 fixtures with (9) LED fixtures in the conference room area
- (6) 4' 4-lamp T8 fixtures with (6) LED fixtures in the conference room area
- (2) 4' 4-lamp T12 fixtures with (2) LED fixtures in the conference room area
- (2) 4' 4-lamp T12 fixtures with (2) LED fixtures in the conference area
- (14) 4' 4-lamp T12 fixtures with (14) LED fixtures in the conference room area
- (4) 4' 3-lamp T12 fixtures with (4) LED fixtures in the conference room area
- (4) 4' 4-lamp T12 fixtures with (4) LED fixtures in the conference room area
- (10) 4' 4-lamp T12 fixtures with (10) LED fixtures in the conference room area
- (8) 4' 3-lamp T8 fixtures with (8) LED fixtures in the conference room area
- (8) incandescent fixtures with (8) LED fixtures in the a - consolidated area
- (5) incandescent fixtures with (5) LED fixtures in the a - consolidated area
- (10) incandescent fixtures with (10) LED fixtures in the a - consolidated area
- (3) incandescent fixtures with (3) LED fixtures in the a - consolidated area
- (8) incandescent fixtures with (8) LED fixtures in the a - consolidated area
- (4) incandescent fixtures with (4) LED fixtures in the a - consolidated area
- (8) incandescent fixtures with (8) LED fixtures in the b - consolidated area
- (5) incandescent fixtures with (5) LED fixtures in the b - consolidated area
- (10) incandescent fixtures with (10) LED fixtures in the b - consolidated area
- (3) incandescent fixtures with (3) LED fixtures in the b - consolidated area
- (8) incandescent fixtures with (8) LED fixtures in the b - consolidated area
- (4) incandescent fixtures with (4) LED fixtures in the b - consolidated area
- (8) incandescent fixtures with (8) LED fixtures in the a - consolidated area
- (5) incandescent fixtures with (5) LED fixtures in the a - consolidated area
- (10) incandescent fixtures with (10) LED fixtures in the a - consolidated area
- (3) incandescent fixtures with (3) LED fixtures in the a - consolidated area
- (8) incandescent fixtures with (8) LED fixtures in the a - consolidated area
- (4) incandescent fixtures with (4) LED fixtures in the a - consolidated area
- (8) incandescent fixtures with (8) LED fixtures in the b - consolidated area
- (5) incandescent fixtures with (5) LED fixtures in the b - consolidated area
- (10) incandescent fixtures with (10) LED fixtures in the b - consolidated area

- (3) incandescent fixtures with (3) LED fixtures in the b - consolidated area
- (8) incandescent fixtures with (8) LED fixtures in the b - consolidated area
- (4) incandescent fixtures with (4) LED fixtures in the b - consolidated area
- (8) incandescent fixtures with (8) LED fixtures in the a - consolidated area
- (5) incandescent fixtures with (5) LED fixtures in the a - consolidated area
- (10) incandescent fixtures with (10) LED fixtures in the a - consolidated area
- (3) incandescent fixtures with (3) LED fixtures in the a - consolidated area
- (8) incandescent fixtures with (8) LED fixtures in the a - consolidated area
- (4) incandescent fixtures with (4) LED fixtures in the a - consolidated area
- (8) incandescent fixtures with (8) LED fixtures in the b - consolidated area
- (5) incandescent fixtures with (5) LED fixtures in the b - consolidated area
- (10) incandescent fixtures with (10) LED fixtures in the b - consolidated area
- (3) incandescent fixtures with (3) LED fixtures in the b - consolidated area
- (8) incandescent fixtures with (8) LED fixtures in the b - consolidated area
- (4) incandescent fixtures with (4) LED fixtures in the b - consolidated area
- (18) incandescent fixtures with (18) LED fixtures in the a - consolidated area
- (2) incandescent fixtures with (2) LED fixtures in the a - consolidated area
- (6) incandescent fixtures with (6) LED fixtures in the a - consolidated area
- (16) incandescent fixtures with (16) LED fixtures in the a - consolidated area
- (18) incandescent fixtures with (18) LED fixtures in the b - consolidated area
- (2) incandescent fixtures with (2) LED fixtures in the b - consolidated area
- (6) incandescent fixtures with (6) LED fixtures in the b - consolidated area
- (16) incandescent fixtures with (16) LED fixtures in the b - consolidated area
- (6) incandescent fixtures with (6) LED fixtures in the consolidated area
- (5) incandescent fixtures with (5) LED fixtures in the consolidated area
- (19) incandescent fixtures with (19) LED fixtures in the consolidated area
- (3) incandescent fixtures with (3) LED fixtures in the consolidated area
- (12) incandescent fixtures with (12) LED fixtures in the consolidated area
- (25) incandescent fixtures with (25) LED fixtures in the consolidated area
- (2) 4' 4-lamp T12 fixtures with (2) LED fixtures in the consolidated area
- (18) incandescent fixtures with (18) LED fixtures in the a - consolidated area
- (2) incandescent fixtures with (2) LED fixtures in the a - consolidated area
- (6) incandescent fixtures with (6) LED fixtures in the a - consolidated area
- (16) incandescent fixtures with (16) LED fixtures in the a - consolidated area
- (18) incandescent fixtures with (18) LED fixtures in the b - consolidated area
- (2) incandescent fixtures with (2) LED fixtures in the b - consolidated area
- (6) incandescent fixtures with (6) LED fixtures in the b - consolidated area
- (16) incandescent fixtures with (16) LED fixtures in the b - consolidated area
- (6) incandescent fixtures with (6) LED fixtures in the consolidated area
- (5) incandescent fixtures with (5) LED fixtures in the consolidated area
- (19) incandescent fixtures with (19) LED fixtures in the consolidated area
- (3) incandescent fixtures with (3) LED fixtures in the consolidated area
- (12) incandescent fixtures with (12) LED fixtures in the consolidated area
- (25) incandescent fixtures with (25) LED fixtures in the consolidated area
- (2) 4' 4-lamp T12 fixtures with (2) LED fixtures in the consolidated area
- (18) incandescent fixtures with (18) LED fixtures in the a - consolidated area

- (2) incandescent fixtures with (2) LED fixtures in the a - consolidated area
- (6) incandescent fixtures with (6) LED fixtures in the a - consolidated area
- (16) incandescent fixtures with (16) LED fixtures in the a - consolidated area
- (18) incandescent fixtures with (18) LED fixtures in the b - consolidated area
- (2) incandescent fixtures with (2) LED fixtures in the b - consolidated area
- (6) incandescent fixtures with (6) LED fixtures in the b - consolidated area
- (16) incandescent fixtures with (16) LED fixtures in the b - consolidated area
- (1) incandescent fixture with (1) LED fixture in the consolidated area
- (14) incandescent fixtures with (14) LED fixtures in the consolidated area
- (8) incandescent fixtures with (8) LED fixtures in the consolidated area
- (22) incandescent fixtures with (22) LED fixtures in the consolidated area
- (2) incandescent fixtures with (2) LED fixtures in the consolidated area
- (3) incandescent fixtures with (3) LED fixtures in the consolidated area
- (4) incandescent fixtures with (4) LED fixtures in the consolidated area
- (8) incandescent fixtures with (8) LED fixtures in the consolidated area
- (18) incandescent fixtures with (18) LED fixtures in the consolidated area
- (2) incandescent fixtures with (2) LED fixtures in the consolidated area
- (6) incandescent fixtures with (6) LED fixtures in the consolidated area
- (16) incandescent fixtures with (16) LED fixtures in the consolidated area
- (18) incandescent fixtures with (18) LED fixtures in the consolidated area
- (2) incandescent fixtures with (2) LED fixtures in the consolidated area
- (6) incandescent fixtures with (6) LED fixtures in the consolidated area
- (16) incandescent fixtures with (16) LED fixtures in the consolidated area
- (18) incandescent fixtures with (18) LED fixtures in the consolidated area
- (2) incandescent fixtures with (2) LED fixtures in the consolidated area
- (6) incandescent fixtures with (6) LED fixtures in the consolidated area
- (16) incandescent fixtures with (16) LED fixtures in the consolidated area
- (1) U-tube 2-lamp T12 fixture with (1) LED fixture in the baby room area
- (4) incandescent fixtures with (4) LED fixtures in the catholic chapel area
- (2) incandescent fixtures with (2) LED fixtures in the catholic chapel area
- (2) 4' 4-lamp T12 fixtures with (2) LED fixtures in the office area
- (6) incandescent fixtures with (6) LED fixtures in the protestant chapel area
- (2) incandescent fixtures with (2) LED fixtures in the protestant chapel area
- (4) incandescent fixtures with (4) LED fixtures in the protestant chapel area
- (6) incandescent fixtures with (6) LED fixtures in the protestant chapel area
- (1) T12 fixture with (1) 4' 2-lamp T8 fixture in the restroom area
- (4) U-tube 2-lamp T12 fixtures with (4) LED fixtures in the restroom area
- (1) incandescent fixture with (1) LED fixture in the consolidated area
- (14) incandescent fixtures with (14) LED fixtures in the consolidated area
- (8) incandescent fixtures with (8) LED fixtures in the consolidated area
- (22) incandescent fixtures with (22) LED fixtures in the consolidated area
- (2) incandescent fixtures with (2) LED fixtures in the consolidated area
- (3) incandescent fixtures with (3) LED fixtures in the consolidated area
- (4) incandescent fixtures with (4) LED fixtures in the consolidated area
- (8) incandescent fixtures with (8) LED fixtures in the consolidated area
- (2) U-tube 2-lamp T12 fixtures with (2) LED fixtures in the patient room area

- (6) 4' 4-lamp T12 fixtures with (6) LED fixtures in the patient room area
- (2) 4' 4-lamp T12 fixtures with (2) LED fixtures in the restroom area
- (116) T12 fixtures with (116) 4' 2-lamp T8 fixtures in the patient restroom area
- (42) U-tube 2-lamp T12 fixtures with (42) LED fixtures in the patient restroom area
- (207) T12 fixtures with (207) 4' 4-lamp T8 fixtures in the patient room area
- (1) T12 fixture with (1) 4' 4-lamp T8 fixture in the patient room area
- (98) U-tube 2-lamp T12 fixtures with (98) LED fixtures in the patient room area
- (19) 4' 3-lamp T12 fixtures with (19) LED fixtures in the patient room area
- (2) T12 fixtures with (2) 4' 4-lamp T8 fixtures in the patient room/storage area
- (1) U-tube 2-lamp T12 fixture with (1) LED fixture in the patient room/storage area
- (22) T12 fixtures with (22) 4' 2-lamp T8 fixtures in the restroom area
- (6) U-tube 2-lamp T12 fixtures with (6) LED fixtures in the restroom area
- (2) T8 fixtures with (2) 4' 2-lamp T8 fixtures in the restroom area
- (3) T12 fixtures with (3) 4' 2-lamp T8 fixtures in the restroom/staff area
- (2) T12 fixtures with (2) 4' 2-lamp T8 fixtures and (2) occupancy sensors in the utility area
- (1) T12 fixture with (1) 4' 2-lamp T8 fixture and (1) occupancy sensor in the clean utility area
- (4) T8 fixtures with (4) 4' 2-lamp T8 fixtures and (4) occupancy sensors in the utility area
- (10) 4' 4-lamp T12 fixtures with (10) LED fixtures in the large classroom area
- (8) 4' 4-lamp T12 fixtures with (8) LED fixtures in the training area
- (2) T12 fixtures with (2) 4' 2-lamp T8 fixtures in the utility area
- (9) 4' 4-lamp T8 fixtures with (9) LED fixtures in the classroom area
- (4) 4' 4-lamp T12 fixtures with (4) LED fixtures in the classroom area
- (1) T12 fixture with (1) 4' 2-lamp T8 fixture in the soil area
- (3) T12 fixtures with (3) 4' 2-lamp T8 fixtures in the supplies area
- (12) 4' 3-lamp T12 fixtures with (12) LED fixtures in the classroom area
- (12) T12 fixtures with (12) 4' 4-lamp T8 fixtures in the classroom area
- (3) U-tube 2-lamp T12 fixtures with (3) LED fixtures in the classroom area
- (24) 4' 3-lamp T12 fixtures with (24) LED fixtures in the classroom area
- (1) 4' 3-lamp T12 fixture with (1) LED fixture in the soiled utility area
- (1) T12 fixture with (1) 4' 2-lamp T8 fixture in the supply area
- (24) T12 fixtures with (24) 4' 2-lamp T8 fixtures in the all area
- (8) 4' 3-lamp T8 fixtures with (8) LED fixtures in the classroom area
- (20) 4' 3-lamp T12 fixtures with (20) LED fixtures in the exam room area
- (9) 4' 3-lamp T12 fixtures with (9) LED fixtures in the music therapy area
- (4) T12 fixtures with (4) 4' 2-lamp T8 fixtures in the shop area
- (2) 4' 4-lamp T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the shop area
- (1) T8 fixture with (1) 4' 2-lamp T8 fixture in the shop area
- (22) T12 fixtures with (22) 4' 3-lamp T8 fixtures in the shop area
- (3) T12 fixtures with (3) 4' 2-lamp T8 fixtures in the shop area
- (52) 4' 4-lamp T12 fixtures with (52) LED fixtures in the shop area
- (10) T12 fixtures with (10) 4' 2-lamp T8 fixtures in the shop area
- (4) T12 fixtures with (4) 4' 2-lamp T8 fixtures in the shop area
- (13) T12 fixtures with (13) 4' 2-lamp T8 fixtures in the shop area

- (2) T12 fixtures with (2) 4' 2-lamp T8 fixtures in the shop area
- (1) 4' 4-lamp T12 fixture with (1) LED fixture in the shop area
- (16) metal halide fixtures with (16) LED fixtures in the warehouse area
- (7) metal halide fixtures with (7) 4' 4-lamp T5HO fixtures in the warehouse area
- (12) 4' 4-lamp T12 fixtures with (12) LED fixtures in the warehouse area
- (8) T12 fixtures with (8) 4' 2-lamp T8 fixtures in the warehouse area
- (5) T12 fixtures with (5) 4' 2-lamp T8 fixtures in the warehouse area
- (5) 8' 2-lamp T12 fixtures with (5) 8' 4-lamp T8 fixtures in the warehouse area
- (14) 4' 4-lamp T12 fixtures with (14) LED fixtures in the surgery area
- (3) U-tube 2-lamp T12 fixtures with (3) LED fixtures and (1) occupancy sensor in the body scan area
- (3) T12 fixtures with (3) 4' 1-lamp T8 fixtures in the dental area
- (6) U-tube 2-lamp T12 fixtures with (6) LED fixtures in the dental area
- (6) 4' 4-lamp T12 fixtures with (6) LED fixtures and (3) occupancy sensors in the dental area
- (2) incandescent fixtures with (2) LED fixtures and (1) occupancy sensor in the exam room area
- (12) T12 fixtures with (12) 4' 1-lamp T8 fixtures in the exam room area
- (2) T12 fixtures with (2) 4' 4-lamp T8 fixtures and (1) occupancy sensor in the exam room area
- (21) 4' 3-lamp T12 fixtures with (21) LED fixtures and (7) occupancy sensors in the exam room area
- (41) 4' 4-lamp T12 fixtures with (41) LED fixtures and (11) occupancy sensors in the exam room area
- (21) 4' 4-lamp T12 fixtures with (21) LED fixtures and (9) occupancy sensors in the exam room area
- (1) 4' 4-lamp T12 fixture with (1) LED fixture in the ultrasound area
- (1) U-tube 2-lamp T12 fixture with (1) LED fixture in the x-ray area
- (1) 4' 4-lamp T12 fixture with (1) LED fixture and (1) occupancy sensor in the x-ray area
- (2) U-tube 2-lamp T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the x-ray review area
- (5) 4' 3-lamp T12 fixtures with (5) LED fixtures and (1) occupancy sensor in the exam room area
- (2) 4' 3-lamp T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the treatment area
- (12) 4' 3-lamp T8 fixtures with (12) LED fixtures and (4) occupancy sensors in the exam room area
- (1) U-tube 2-lamp T12 fixture with (1) LED fixture in the office area
- (90) 4' 4-lamp T12 fixtures with (90) LED fixtures and (32) occupancy sensors in the office area
- (1) 4' 4-lamp T8 fixture with (1) LED fixture and (1) occupancy sensor in the kitchenette area
- (42) 4' 4-lamp T12 fixtures with (42) LED fixtures and (10) occupancy sensors in the office are
- (2) 4' 4-lamp T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the police area

- (1) 4' 4-lamp T12 fixture with (1) LED fixture and (1) occupancy sensor in the kitchenette area
- (1) 4' 4-lamp T8 fixture with (1) LED fixture and (1) occupancy sensor in the kitchenette area
- (2) T12 fixtures with (2) 4' 1-lamp T8 fixtures in the office area
- (4) U-tube 2-lamp T12 fixtures with (4) LED fixtures and (1) occupancy sensor in the office area
- (50) 4' 4-lamp T12 fixtures with (50) LED fixtures and (16) occupancy sensors in the office area
- (4) 4' 4-lamp T12 fixtures with (4) LED fixtures and (1) occupancy sensor in the office area
- (3) incandescent fixtures with (3) LED fixtures in the office area
- (1) 4' 4-lamp T12 fixture with (1) LED fixture in the office area
- (39) 4' 4-lamp T12 fixtures with (39) LED fixtures and (21) occupancy sensors in the office area
- (2) 4' 4-lamp T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the office area
- (55) 4' 4-lamp T12 fixtures with (55) LED fixtures and (22) occupancy sensors in the office area
- (26) 4' 4-lamp T8 fixtures with (26) LED fixtures and (5) occupancy sensors in the office area
- (31) 4' 4-lamp T12 fixtures with (31) LED fixtures and (12) occupancy sensors in the office area
- (35) 4' 4-lamp T8 fixtures with (35) LED fixtures and (12) occupancy sensors in the office area
- (21) 4' 4-lamp T12 fixtures with (21) LED fixtures and (11) occupancy sensors in the office area
- (39) 4' 4-lamp T8 fixtures with (39) LED fixtures and (11) occupancy sensors in the office area
- (2) 4' 4-lamp T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the front office area
- (1) U-tube 2-lamp T12 fixture with (1) LED fixture in the office area
- (6) 4' 4-lamp T12 fixtures with (6) LED fixtures and (2) occupancy sensors in the office area
- (1) U-tube 2-lamp T12 fixture with (1) LED fixture in the office area
- (24) 4' 4-lamp T12 fixtures with (24) LED fixtures and (9) occupancy sensors in the office area
- (4) U-tube 2-lamp T12 fixtures with (4) LED fixtures and (1) occupancy sensor in the office area
- (2) 4' 4-lamp T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the office area
- (9) 4' 4-lamp T12 fixtures with (9) LED fixtures and (4) occupancy sensors in the office area
- (11) U-tube 2-lamp T12 fixtures with (11) LED fixtures and (3) occupancy sensors in the office area

- (6) 4' 3-lamp T12 fixtures with (6) LED fixtures and (2) occupancy sensors in the office area
- (100) 4' 4-lamp T12 fixtures with (100) LED fixtures and (40) occupancy sensors in the office area
- (10) 4' 4-lamp T8 fixtures with (10) LED fixtures and (4) occupancy sensors in the office area
- (6) 4' 4-lamp T12 fixtures with (6) LED fixtures and (1) occupancy sensor in the therapy area
- (1) U-tube 2-lamp T12 fixture with (1) LED fixture in the office area
- (4) 4' 4-lamp T12 fixtures with (4) LED fixtures and (1) occupancy sensor in the office area
- (6) 4' 4-lamp T12 fixtures with (6) LED fixtures and (1) occupancy sensor in the server room area
- (5) 4' 3-lamp T12 fixtures with (5) LED fixtures and (1) occupancy sensor in the admissions area
- (1) 4' 4-lamp T12 fixture with (1) LED fixture and (1) occupancy sensor in the file office area
- (2) incandescent fixtures with (2) LED fixtures in the files area
- (2) U-tube 2-lamp T12 fixtures with (2) LED fixtures in the files area
- (2) U-tube 2-lamp T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the files area
- (6) 4' 4-lamp T12 fixtures with (6) LED fixtures in the files area
- (4) 4' 4-lamp T12 fixtures with (4) LED fixtures in the files area
- (1) 4' 4-lamp T12 fixture with (1) LED fixture and (1) occupancy sensor in the ice area
- (2) incandescent fixtures with (2) LED fixtures and (1) occupancy sensor in the office area
- (51) T12 fixtures with (51) 4' 1-lamp T8 fixtures and (11) occupancy sensors in the office area
- (11) T12 fixtures with (11) 4' 4-lamp T8 fixtures and (1) occupancy sensor in the office area
- (6) U-tube 2-lamp T12 fixtures with (6) LED fixtures in the office area
- (30) 4' 3-lamp T12 fixtures with (30) LED fixtures and (10) occupancy sensors in the office area
- (83) 4' 4-lamp T12 fixtures with (83) LED fixtures and (28) occupancy sensors in the office area
- (55) 4' 4-lamp T12 fixtures with (55) LED fixtures and (22) occupancy sensors in the office area
- (1) T12 fixture with (1) 4' 1-lamp T8 fixture in the police area
- (3) 4' 3-lamp T12 fixtures with (3) LED fixtures and (1) occupancy sensor in the police area
- (15) 4' 4-lamp T12 fixtures with (15) LED fixtures and (6) occupancy sensors in the office area
- (6) 4' 3-lamp T12 fixtures with (6) LED fixtures and (1) occupancy sensor in the art therapy area
- (16) 4' 3-lamp T12 fixtures with (16) LED fixtures and (8) occupancy sensors in the charting area

- (2) 4' 3-lamp T12 fixtures with (2) LED fixtures and (2) occupancy sensors in the nourishment area
- (6) 4' 3-lamp T12 fixtures with (6) LED fixtures and (4) occupancy sensors in the nourishment area
- (1) U-tube 2-lamp T12 fixture with (1) LED fixture and (2) occupancy sensors in the office area
- (131) 4' 3-lamp T12 fixtures with (131) LED fixtures and (41) occupancy sensors in the office area
- (1) 4' 4-lamp T12 fixture with (1) LED fixture and (1) occupancy sensor in the office area
- (6) 4' 3-lamp T8 fixtures with (6) LED fixtures and (2) occupancy sensors in the office area
- (4) 4' 3-lamp T12 fixtures with (4) LED fixtures and (1) occupancy sensor in the office/kitchen area
- (12) 4' 3-lamp T12 fixtures with (12) LED fixtures and (5) occupancy sensors in the quiet room area
- (6) 4' 3-lamp T8 fixtures with (6) LED fixtures and (3) occupancy sensors in the quiet room area
- (3) 4' 3-lamp T12 fixtures with (3) LED fixtures and (1) occupancy sensor in the speech area
- (1) U-tube 2-lamp T12 fixture with (1) LED fixture in the office area
- (46) 4' 3-lamp T12 fixtures with (46) LED fixtures and (15) occupancy sensors in the office area
- (4) 4' 3-lamp T8 fixtures with (4) LED fixtures and (2) occupancy sensors in the canteen office area
- (4) 4' 3-lamp T8 fixtures with (4) LED fixtures and (4) occupancy sensors in the coffee area
- (6) 4' 3-lamp T8 fixtures with (6) LED fixtures and (1) occupancy sensor in the lounge area
- (2) incandescent fixtures with (2) LED fixtures in the office area
- (5) T8 fixtures with (5) 4' 1-lamp T8 fixtures and (4) occupancy sensors in the office area
- (50) 4' 3-lamp T8 fixtures with (50) LED fixtures and (23) occupancy sensors in the office area
- (1) 4' 4-lamp T12 fixture with (1) LED fixture in the server area
- (1) incandescent fixture with (1) LED fixture in the communication area
- (1) T12 fixture with (1) 4' 2-lamp T8 fixture in the server room area
- (1) 4' 4-lamp T12 fixture with (1) LED fixture in the supply area
- (6) 4' 4-lamp T12 fixtures with (6) LED fixtures in the office area
- (5) metal halide fixtures with (5) LED fixtures in the exterior area
- (1) metal halide fixture with (1) LED fixture in the exterior area
- (1) incandescent fixture with (1) LED fixture in the exterior area
- (1) U-tube 2-lamp T12 fixture with (1) LED fixture in the office area
- (8) 4' 4-lamp T12 fixtures with (8) LED fixtures in the office area
- (2) T12 fixtures with (2) 4' 1-lamp T8 fixtures in the barber shop area
- (4) 4' 4-lamp T12 fixtures with (4) LED fixtures in the barber shop area
- (6) 4' 4-lamp T12 fixtures with (6) LED fixtures in the office area
- (1) 4' 4-lamp T8 fixture with (1) LED fixture in the office area

- (6) U-tube 2-lamp T12 fixtures with (6) LED fixtures in the body scan area
- (3) 4' 4-lamp T12 fixtures with (3) LED fixtures in the clean room area
- (11) 4' 4-lamp T12 fixtures with (11) LED fixtures in the clean room area
- (2) 4' 4-lamp T12 fixtures with (2) LED fixtures in the clean room area
- (4) U-tube 2-lamp T12 fixtures with (4) LED fixtures in the exam hall unit area
- (2) 4' 4-lamp T12 fixtures with (2) LED fixtures in the help desk area
- (2) incandescent fixtures with (2) LED fixtures in the IT area
- (1) incandescent fixture with (1) LED fixture in the phone area
- (3) T12 fixtures with (3) 4' 2-lamp T8 fixtures in the phone area
- (1) 4' 4-lamp T12 fixture with (1) LED fixture in the print area
- (3) T12 fixtures with (3) 4' 4-lamp T8 fixtures in the prosthetics shop area
- (1) T12 fixture with (1) 4' 2-lamp T8 fixture in the server room area
- (1) 4' 4-lamp T12 fixture with (1) LED fixture in the server room area
- (4) incandescent fixtures with (4) LED fixtures in the sound pod area
- (1) U-tube 2-lamp T12 fixture with (1) LED fixture in the office area
- (2) 4' 3-lamp T12 fixtures with (2) LED fixtures in the kitchen area
- (21) T12 fixtures with (21) 4' 4-lamp T8 fixtures in the office area
- (12) U-tube 2-lamp T12 fixtures with (12) LED fixtures in the office area
- (2) 4' 3-lamp T8 fixtures with (2) LED fixtures in the office area
- (4) T12 fixtures with (4) 4' 2-lamp T8 fixtures in the server room area
- (4) T8 fixtures with (4) 4' 2-lamp T8 fixtures in the IT area
- (7) T12 fixtures with (7) 4' 4-lamp T8 fixtures in the lab area
- (57) 4' 4-lamp T12 fixtures with (57) LED fixtures in the lab area
- (2) 4' 4-lamp T12 fixtures with (2) LED fixtures in the MRI area
- (6) 4' 4-lamp T12 fixtures with (6) LED fixtures in the prosthetics shop area
- (2) 4' 4-lamp T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the copy area
- (2) 4' 4-lamp T12 fixtures with (2) LED fixtures and (2) occupancy sensors in the copy area
- (1) 4' 4-lamp T12 fixture with (1) LED fixture and (1) occupancy sensor in the copy area
- (2) 4' 4-lamp T12 fixtures with (2) LED fixtures and (2) occupancy sensors in the copy area
- (1) 4' 4-lamp T8 fixture with (1) LED fixture and (1) occupancy sensor in the copy area
- (5) 4' 4-lamp T12 fixtures with (5) LED fixtures and (2) occupancy sensors in the copy area
- (1) 4' 3-lamp T12 fixture with (1) LED fixture and (1) occupancy sensor in the copy area
- (1) T12 fixture with (1) 4' 2-lamp T8 fixture in the copy area
- (5) 4' 3-lamp T12 fixtures with (5) LED fixtures in the consultations area
- (8) 4' 3-lamp T12 fixtures with (8) LED fixtures in the office area
- (13) 4' 3-lamp T12 fixtures with (13) LED fixtures in the physical therapy area
- (25) 4' 3-lamp T12 fixtures with (25) LED fixtures in the recreation clinic area
- (32) 4' 3-lamp T12 fixtures with (32) LED fixtures in the break room area
- (20) 4' 4-lamp T12 fixtures with (20) LED fixtures and (2) occupancy sensors in the open office area
- (12) 4' 4-lamp T12 fixtures with (12) LED fixtures and (2) occupancy sensors in the rec room area

- (8) 4' 4-lamp T12 fixtures with (8) LED fixtures and (1) occupancy sensor in the office area
- (7) 4' 4-lamp T12 fixtures with (7) LED fixtures and (2) occupancy sensors in the open office area
- (8) U-tube 2-lamp T12 fixtures with (8) LED fixtures and (4) occupancy sensors in the office area
- (10) 4' 4-lamp T12 fixtures with (10) LED fixtures and (1) occupancy sensor in the office area
- (7) 4' 4-lamp T8 fixtures with (7) LED fixtures and (1) occupancy sensor in the office area
- (15) 4' 4-lamp T12 fixtures with (15) LED fixtures and (5) occupancy sensors in the open office area
- (4) 4' 4-lamp T8 fixtures with (4) LED fixtures in the open office area
- (10) 4' 4-lamp T12 fixtures with (10) LED fixtures and (1) occupancy sensor in the computer room area
- (12) 8' 1-lamp T12 fixtures with (12) 8' 2-lamp T8 fixtures and (2) occupancy sensors in the server room area
- (1) T12 fixture with (1) 4' 1-lamp T8 fixture and (1) occupancy sensor in the morgue area
- (4) T12 fixtures with (4) 4' 2-lamp T8 fixtures in the morgue area
- (3) 4' 4-lamp T12 fixtures with (3) LED fixtures in the morgue area
- (9) 4' 4-lamp T8 fixtures with (9) LED fixtures in the morgue area
- (1) U-tube 2-lamp T12 fixture with (1) LED fixture in the open office area
- (2) 4' 3-lamp T12 fixtures with (2) LED fixtures in the open office area
- (29) 4' 4-lamp T12 fixtures with (29) LED fixtures and (2) occupancy sensors in the open office area
- (6) U-tube 2-lamp T12 fixtures with (6) LED fixtures and (1) occupancy sensor in the small hallway unit area
- (2) U-tube 2-lamp T12 fixtures with (2) LED fixtures in the open office area
- (6) 4' 3-lamp T12 fixtures with (6) LED fixtures and (2) occupancy sensors in the open office area
- (40) 4' 3-lamp T8 fixtures with (40) LED fixtures and (4) occupancy sensors in the canteen area
- (1) U-tube 2-lamp T12 fixture with (1) LED fixture in the open office area
- (7) 4' 4-lamp T12 fixtures with (7) LED fixtures in the open office area
- (3) 4' 4-lamp T12 fixtures with (3) LED fixtures in the open office area
- (13) 4' 4-lamp T12 fixtures with (13) LED fixtures in the open office area
- (16) 4' 4-lamp T12 fixtures with (16) LED fixtures in the server room area
- (4) 4' 4-lamp T12 fixtures with (4) LED fixtures in the open office area
- (15) 4' 3-lamp T12 fixtures with (15) LED fixtures in the occupational therapy area
- (1) T12 fixture with (1) 4' 2-lamp T8 fixture in the restroom men's area
- (1) T12 fixture with (1) 4' 2-lamp T8 fixture in the restroom women's area
- (2) T12 fixtures with (2) 4' 2-lamp T8 fixtures in the restroom area
- (5) T12 fixtures with (5) 4' 2-lamp T8 fixtures in the restroom men's area
- (16) 4' 3-lamp T12 fixtures with (16) LED fixtures in the day room area
- (16) 4' 3-lamp T12 fixtures with (16) LED fixtures in the day room area
- (32) 4' 3-lamp T12 fixtures with (32) LED fixtures in the dayroom area

- (3) 4' 4-lamp T8 fixtures with (3) LED fixtures in the laundry area
- (1) 4' 4-lamp T8 fixture with (1) LED fixture in the laundry area
- (2) metal halide fixtures with (2) LED fixtures in the perimeter - exterior area
- (3) metal halide fixtures with (3) LED fixtures in the consolidated exterior area
- (2) incandescent fixtures with (2) LED fixtures in the consolidated exterior area
- (1) metal halide fixture with (1) LED fixture in the a - consolidated - exterior area
- (1) metal halide fixture with (1) LED fixture in the consolidated - exterior area
- (3) metal halide fixtures with (3) LED fixtures in the exterior area
- (1) incandescent fixture with (1) LED fixture in the porch area
- (1) metal halide fixture with (1) LED fixture in the exterior area
- (2) metal halide fixtures with (2) LED fixtures in the exterior area
- (1) metal halide fixture with (1) LED fixture in the consolidated - exterior area
- (1) incandescent fixture with (1) LED fixture in the perimeter area
- (1) metal halide fixture with (1) LED fixture in the driveway - exterior area
- (2) metal halide fixtures with (2) LED fixtures in the garages - exterior area
- (21) incandescent fixtures with (21) LED fixtures in the canopy area
- (8) metal halide fixtures with (8) LED fixtures in the exterior area
- (12) metal halide fixtures with (12) LED fixtures in the exterior area
- (5) metal halide fixtures with (5) LED fixtures in the exterior area
- (6) metal halide fixtures with (6) LED fixtures in the exterior area
- (18) metal halide fixtures with (18) LED fixtures in the exterior area
- (14) metal halide fixtures with (14) LED fixtures in the exterior area
- (10) metal halide fixtures with (10) LED fixtures in the exterior area
- (3) metal halide fixtures with (3) LED fixtures in the exterior area
- (2) metal halide fixtures with (2) LED fixtures in the exterior area
- (29) metal halide fixtures with (29) LED fixtures in the exterior area
- (2) incandescent fixtures with (2) LED fixtures in the exterior area
- (2) 4' 4-lamp T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the lounge area
- (2) 4' 4-lamp T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the lunchroom area
- (2) 4' 4-lamp T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the lounge area
- (1) U-tube 2-lamp T12 fixture with (1) LED fixture and (1) occupancy sensor in the break room area
- (4) 4' 4-lamp T8 fixtures with (4) LED fixtures and (2) occupancy sensors in the break room area
- (4) 4' 4-lamp T8 fixtures with (4) LED fixtures and (2) occupancy sensors in the break room area
- (1) 4' 4-lamp T12 fixture with (1) LED fixture and (1) occupancy sensor in the kitchen area
- (2) 4' 4-lamp T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the kitchen area
- (1) T12 fixture with (1) 4' 2-lamp T8 fixture and (1) occupancy sensor in the kitchen area
- (1) U-tube 2-lamp T12 fixture with (1) LED fixture in the break room area

- (4) 4' 3-lamp T12 fixtures with (4) LED fixtures and (1) occupancy sensor in the break room area
- (2) 4' 4-lamp T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the break room area
- (1) 4' 4-lamp T12 fixture with (1) LED fixture and (1) occupancy sensor in the break room area
- (3) 4' 4-lamp T12 fixtures with (3) LED fixtures and (1) occupancy sensor in the lounge area
- (2) U-tube 2-lamp T12 fixtures with (2) LED fixtures and (2) occupancy sensors in the break room area
- (4) 4' 3-lamp T12 fixtures with (4) LED fixtures and (1) occupancy sensor in the break room area
- (3) 4' 4-lamp T12 fixtures with (3) LED fixtures and (2) occupancy sensors in the break room area
- (11) 4' 3-lamp T12 fixtures with (11) LED fixtures and (3) occupancy sensors in the break room area
- (8) 4' 3-lamp T8 fixtures with (8) LED fixtures and (4) occupancy sensors in the lounge area
- (1) 4' 4-lamp T12 fixture with (1) LED fixture in the kitchen area
- (5) 4' 4-lamp T12 fixtures with (5) LED fixtures in the kitchen area
- (1) incandescent fixture with (1) LED fixture in the game room area
- (1) 4' 4-lamp T12 fixture with (1) LED fixture and (1) occupancy sensor in the waiting room area
- (4) T12 fixtures with (4) 4' 1-lamp T8 fixtures and (1) occupancy sensor in the TV room area
- (1) T12 fixture with (1) 4' 1-lamp T8 fixture in the waiting room area
- (6) U-tube 2-lamp T12 fixtures with (6) LED fixtures in the waiting room area
- (3) 4' 4-lamp T12 fixtures with (3) LED fixtures and (1) occupancy sensor in the waiting room area
- (2) T12 fixtures with (2) 4' 2-lamp T8 fixtures in the TV area
- (2) U-tube 2-lamp T12 fixtures with (2) LED fixtures in the waiting area
- (1) 4' 4-lamp T12 fixture with (1) LED fixture in the restroom area
- (7) 4' 4-lamp T12 fixtures with (7) LED fixtures and (4) occupancy sensors in the restroom area
- (4) T12 fixtures with (4) 4' 1-lamp T8 fixtures in the restroom area
- (1) U-tube 2-lamp T12 fixture with (1) LED fixture and (1) occupancy sensor in the restroom area
- (6) 4' 4-lamp T12 fixtures with (6) LED fixtures and (3) occupancy sensors in the restroom area
- (2) T12 fixtures with (2) 4' 1-lamp T8 fixtures in the restroom area
- (4) 4' 4-lamp T12 fixtures with (4) LED fixtures and (2) occupancy sensors in the restroom area
- (1) incandescent fixture with (1) LED fixture in the restroom area
- (3) T12 fixtures with (3) 4' 1-lamp T8 fixtures in the restroom area
- (1) 4' 4-lamp T12 fixture with (1) LED fixture and (2) occupancy sensors in the restroom area

- (1) 4' 4-lamp T12 fixture with (1) LED fixture and (1) occupancy sensor in the restroom area
- (1) 4' 4-lamp T12 fixture with (1) LED fixture and (1) occupancy sensor in the restroom area
- (2) 4' 4-lamp T12 fixtures with (2) LED fixtures and (2) occupancy sensors in the restroom area
- (4) 4' 4-lamp T12 fixtures with (4) LED fixtures and (1) occupancy sensor in the restroom men's area
- (2) incandescent fixtures with (2) LED fixtures and (2) occupancy sensors in the restroom area
- (1) T12 fixture with (1) 4' 2-lamp T8 fixture in the restroom area
- (2) incandescent fixtures with (2) LED fixtures in the restroom area
- (1) T12 fixture with (1) 4' 1-lamp T8 fixture and (1) occupancy sensor in the restroom area
- (2) T12 fixtures with (2) 4' 2-lamp T8 fixtures and (1) occupancy sensor in the restroom area
- (3) U-tube 2-lamp T12 fixtures with (3) LED fixtures and (2) occupancy sensors in the restroom area
- (4) 4' 4-lamp T12 fixtures with (4) LED fixtures and (2) occupancy sensors in the restroom area
- (3) 4' 4-lamp T12 fixtures with (3) LED fixtures and (1) occupancy sensor in the restroom area
- (1) 4' 4-lamp T12 fixture with (1) LED fixture and (1) occupancy sensor in the restroom men's area
- (4) incandescent fixtures with (4) LED fixtures and (1) occupancy sensor in the restroom women's area
- (2) T12 fixtures with (2) 4' 2-lamp T8 fixtures in the restroom men's area
- (1) 4' 3-lamp T12 fixture with (1) LED fixture and (1) occupancy sensor in the restroom men's area
- (2) T8 fixtures with (2) 4' 2-lamp T8 fixtures and (1) occupancy sensor in the restroom men's area
- (2) T12 fixtures with (2) 4' 2-lamp T8 fixtures and (1) occupancy sensor in the restroom women's area
- (1) T12 fixture with (1) 4' 2-lamp T8 fixture and (2) occupancy sensors in the restroom men's area
- (1) T12 fixture with (1) 4' 2-lamp T8 fixture and (2) occupancy sensors in the restroom women's area
- (1) 4' 4-lamp T8 fixture with (1) LED fixture and (1) occupancy sensor in the canteen restroom area
- (1) 4' 4-lamp T12 fixture with (1) LED fixture in the restroom area
- (2) incandescent fixtures with (2) LED fixtures in the shower area
- (1) incandescent fixture with (1) LED fixture in the restroom area
- (1) U-tube 2-lamp T12 fixture with (1) LED fixture in the restroom area
- (1) incandescent fixture with (1) LED fixture in the restroom area
- (2) 4' 4-lamp T12 fixtures with (2) LED fixtures in the nurse area
- (8) 4' 3-lamp T12 fixtures with (8) LED fixtures in the nurses station area

- (48) T12 fixtures with (48) 4' 2-lamp T8 fixtures in the shower area
- (16) T12 fixtures with (16) 4' 2-lamp T8 fixtures in the shower area
- (3) T12 fixtures with (3) 4' 2-lamp T8 fixtures in the restroom area
- (20) 4' 3-lamp T8 fixtures with (20) LED fixtures in the nurse station area
- (23) T12 fixtures with (23) 4' 2-lamp T8 fixtures in the basement area
- (10) T12 fixtures with (10) 4' 2-lamp T8 fixtures in the basement area
- (40) T12 fixtures with (40) 4' 2-lamp T8 fixtures in the storage area
- (39) T12 fixtures with (39) 4' 2-lamp T8 fixtures in the storage area
- (28) T12 fixtures with (28) 4' 2-lamp T8 fixtures in the storage area
- (7) T12 fixtures with (7) 4' 2-lamp T8 fixtures in the basement area
- (19) T12 fixtures with (19) 4' 2-lamp T8 fixtures in the mechanical area
- (14) T12 fixtures with (14) 4' 2-lamp T8 fixtures in the mechanical area
- (7) T8 fixtures with (7) 4' 2-lamp T8 fixtures in the mechanical area
- (7) T12 fixtures with (7) 4' 2-lamp T8 fixtures in the equipment area
- (7) T12 fixtures with (7) 4' 2-lamp T8 fixtures in the mechanical area
- (11) T12 fixtures with (11) 4' 2-lamp T8 fixtures in the storage area
- (2) 4' 4-lamp T12 fixtures with (2) LED fixtures in the supplies area
- (16) T12 fixtures with (16) 4' 2-lamp T8 fixtures in the mechanical area
- (40) T12 fixtures with (40) 4' 2-lamp T8 fixtures in the mechanical area
- (8) T12 fixtures with (8) 4' 2-lamp T8 fixtures in the storage area
- (21) 4' 3-lamp T12 fixtures with (21) LED fixtures in the dining area
- (6) 4' 4-lamp T12 fixtures with (6) LED fixtures in the ingredient control area
- (106) T12 fixtures with (106) 4' 2-lamp T8 fixtures in the kitchen area
- (1) T12 fixture with (1) 4' 2-lamp T8 fixture in the serving area
- (5) 4' 3-lamp T12 fixtures with (5) LED fixtures in the serving area
- (47) T12 fixtures with (47) 4' 2-lamp T8 fixtures in the wash room area
- (8) T8 fixtures with (8) 4' 3-lamp T8 fixtures in the canteen dry goods area
- (1) T12 fixture with (1) 4' 2-lamp T8 fixture in the canteen kitchen area
- (11) 4' 3-lamp T8 fixtures with (11) LED fixtures in the canteen kitchen area
- (1) U-tube 2-lamp T12 fixture with (1) LED fixture and (3) occupancy sensors in the hall area
- (1) T12 fixture with (1) 4' 1-lamp T8 fixture and (1) occupancy sensor in the entry area
- (2) 4' 4-lamp T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the entry area
- (2) 4' 4-lamp T8 fixtures with (2) LED fixtures and (1) occupancy sensor in the entry area
- (2) 4' 4-lamp T8 fixtures with (2) LED fixtures and (1) occupancy sensor in the entry area
- (10) 4' 4-lamp T12 fixtures with (10) LED fixtures and (3) occupancy sensors in the hall area
- (3) 4' 4-lamp T12 fixtures with (3) LED fixtures and (2) occupancy sensors in the short hall area
- (1) 4' 3-lamp T12 fixture with (1) LED fixture and (1) occupancy sensor in the hallway area
- (3) 4' 4-lamp T12 fixtures with (3) LED fixtures in the hallway area
- (2) 4' 3-lamp T12 fixtures with (2) LED fixtures and (1) occupancy sensor in the lobby area

- (8) U-tube 2-lamp T12 fixtures with (8) LED fixtures and (2) occupancy sensors in the hall area
- (4) 4' 4-lamp T12 fixtures with (4) LED fixtures and (1) occupancy sensor in the entrance area
- (3) 4' 4-lamp T12 fixtures with (3) LED fixtures and (1) occupancy sensor in the hallway area
- (6) U-tube 2-lamp T12 fixtures with (6) LED fixtures and (1) occupancy sensor in the hallway area
- (1) 4' 4-lamp T12 fixture with (1) LED fixture in the hallway unit area
- (9) U-tube 2-lamp T12 fixtures with (9) LED fixtures and (2) occupancy sensors in the hallway unit b area
- (17) U-tube 2-lamp T12 fixtures with (17) LED fixtures and (4) occupancy sensors in the hallway unit c area
- (1) 4' 4-lamp T12 fixture with (1) LED fixture and (1) occupancy sensor in the hallway unit c area
- (1) 4' 4-lamp T12 fixture with (1) LED fixture in the hallways unit area
- (30) U-tube 2-lamp T12 fixtures with (30) LED fixtures and (6) occupancy sensors in the hallways unit a & waiting area
- (3) U-tube 2-lamp T12 fixtures with (3) LED fixtures and (1) occupancy sensor in the short hall area
- (3) U-tube 2-lamp T12 fixtures with (3) LED fixtures and (1) occupancy sensor in the short hall unit c area
- (10) U-tube 2-lamp T12 fixtures with (10) LED fixtures in the unit a hall area
- (1) T12 fixture with (1) 4' 2-lamp T8 fixture in the hallway area
- (32) T12 fixtures with (32) 4' 2-lamp T8 fixtures in the hallway area
- (7) U-tube 2-lamp T12 fixtures with (7) LED fixtures in the hallway area
- (2) 8' 2-lamp T12 fixtures with (2) 8' 4-lamp T8 fixtures in the hallway/birdcage area
- (1) 4' 3-lamp T12 fixture with (1) LED fixture and (1) occupancy sensor in the vestibule area
- (8) 4' 3-lamp T12 fixtures with (8) LED fixtures and (2) occupancy sensors in the hallway area
- (4) 4' 3-lamp T12 fixtures with (4) LED fixtures and (1) occupancy sensor in the lobby area
- (3) 4' 3-lamp T8 fixtures with (3) LED fixtures and (1) occupancy sensor in the hall office area
- (14) T8 fixtures with (14) 4' 2-lamp T8 fixtures and (2) occupancy sensors in the hallway patient b-wing area
- (5) 4' 2-lamp T8 fixtures with (5) LED fixtures and (1) occupancy sensor in the hallway patient b-wing area
- (7) 4' 2-lamp T8 fixtures with (7) LED fixtures and (1) occupancy sensor in the hallway patient c-wing area
- (1) 4' 4-lamp T12 fixture with (1) LED fixture in the vestibule area
- (1) 4' 4-lamp T12 fixture with (1) LED fixture in the vestibule area
- (1) 4' 4-lamp T12 fixture with (1) LED fixture in the hallway area
- (1) incandescent fixture with (1) LED fixture in the vestibule area
- (1) 4' 4-lamp T12 fixture with (1) LED fixture in the vestibule area

- (2) U-tube 2-lamp T12 fixtures with (2) LED fixtures in the entry area
- (1) 4' 4-lamp T12 fixture with (1) LED fixture in the entry area
- (1) 4' 3-lamp T12 fixture with (1) LED fixture in the entrance area
- (24) U-tube 2-lamp T12 fixtures with (24) LED fixtures in the lobby area
- (1) 4' 4-lamp T12 fixture with (1) LED fixture in the vestibule area
- (1) 4' 4-lamp T12 fixture with (1) LED fixture in the entrance area
- (3) U-tube 2-lamp T12 fixtures with (3) LED fixtures in the hallway area
- (1) T12 fixture with (1) 4' 1-lamp T8 fixture in the hallway unit b area
- (10) U-tube 2-lamp T12 fixtures with (10) LED fixtures in the hallway unit c area
- (1) 4' 4-lamp T12 fixture with (1) LED fixture in the lobby area
- (4) 4' 3-lamp T12 fixtures with (4) LED fixtures in the nurse station unit c area
- (5) U-tube 2-lamp T12 fixtures with (5) LED fixtures in the patient hall unit c area
- (1) T12 fixture with (1) 4' 2-lamp T8 fixture in the short hall unit c area
- (4) 4' 4-lamp T12 fixtures with (4) LED fixtures in the entrance area
- (6) 4' 2-lamp T12 fixtures with (6) LED fixtures in the hallway area
- (44) T12 fixtures with (44) 4' 2-lamp T8 fixtures in the hallway/elevator lobby area
- (1) 4' 3-lamp T12 fixture with (1) LED fixture in the patient room vestibule area
- (1) 4' 3-lamp T12 fixture with (1) LED fixture in the patient vestibule area
- (9) 4' 3-lamp T12 fixtures with (9) LED fixtures in the hallway area
- (2) T12 fixtures with (2) 4' 2-lamp T8 fixtures and (1) occupancy sensor in the lockers area
- (5) U-tube 2-lamp T12 fixtures with (5) LED fixtures and (2) occupancy sensors in the lockers area
- (8) incandescent fixtures with (8) LED fixtures in the lockers area
- (1) incandescent fixture with (1) LED fixture in the truck bay area
- (4) T12 fixtures with (4) 4' 1-lamp T8 fixtures in the elevator area
- (1) U-tube 2-lamp T12 fixture with (1) LED fixture in the stairs area
- (3) 4' 4-lamp T12 fixtures with (3) LED fixtures in the stairs area
- (1) T12 fixture with (1) 4' 2-lamp T8 fixture in the elevator area
- (2) T12 fixtures with (2) 4' 2-lamp T8 fixtures in the garage area
- (3) U-tube 2-lamp T12 fixtures with (3) LED fixtures in the hallway unit b area
- (11) U-tube 2-lamp T12 fixtures with (11) LED fixtures in the hallway unit c area
- (7) U-tube 2-lamp T12 fixtures with (7) LED fixtures in the hallways unit a & waiting area
- (4) U-tube 2-lamp T12 fixtures with (4) LED fixtures in the main pharmacy area
- (3) U-tube 2-lamp T12 fixtures with (3) LED fixtures in the main pharmacy area
- (34) 4' 4-lamp T12 fixtures with (34) LED fixtures in the main pharmacy area
- (4) U-tube 2-lamp T12 fixtures with (4) LED fixtures in the patient hall unit c area
- (1) U-tube 2-lamp T12 fixture with (1) LED fixture in the short hall unit c area
- (22) T12 fixtures with (22) 4' 2-lamp T8 fixtures in the garage area
- (4) T12 fixtures with (4) 4' 2-lamp T8 fixtures in the elevator area
- (1) U-tube 2-lamp T12 fixture with (1) LED fixture in the hallway area
- (12) 4' 2-lamp T12 fixtures with (12) LED fixtures in the hallway area
- (2) T12 fixtures with (2) 4' 2-lamp T8 fixtures in the stairs area
- (1) T12 fixture with (1) 4' 2-lamp T8 fixture in the tunnel area
- (1) 8' 2-lamp T12 fixture with (1) 8' 4-lamp T8 fixture in the tunnel area

- (6) T12 fixtures with (6) 4' 1-lamp T8 fixtures in the elevator area

Measurement and Verification Effort

During the M&V visit, ADM staff verified equipment installation, baseline and post-retrofit connected load, and placed eleven photo-sensor loggers at the site (from 3/03/2016 to 3/16/2016) to monitor lighting operation. These data were used to calculate energy savings.

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*

Lighting occupancy sensor energy savings are calculated as:

$$kWh_{savings} = \sum_{Area} \left[HCIF \times W \times N \times \left(t_{base} - t_{as-built} \right) / 1000 \right]$$

Where:

$kWh_{savings}$ = *Annual energy savings*

N = *Number of occupancy sensors*

W = *Wattage controlled by each occupancy sensor*

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 Custom project.

Lighting Retrofit Savings Calculations

Measure	Quantity (Fixtures)		Wattage		Hours	Expected kWh Savings	Realized kWh Savings	Heating Cooling Interaction Factor	Realization Rate
	Old	New	Old	New					
MH to LED	1	1	190	45	991	113	153	1.07	135%
2' 2L T12 to 2' 2L T8	1	1	56	24	4,702	41	161	1.07	393%
3' 2L T12 to 3' T8	1	1	66	33	4,702	42	166	1.07	393%
4' 2L T12 to LED	3	3	63	22	4,702	157	617	1.07	393%
4' 2L T12 to LED	2	2	78	22	4,702	143	562	1.07	393%
Incand. to LED	6	6	75	18	2,635	490	962	1.07	196%
4' 2L T12 to LED	1	1	63	33	2,635	43	84	1.07	196%

Measure	*Quantity (Fixtures)*		*Wattage*		*Hours*	*Expected kWh Savings*	*Realized kWh Savings*	*Heating Cooling Interaction Factor*	*Realization Rate*
	Old	*New*	*Old*	*New*					
4' 2L T8 to LED	1	1	56	33	2,635	33	65	1.07	196%
4' 2L T12 to LED	2	2	78	33	2,635	129	253	1.07	196%
4' 2L T12 to LED	1	1	78	33	2,635	65	127	1.07	196%
2' 1L T12 to 2' 1L T8	1	1	32	13	2,635	27	53	1.07	196%
3' 1L T12 to 3' 1L T8	1	1	38	17	2,635	30	59	1.07	196%
4' 2L T12 to LED	1	1	78	22	4,702	87	281	1.07	324%
4' 2L T12 to LED	1	1	78	22	4,702	87	281	1.07	324%
4' 2L T12 to LED	1	1	78	22	4,702	87	281	1.07	324%
4' 2L T12 to LED	1	1	78	22	4,702	87	281	1.07	324%
4' 2L T12 to LED	1	1	78	22	4,702	87	281	1.07	324%
4' 2L T12 to LED	1	1	78	22	4,702	87	281	1.07	324%
4' 2L T12 to LED	1	1	78	22	4,702	87	281	1.07	324%
4' 2L T12 to LED	1	1	78	22	4,702	87	281	1.07	324%
4' 2L T12 to LED	1	1	78	22	4,702	87	281	1.07	324%
4' 2L T12 to LED	1	1	78	22	4,702	87	281	1.07	324%
4' 2L T12 to LED	1	1	78	22	4,702	87	281	1.07	324%
4' 2L T12 to LED	1	1	78	22	4,702	87	281	1.07	324%
4' 2L T12 to LED	1	1	78	22	4,702	87	281	1.07	324%
4' 2L T12 to LED	1	1	78	22	4,702	87	281	1.07	324%
4' 2L T12 to LED	1	1	78	22	4,702	87	281	1.07	324%
4' 2L T12 to LED	1	1	78	22	4,702	87	281	1.07	324%
Incand. to LED	10	10	65	18	2,374	729	1,191	1.07	163%
Incand. exit sign to LED Exit Sign	1	1	30	-	2,374	47	76	1.07	163%
Incand. to LED	4	4	65	18	2,374	292	476	1.07	163%
3' 2L T12 to 3' T8	2	2	66	33	4,702	102	331	1.07	324%
4' 2L T12 to LED	1	1	78	22	4,702	87	281	1.07	324%
3' 2L T12 to 3' T8	8	8	66	33	4,702	409	1,325	1.07	324%
2' 2L T12 to 2' 2L T8	1	1	56	24	4,702	50	161	1.07	324%
3' 2L T12 to 3' T8	6	6	66	33	4,702	307	994	1.07	324%
Incand. to LED	1	1	75	20	991	86	58	1.07	68%
U-tube 2L T12 to U-tube 2L T8	1	1	60	24	991	56	38	1.07	68%
4' 2L T12 to LED	3	3	63	22	991	192	130	1.07	68%
Incand. to LED	3	3	65	18	2,374	221	357	1.07	162%
4' 2L T12 to LED	3	3	78	33	2,374	211	342	1.07	162%
U-tube 2L T12 to 2' 2L T8	1	1	79	24	991	86	58	1.07	68%
U-tube 2L T12 to 2' 2L T8	1	1	60	24	8,760	56	337	1.07	598%
4' 2L T12 to LED	3	3	63	33	2,374	141	228	1.07	162%
4' 2L T12 to LED	2	2	63	22	991	128	87	1.07	68%
4' 2L T12 to LED	5	5	63	22	991	321	217	1.07	68%
4' 2L T12 to LED	1	1	63	22	8,760	64	383	1.07	598%
4' 2L T12 to LED	1	1	78	22	991	131	59	1.07	45%
8' 4L T12 to 8' 4L T8	8	8	246	85	991	3,022	1,362	1.07	45%
8' 4L T12 to 8' 4L T8	4	4	246	85	991	1,511	681	1.07	45%
MH to 4' 3L T5HO	9	9	455	158	991	6,621	2,827	1.07	43%
8' 4L T12 to 8' 4L T8	1	1	246	85	991	399	170	1.07	43%
4' 2L T12 to LED	4	4	78	33	2,374	469	456	1.07	97%
3' 2L T12 to 3' T8	2	2	66	33	2,374	172	167	1.07	97%
4' 2L T12 to LED	1	1	78	33	2,374	117	114	1.07	97%
Incand. to LED	17	17	75	20	2,635	2,438	2,630	1.07	108%
2' 1L T12 to 2' 1L T8	1	1	32	13	2,635	50	53	1.07	108%
3' 1L T12 to 3' 1L T8	3	3	38	17	2,635	164	177	1.07	108%
4' 2L T12 to LED	6	6	63	33	2,635	469	506	1.07	108%
4' 2L T12 to LED	5	5	78	33	2,635	587	633	1.07	108%
4' 2L T12 to LED	1	1	63	33	2,635	78	84	1.07	108%
4' 2L T12 to LED	4	4	78	33	2,374	469	456	1.07	97%
4' 4L T12 to LED	10	10	146	33	2,374	2,946	2,864	1.07	97%
4' 2L T12 to LED	5	5	63	33	2,374	391	380	1.07	97%

Measure	Quantity (Fixtures)		Wattage		Hours	Expected kWh Savings	Realized kWh Savings	Heating Cooling Interaction Factor	Realization Rate
	Old	New	Old	New					
4' 2L T12 to LED	3	3	78	33	2,374	352	342	1.07	97%
4' 2L T12 to LED	2	2	78	33	2,374	235	228	1.07	97%
4' 2L T12 to LED	13	13	63	33	2,374	1,017	988	1.07	97%
4' 2L T12 to LED	2	2	78	33	2,374	235	228	1.07	97%
4' 2L T12 to LED	1	1	78	33	2,374	117	114	1.07	97%
2' 3L T5 to LED	4	4	117	32	2,374	886	862	1.07	97%
2' 2L T8 to 2' 2L T8	2	2	34	24	2,374	52	51	1.07	97%
4' 2L T12 to LED	15	15	78	33	2,374	1,760	1,711	1.07	97%
4' 2L T12 to LED	1	1	78	33	2,374	117	114	1.07	97%
4' 2L T12 to LED	2	2	78	33	2,374	235	228	1.07	97%
4' 4L T12 to LED	2	2	146	22	2,374	647	628	1.07	97%
4' 2L T12 to LED	1	1	78	22	2,374	146	142	1.07	97%
4' 4L T12 to LED	1	1	146	22	2,374	323	314	1.07	97%
4' 2L T12 to LED	6	6	78	22	2,374	876	852	1.07	97%
4' 2L T12 to LED	2	2	78	33	2,374	235	228	1.07	97%
4' 2L T12 to LED	6	6	78	33	2,374	704	684	1.07	97%
4' 4L T12 to LED	2	2	146	33	2,374	589	573	1.07	97%
4' 2L T8 to LED	2	2	56	33	2,374	120	117	1.07	97%
4' 2L T12 to LED	1	1	63	22	5,215	107	228	1.07	214%
Incand. to LED	2	2	75	20	2,374	287	279	1.07	97%
2' 1L T12 to 2' 1L T8	6	6	32	13	2,374	297	289	1.07	97%
2' 2L T12 to 2' 2L T8	1	1	56	24	2,374	83	81	1.07	97%
3' 1L T12 to 3' 1L T8	11	11	38	17	2,374	602	585	1.07	97%
3' 1L T12 to 3' 1L T8	2	2	46	17	2,374	151	147	1.07	97%
4' 2L T12 to LED	3	3	63	33	2,374	235	228	1.07	97%
4' 2L T12 to LED	1	1	78	33	2,374	117	114	1.07	97%
4' 2L T12 to LED	22	22	78	33	2,374	2,581	2,509	1.07	97%
4' 2L T8 to LED	1	1	56	33	2,374	60	58	1.07	97%
4' 2L T12 to LED	5	5	63	33	2,374	391	380	1.07	97%
4' 2L T12 to LED	1	1	78	33	2,374	117	114	1.07	97%
CFL to LED	82	82	35	20	2,374	3,207	3,117	1.07	97%
3' 1L T12 to 3' 1L T8	1	1	38	17	2,374	55	53	1.07	97%
8' 4L T12 to 8' 4L T8	1	1	246	112	2,374	349	340	1.07	97%
T8 to 8' 2L T8	1	1	110	58	2,374	136	132	1.07	97%
8' 4L T12 to 8' 4L T8	2	2	246	112	2,374	699	679	1.07	97%
4' 2L T12 to LED	1	1	78	33	2,374	117	114	1.07	97%
4' 2L T12 to LED	2	2	78	22	5,215	292	624	1.07	214%
4' 2L T12 to LED	1	1	78	33	2,374	117	114	1.07	97%
4' 2L T12 to LED	6	6	78	22	2,374	876	852	1.07	97%
4' 4L T12 to LED	2	2	146	22	991	647	262	1.07	41%
4' 4L T12 to LED	1	1	146	22	2,374	323	314	1.07	97%
4' 4L T12 to LED	1	1	146	22	2,374	323	314	1.07	97%
4' 2L T12 to LED	1	1	78	33	2,374	117	114	1.07	97%
Incand. exit sign to LED Exit Sign	1	1	30	-	2,374	78	76	1.07	97%
4' 3L T8 to LED	11	11	54	22	2,374	918	892	1.07	97%
4' 2L T12 to LED	1	1	78	22	2,374	146	142	1.07	97%
4' 2L T12 to LED	1	1	78	33	2,374	117	114	1.07	97%
4' 2L T8 to LED	11	11	56	33	2,374	660	641	1.07	97%
4' 2L T12 to LED	5	5	63	22	8,760	534	1,917	1.07	359%
Incand. to LED	1	1	90	22	8,760	177	636	1.07	359%
4' 1L T12 to LED	1	1	42	22	2,635	61	56	1.07	92%
4' 2L T12 to LED	1	1	78	22	2,635	172	158	1.07	92%
4' 2L T8 to LED	1	1	56	22	2,635	104	96	1.07	92%
4' 4L T12 to LED	1	1	146	22	2,635	380	349	1.07	92%
4' 2L T12 to LED	2	2	78	22	2,635	343	315	1.07	92%
4' 2L T12 to LED	1	1	78	22	2,635	172	158	1.07	92%
Incand. to LED	10	10	120	18	2,374	3,351	2,585	1.07	77%
4' 4L T12 to LED	14	14	146	33	2,635	5,939	4,450	1.07	75%

Measure	*Quantity (Fixtures)*		*Wattage*		*Hours*	*Expected kWh Savings*	*Realized kWh Savings*	*Heating Cooling Interaction Factor*	*Realization Rate*
	Old	*New*	*Old*	*New*					
4' 2L T12 to LED	14	14	78	33	2,635	2,365	1,772	1.07	75%
4' 2L T12 to LED	2	2	78	33	2,635	338	253	1.07	75%
4' 2L T12 to LED	1	1	78	22	2,374	210	142	1.07	68%
4' 2L T12 to LED	15	15	78	22	2,374	3,153	2,129	1.07	68%
4' 2L T12 to LED	19	19	63	33	2,635	2,140	1,603	1.07	75%
4' 4L T12 to LED	12	12	146	33	2,635	5,090	3,814	1.07	75%
4' 4L T12 to LED	7	7	146	33	2,374	2,969	2,005	1.07	68%
CFL to LED	1	1	40	20	4,702	80	100	1.07	125%
2' 2L T12 to 2' 2L T8	1	1	56	24	4,702	128	161	1.07	125%
4' 2L T12 to LED	2	2	78	22	991	480	118	1.07	25%
4' 2L T12 to LED	6	6	63	22	991	1,055	260	1.07	25%
4' 2L T8 to LED	2	2	56	22	991	292	72	1.07	25%
Incand. to LED	3	3	100	22	4,305	1,025	1,007	1.00	98%
Incand. to LED	2	2	100	22	4,305	683	672	1.00	98%
Incand. to LED	2	2	100	22	4,305	683	672	1.00	98%
Incand. to LED	1	1	100	22	4,305	342	336	1.00	98%
Incand. to LED	1	1	90	22	4,305	298	293	1.00	98%
Incand. to LED	1	1	90	22	4,305	298	293	1.00	98%
Incand. to LED	6	6	90	22	4,305	1,787	1,756	1.00	98%
MH to LED	1	1	181	45	4,305	596	585	1.00	98%
MH to LED	3	3	130	45	4,305	1,117	1,098	1.00	98%
MH to LED	4	4	130	45	4,305	1,489	1,464	1.00	98%
MH to LED	56	56	120	40	991	19,622	4,738	1.07	24%
MH to LED	26	26	181	55	991	14,349	3,465	1.07	24%
MH to LED	9	9	190	45	4,305	5,716	5,618	1.00	98%
4' 2L T12 to LED	1	1	78	22	2,635	250	158	1.07	63%
4' 2L T12 to LED	1	1	78	22	2,635	250	158	1.07	63%
4' 2L T12 to LED	1	1	78	22	2,635	250	158	1.07	63%
8' 4L T12 to 8' 4L T8	2	2	246	112	2,635	1,198	754	1.07	63%
4' 2L T12 to LED	1	1	78	22	5,215	250	312	1.07	125%
4' 2L T8 to LED	2	2	56	22	2,635	304	191	1.07	63%
2' 1L T12 to 2' 1L T8	1	1	32	13	2,635	85	53	1.07	63%
4' 2L T12 to LED	1	1	63	22	2,635	183	115	1.07	63%
4' 2L T12 to LED	6	6	63	22	2,635	1,100	692	1.07	63%
4' 2L T12 to LED	14	14	78	22	4,702	3,864	3,936	1.07	102%
4' 2L T12 to LED	7	7	78	22	4,702	1,932	1,968	1.07	102%
4' 2L T12 to LED	1	1	78	22	2,635	276	158	1.07	57%
2' 3L T5 to LED	64	64	117	22	4,702	29,962	30,522	1.07	102%
2' 1L T12 to 2' 1L T8	3	3	32	13	4,702	296	286	1.07	97%
4' 2L T12 to LED	1	1	78	22	4,702	291	281	1.07	97%
Incand. to LED	2	2	60	14	4,702	478	462	1.07	97%
2' 1L T12 to 2' 1L T8	3	3	32	13	4,702	296	286	1.07	97%
2' 2L T12 to 2' 2L T8	1	1	56	24	4,702	166	161	1.07	97%
4' 2L T12 to LED	5	5	78	22	4,702	1,456	1,406	1.07	97%
2' 2L T12 to 2' 2L T8	2	2	56	24	4,702	333	321	1.07	97%
4' 2L T12 to LED	3	3	78	22	4,702	874	843	1.07	97%
4' 2L T12 to LED	2	2	78	22	4,702	583	562	1.07	97%
2' 3L T5 to LED	4	4	117	22	4,702	1,976	1,908	1.07	97%
2' 2L T8 to 2' 2L T8	2	2	34	24	4,702	104	100	1.07	97%
2' 3L T5 to LED	4	4	117	22	4,702	1,976	1,908	1.07	97%
2' 2L T8 to 2' 2L T8	2	2	34	24	4,702	104	100	1.07	97%
2' 3L T5 to LED	4	4	117	22	4,702	1,976	1,908	1.07	97%
2' 2L T8 to 2' 2L T8	2	2	34	24	4,702	104	100	1.07	97%
2' 3L T5 to LED	4	4	117	22	4,702	1,976	1,908	1.07	97%
2' 2L T8 to 2' 2L T8	2	2	34	24	4,702	104	100	1.07	97%
2' 3L T5 to LED	4	4	117	22	4,702	1,976	1,908	1.07	97%
2' 2L T8 to 2' 2L T8	1	1	34	24	4,702	52	50	1.07	97%
2' 3L T5 to LED	4	4	117	22	4,702	1,976	1,908	1.07	97%
2' 2L T8 to 2' 2L T8	1	1	34	24	4,702	52	50	1.07	97%

Measure	Quantity (Fixtures)		Wattage		Hours	Expected kWh Savings	Realized kWh Savings	Heating Cooling Interaction Factor	Realization Rate
	Old	New	Old	New					
2' 2L T12 to 2' 2L T8	2	2	56	24	4,702	333	321	1.07	97%
4' 2L T12 to LED	2	2	78	22	4,702	583	562	1.07	97%
2' 2L T12 to 2' 1L T8	1	1	56	15	4,702	213	206	1.07	97%
4' 2L T12 to LED	2	2	78	22	4,702	583	562	1.07	97%
4' 2L T12 to LED	1	1	63	22	4,702	213	206	1.07	97%
2' 2L T12 to 2' 2L T8	1	1	56	24	4,702	166	161	1.07	97%
4' 2L T12 to LED	2	2	78	22	4,702	583	562	1.07	97%
2' 3L T5 to LED	5	5	117	22	4,702	2,470	2,385	1.07	97%
2' 2L T8 to 2' 2L T8	2	2	34	24	4,702	104	100	1.07	97%
2' 3L T5 to LED	9	9	117	22	4,702	4,447	4,292	1.07	97%
2' 2L T8 to 2' 2L T8	3	3	34	24	4,702	156	151	1.07	97%
Incand. to LED	11	11	75	20	4,702	3,147	3,037	1.07	97%
2' 1L T12 to 2' 1L T8	7	7	32	13	4,702	692	668	1.07	97%
2' 2L T12 to 2' 2L T8	12	12	56	24	4,702	1,997	1,928	1.07	97%
3' 1L T12 to 3' 1L T8	2	2	46	17	4,702	302	291	1.07	97%
4' 2L T12 to LED	14	14	63	22	4,702	2,985	2,881	1.07	97%
4' 2L T12 to LED	2	2	78	22	4,702	583	562	1.07	97%
4' 2L T12 to LED	3	3	78	22	4,702	874	843	1.07	97%
4' 4L T12 to LED	2	2	146	22	4,702	1,290	1,245	1.07	97%
2' 2L T8 to LED	5	5	34	22	4,702	312	301	1.07	97%
4' 2L T12 to LED	2	2	63	22	4,702	426	412	1.07	97%
4' 2L T12 to LED	8	8	63	22	4,702	1,706	1,647	1.07	97%
4' 2L T12 to LED	6	6	63	22	4,702	1,279	1,235	1.07	97%
4' 2L T12 to LED	4	4	63	22	4,702	853	823	1.07	97%
4' 2L T12 to LED	4	4	63	22	4,702	853	823	1.07	97%
2' 2L T8 to 2' 2L T8	1	1	34	24	4,702	52	50	1.07	97%
2' 4L T12 to LED	1	1	112	22	4,702	468	452	1.07	97%
4' 2L T12 to LED	2	2	78	22	4,702	583	562	1.07	97%
2' 1L T12 to 2' 1L T8	1	1	32	13	4,702	99	95	1.07	97%
4' 2L T12 to LED	1	1	78	22	4,702	291	281	1.07	97%
4' 1L T12 to LED	1	1	42	22	4,702	104	100	1.07	97%
4' 4L T12 to LED	1	1	146	22	4,702	645	622	1.07	97%
4' 4L T12 to LED	1	1	146	22	4,702	645	622	1.07	97%
CFL to LED	88	88	40	13	2,374	12,358	6,021	1.07	49%
3' 2L T12 to 3' T8	8	8	66	33	4,702	1,373	1,325	1.07	97%
CFL to LED	8	8	35	13	4,702	915	884	1.07	97%
CFL to LED	16	16	35	13	2,374	1,831	892	1.07	49%
Incand. to LED	9	9	60	14	991	2,191	438	1.07	20%
U-tube 2L T12 to 2' 2L T8	7	7	79	24	991	2,038	407	1.07	20%
Incand. to 4' 2L T8	9	9	300	38	991	12,481	2,494	1.07	20%
2' 1L T12 to 2' 1L T8	8	8	32	13	8,760	805	1,422	1.07	177%
4' 2L T8 to LED	18	18	56	22	991	3,239	647	1.07	20%
CFL to LED	18	18	40	20	5,215	1,971	2,004	1.07	102%
2' 3L T5 to LED	1	1	117	22	4,702	520	477	1.07	92%
4' 2L T12 to LED	1	1	78	22	4,702	337	281	1.07	83%
4' 1L T12 to LED	1	1	42	22	4,702	120	100	1.07	83%
4' 2L T12 to LED	1	1	63	22	4,702	247	206	1.07	83%
4' 2L T12 to LED	1	1	78	22	4,702	337	281	1.07	83%
4' 2L T12 to LED	2	2	63	22	4,702	494	412	1.07	83%
4' 2L T12 to LED	1	1	78	22	4,702	337	281	1.07	83%
4' 2L T12 to LED	14	14	78	22	4,702	4,722	3,936	1.07	83%
4' 2L T12 to LED	4	4	78	22	4,702	1,349	1,124	1.07	83%
4' 2L T8 to LED	3	3	56	22	4,702	614	512	1.07	83%
4' 2L T12 to LED	1	1	78	22	4,702	337	281	1.07	83%
4' 2L T12 to LED	1	1	78	22	4,702	337	281	1.07	83%
4' 2L T12 to LED	1	1	78	22	4,702	337	281	1.07	83%
4' 2L T12 to LED	3	3	78	22	4,702	1,012	843	1.07	83%
CFL to LED	2	2	40	20	4,702	241	201	1.07	83%
CFL to LED	70	70	40	20	4,702	8,432	7,028	1.07	83%

Measure	*Quantity (Fixtures)*		*Wattage*		*Hours*	*Expected kWh Savings*	*Realized kWh Savings*	*Heating Cooling Interaction Factor*	*Realization Rate*
	Old	*New*	*Old*	*New*					
CFL to LED	3	3	40	13	4,702	488	407	1.07	83%
CFL to LED	9	9	40	20	4,702	1,084	904	1.07	83%
3' 2L T12 to 3' T8	128	128	66	33	4,702	25,441	21,205	1.07	83%
4' 4L T12 to LED	1	1	146	22	4,702	747	622	1.07	83%
CFL to LED	3	3	35	20	4,702	271	226	1.07	83%
4' 2L T8 to LED	28	28	56	22	4,702	5,734	4,779	1.07	83%
4' 2L T8 to LED	15	15	56	22	4,702	3,072	2,560	1.07	83%
4' 2L T8 to LED	5	5	56	22	4,702	1,024	853	1.07	83%
4' 2L T8 to LED	5	5	56	22	4,702	1,024	853	1.07	83%
CFL to LED	3	3	35	20	4,702	271	226	1.07	83%
4' 2L T8 to LED	20	20	56	22	4,702	4,096	3,414	1.07	83%
4' 2L T12 to LED	7	7	78	22	4,702	2,361	1,968	1.07	83%
4' 4L T12 to LED	2	2	146	22	4,702	1,494	1,245	1.07	83%
4' 2L T12 to LED	2	2	78	22	4,702	675	562	1.07	83%
4' 1L T12 to LED	1	1	42	22	4,702	120	100	1.07	83%
4' 4L T12 to LED	1	1	146	22	4,702	747	622	1.07	83%
CFL to LED	6	6	40	20	4,702	723	602	1.07	83%
4' 2L T12 to LED	2	2	78	22	4,702	675	562	1.07	83%
CFL to LED	4	4	40	20	4,702	482	402	1.07	83%
CFL to LED	4	4	40	20	4,702	482	402	1.07	83%
CFL to LED	6	6	52	20	4,702	1,156	964	1.07	83%
CFL to LED	6	6	52	20	4,702	1,156	964	1.07	83%
3' 2L T12 to 3' T8	12	12	66	33	4,702	2,385	1,988	1.07	83%
4' 2L T12 to LED	4	4	63	22	4,702	988	823	1.07	83%
4' 2L T8 to LED	8	8	56	22	4,702	1,638	1,365	1.07	83%
4' 2L T12 to LED	1	1	63	22	4,357	307	191	1.07	62%
3' 1L T12 to 3' 1L T8	4	4	38	17	4,702	736	422	1.07	57%
2' 2L T12 to 2' 2L T8	1	1	56	24	4,702	280	161	1.07	57%
Incand. to 4' 2L T8	4	4	150	58	4,305	3,224	1,584	1.00	49%
8' 4L T12 to 8' 4L T8	4	4	246	112	4,305	4,695	2,307	1.00	49%
8' 4L T12 to 8' 4L T8	1	1	246	112	4,305	1,174	577	1.00	49%
2' 2L T8 to 2' 2L T8	1	1	34	24	8,760	88	94	1.07	107%
4' 2L T12 to LED	2	2	78	22	4,702	981	562	1.07	57%
4' 2L T12 to LED	1	1	63	22	8,760	359	383	1.07	107%
3' 2L T12 to 3' T8	24	24	66	33	4,702	6,938	3,976	1.07	57%
CFL to LED	31	31	40	20	4,702	5,431	3,112	1.07	57%
CFL to LED	1	1	40	13	4,702	237	136	1.07	57%
CFL to LED	1	1	40	20	4,702	175	100	1.07	57%
4' 2L T12 to LED	12	12	63	22	4,702	4,310	2,470	1.07	57%
CFL to LED	6	6	52	20	4,702	1,682	964	1.07	57%
CFL to LED	6	6	52	20	4,702	1,682	964	1.07	57%
4' 2L T12 to LED	8	8	63	22	8,760	2,873	3,067	1.07	107%
4' 2L T12 to LED	5	5	63	22	8,760	1,796	1,917	1.07	107%
3' 1L T12 to 3' 1L T8	6	6	38	17	4,702	1,104	633	1.07	57%
4' 2L T12 to LED	2	2	63	22	8,760	718	767	1.07	107%
2' 3L T5 to LED	20	20	117	22	4,702	16,644	9,538	1.07	57%
4' 2L T8 to LED	7	7	56	22	4,702	2,085	1,195	1.07	57%
4' 2L T8 to LED	18	18	56	22	4,702	5,361	3,072	1.07	57%
4' 2L T8 to LED	9	9	56	22	4,702	2,681	1,536	1.07	57%
Total						396,677	302,038		76%

The table shown below presents expected and realized energy savings for the lighting retrofit installed under the Prescriptive project.

Lighting Retrofit Savings Calculations

Measure	*Quantity (Fixtures)*	*Wattage*	*Hours*	*Realized kWh*	*Heating Cooling*

	Old	*New*	*Old*	*New*		*Savings*	*Interaction Factor*
4' 4L T12 to LED	4	4	146	33	2,635	1,271	1.07
4' 4L T12 to LED	4	4	146	33	2,635	1,271	1.07
4' 4L T12 to LED	20	20	146	33	2,635	6,357	1.07
4' 4L T12 to LED	9	9	146	33	2,635	2,861	1.07
4' 4L T12 to LED	10	10	146	33	2,635	3,179	1.07
4' 4L T8 to LED	2	2	109	33	2,635	428	1.07
4' 4L T8 to LED	9	9	109	33	2,635	1,924	1.07
4' 4L T8 to LED	6	6	109	33	2,635	1,283	1.07
4' 4L T12 to LED	2	2	146	33	2,635	636	1.07
4' 4L T12 to LED	2	2	146	33	2,635	636	1.07
4' 4L T12 to LED	14	14	146	33	2,635	4,450	1.07
4' 3L T12 to LED	4	4	91	33	2,635	653	1.07
4' 4L T12 to LED	4	4	129	33	2,635	1,080	1.07
4' 4L T12 to LED	10	10	146	33	2,635	3,179	1.07
4' 3L T8 to LED	8	8	88	33	2,635	1,238	1.07
Incand. to LED	8	8	25	6	4,702	763	1.07
Incand. to LED	5	5	60	6	4,702	1,355	1.07
Incand. to LED	10	10	60	10	4,702	2,510	1.07
Incand. to LED	3	3	60	29	4,702	467	1.07
Incand. to LED	8	8	60	38	4,702	884	1.07
Incand. to LED	4	4	75	10	4,702	1,305	1.07
Incand. to LED	8	8	25	6	4,702	763	1.07
Incand. to LED	5	5	60	6	4,702	1,355	1.07
Incand. to LED	10	10	60	10	4,702	2,510	1.07
Incand. to LED	3	3	60	29	4,702	467	1.07
Incand. to LED	8	8	60	38	4,702	884	1.07
Incand. to LED	4	4	75	10	4,702	1,305	1.07
Incand. to LED	8	8	25	6	4,702	763	1.07
Incand. to LED	5	5	60	6	4,702	1,355	1.07
Incand. to LED	10	10	60	10	4,702	2,510	1.07
Incand. to LED	3	3	60	29	4,702	467	1.07
Incand. to LED	8	8	60	38	4,702	884	1.07
Incand. to LED	4	4	75	10	4,702	1,305	1.07
Incand. to LED	8	8	25	6	4,702	763	1.07
Incand. to LED	5	5	60	6	4,702	1,355	1.07
Incand. to LED	10	10	60	10	4,702	2,510	1.07
Incand. to LED	3	3	60	29	4,702	467	1.07
Incand. to LED	8	8	60	38	4,702	884	1.07
Incand. to LED	4	4	75	10	4,702	1,305	1.07
Incand. to LED	8	8	25	6	4,702	763	1.07
Incand. to LED	5	5	60	6	4,702	1,355	1.07
Incand. to LED	10	10	60	10	4,702	2,510	1.07
Incand. to LED	3	3	60	29	4,702	467	1.07
Incand. to LED	8	8	60	38	4,702	884	1.07
Incand. to LED	4	4	75	10	4,702	1,305	1.07
Incand. to LED	8	8	25	6	4,702	763	1.07
Incand. to LED	5	5	60	6	4,702	1,355	1.07
Incand. to LED	10	10	60	10	4,702	2,510	1.07
Incand. to LED	3	3	60	29	4,702	467	1.07
Incand. to LED	8	8	60	38	4,702	884	1.07
Incand. to LED	4	4	75	10	4,702	1,305	1.07
Incand. to LED	18	18	60	10	4,702	4,518	1.07
Incand. to LED	2	2	60	19	4,702	412	1.07
Incand. to LED	6	6	60	29	4,702	934	1.07
Incand. to LED	16	16	60	38	4,702	1,767	1.07
Incand. to LED	18	18	60	10	4,702	4,518	1.07
Incand. to LED	2	2	60	19	4,702	412	1.07
Incand. to LED	6	6	60	29	4,702	934	1.07
Incand. to LED	16	16	60	38	4,702	1,767	1.07
Incand. to LED	6	6	25	4	4,702	633	1.07
Incand. to LED	5	5	60	6	4,702	1,355	1.07

Measure	*Quantity (Fixtures)*		*Wattage*		*Hours*	*Realized kWh Savings*	*Heating Cooling Interaction Factor*
	Old	*New*	*Old*	*New*			
Incand. to LED	19	19	60	10	4,702	4,769	1.07
Incand. to LED	3	3	60	29	4,702	467	1.07
Incand. to LED	12	12	60	38	4,702	1,325	1.07
Incand. to LED	25	25	75	10	4,702	8,158	1.07
4' 4L T12 to LED	2	2	146	22	4,702	1,245	1.07
Incand. to LED	18	18	60	10	4,702	4,518	1.07
Incand. to LED	2	2	60	19	4,702	412	1.07
Incand. to LED	6	6	60	29	4,702	934	1.07
Incand. to LED	16	16	60	38	4,702	1,767	1.07
Incand. to LED	18	18	60	10	4,702	4,518	1.07
Incand. to LED	2	2	60	19	4,702	412	1.07
Incand. to LED	6	6	60	29	4,702	934	1.07
Incand. to LED	16	16	60	38	4,702	1,767	1.07
Incand. to LED	6	6	25	4	4,702	633	1.07
Incand. to LED	5	5	60	6	4,702	1,355	1.07
Incand. to LED	19	19	60	10	4,702	4,769	1.07
Incand. to LED	3	3	60	29	4,702	467	1.07
Incand. to LED	12	12	60	38	4,702	1,325	1.07
Incand. to LED	25	25	75	10	4,702	8,158	1.07
4' 4L T12 to LED	2	2	146	22	4,702	1,245	1.07
Incand. to LED	18	18	60	10	4,702	4,518	1.07
Incand. to LED	2	2	60	19	4,702	412	1.07
Incand. to LED	6	6	60	29	4,702	934	1.07
Incand. to LED	16	16	60	38	4,702	1,767	1.07
Incand. to LED	18	18	60	10	4,702	4,518	1.07
Incand. to LED	2	2	60	19	4,702	412	1.07
Incand. to LED	6	6	60	29	4,702	934	1.07
Incand. to LED	16	16	60	38	4,702	1,767	1.07
Incand. to LED	1	1	100	10	4,702	452	1.07
Incand. to LED	14	14	40	6	4,702	2,390	1.07
Incand. to LED	8	8	40	10	4,702	1,205	1.07
Incand. to LED	22	22	60	10	4,702	5,522	1.07
Incand. to LED	2	2	60	19	4,702	412	1.07
Incand. to LED	3	3	60	29	4,702	467	1.07
Incand. to LED	4	4	60	38	4,702	442	1.07
Incand. to LED	8	8	75	10	4,702	2,610	1.07
Incand. to LED	18	18	60	10	4,702	4,518	1.07
Incand. to LED	2	2	60	19	4,702	412	1.07
Incand. to LED	6	6	60	29	4,702	934	1.07
Incand. to LED	16	16	60	38	4,702	1,767	1.07
Incand. to LED	18	18	60	10	4,702	4,518	1.07
Incand. to LED	2	2	60	19	4,702	412	1.07
Incand. to LED	6	6	60	29	4,702	934	1.07
Incand. to LED	16	16	60	38	4,702	1,767	1.07
Incand. to LED	18	18	60	10	4,702	4,518	1.07
Incand. to LED	2	2	60	19	4,702	412	1.07
Incand. to LED	6	6	60	29	4,702	934	1.07
Incand. to LED	16	16	60	38	4,702	1,767	1.07
U-tube 2L T12 to LED	1	1	79	22	4,702	286	1.07
Incand. to LED	4	4	100	10	2,374	912	1.07
Incand. to LED	2	2	25	4	2,374	106	1.07
4' 4L T12 to LED	2	2	146	33	2,374	573	1.07
Incand. to LED	6	6	100	10	2,374	1,369	1.07
Incand. to LED	2	2	60	10	2,374	253	1.07
Incand. to LED	4	4	60	19	2,374	416	1.07
Incand. to LED	6	6	60	29	2,374	471	1.07
T12 to 4' 2L T8	1	1	78	38	4,702	201	1.07
U-tube 2L T12 to LED	4	4	79	22	4,702	1,145	1.07
Incand. to LED	1	1	100	10	4,702	452	1.07

Measure	Quantity (Fixtures)		Wattage		Hours	Realized kWh Savings	Heating Cooling Interaction Factor
	Old	New	Old	New			
Incand. to LED	14	14	40	6	4,702	2,390	1.07
Incand. to LED	8	8	40	10	4,702	1,205	1.07
Incand. to LED	22	22	60	10	4,702	5,522	1.07
Incand. to LED	2	2	60	19	4,702	412	1.07
Incand. to LED	3	3	60	29	4,702	467	1.07
Incand. to LED	4	4	60	38	4,702	442	1.07
Incand. to LED	8	8	75	10	4,702	2,610	1.07
U-tube 2L T12 to LED	2	2	60	22	2,635	214	1.07
4' 4L T12 to LED	6	6	129	33	2,635	1,620	1.07
4' 4L T12 to LED	2	2	146	22	4,702	1,245	1.07
T12 to 4' 2L T8	116	116	63	38	4,702	14,558	1.07
U-tube 2L T12 to LED	42	42	60	22	4,702	8,012	1.07
T12 to 4' 4L T8	207	207	129	80	2,635	28,532	1.07
T12 to 4' 4L T8	1	1	146	80	2,635	186	1.07
U-tube 2L T12 to LED	98	98	60	22	2,635	10,476	1.07
4' 3L T12 to LED	19	19	91	22	2,635	3,688	1.07
T12 to 4' 4L T8	2	2	129	80	2,635	276	1.07
U-tube 2L T12 to LED	1	1	60	22	2,635	107	1.07
T12 to 4' 2L T8	22	22	63	38	4,702	2,761	1.07
U-tube 2L T12 to LED	6	6	60	22	4,702	1,145	1.07
T8 to 4' 2L T8	2	2	56	38	4,702	181	1.07
T12 to 4' 2L T8	3	3	63	38	4,702	377	1.07
T12 to 4' 2L T8	2	2	63	38	991	53	1.07
T12 to 4' 2L T8	1	1	63	38	991	26	1.07
T8 to 4' 2L T8	4	4	56	38	991	76	1.07
4' 4L T12 to LED	10	10	146	33	2,374	2,864	1.07
4' 4L T12 to LED	8	8	146	33	2,635	2,543	1.07
T12 to 4' 2L T8	2	2	146	38	991	228	1.07
4' 4L T8 to LED	9	9	109	33	2,374	1,733	1.07
4' 4L T12 to LED	4	4	146	33	2,374	1,145	1.07
T12 to 4' 2L T8	1	1	129	38	991	96	1.07
T12 to 4' 2L T8	3	3	129	38	8,760	2,553	1.07
4' 3L T12 to LED	12	12	91	33	2,374	1,764	1.07
T12 to 4' 4L T8	12	12	129	80	2,374	1,490	1.07
U-tube 2L T12 to LED	3	3	60	32	2,374	213	1.07
4' 3L T12 to LED	24	24	91	33	2,374	3,528	1.07
4' 3L T12 to LED	1	1	91	22	991	73	1.07
T12 to 4' 2L T8	1	1	63	38	8,760	234	1.07
T12 to 4' 2L T8	24	24	78	38	4,702	4,819	1.07
4' 3L T8 to LED	8	8	88	33	2,374	1,115	1.07
4' 3L T12 to LED	20	20	91	33	2,635	3,263	1.07
4' 3L T12 to LED	9	9	91	33	2,635	1,468	1.07
T12 to 4' 2L T8	4	4	146	58	991	372	1.07
4' 4L T12 to LED	2	2	146	33	991	239	1.07
T8 to 4' 2L T8	1	1	56	38	991	19	1.07
T12 to 4' 3L T8	22	22	91	55	991	838	1.07
T12 to 4' 2L T8	3	3	146	58	991	279	1.07
4' 4L T12 to LED	52	52	146	33	991	6,215	1.07
T12 to 4' 2L T8	10	10	78	43	991	370	1.07
T12 to 4' 2L T8	4	4	91	43	991	203	1.07
T12 to 4' 2L T8	13	13	146	43	991	1,416	1.07
T12 to 4' 2L T8	2	2	146	58	991	186	1.07
4' 4L T12 to LED	1	1	146	33	991	120	1.07
MH to LED	16	16	146	33	991	1,912	1.07
MH to 4' 4L T5HO	7	7	455	210	991	1,814	1.07
4' 4L T12 to LED	12	12	146	33	991	1,434	1.07
T12 to 4' 2L T8	8	8	78	38	991	338	1.07
T12 to 4' 2L T8	5	5	105	43	991	328	1.07
8' 2L T12 to 8' 4L T8	5	5	123	85	991	201	1.07

Measure	*Quantity (Fixtures)*		*Wattage*		*Hours*	*Realized kWh Savings*	*Heating Cooling Interaction Factor*
	Old	*New*	*Old*	*New*			
4' 4L T12 to LED	14	14	129	33	2,374	3,406	1.07
U-tube 2L T12 to LED	3	3	79	32	2,374	357	1.07
T12 to 4' 1L T8	3	3	42	20	2,374	167	1.07
U-tube 2L T12 to LED	6	6	79	32	2,374	715	1.07
4' 4L T12 to LED	6	6	129	33	2,374	1,460	1.07
Incand. to LED	2	2	60	10	2,635	281	1.07
T12 to 4' 1L T8	12	12	42	20	2,635	743	1.07
T12 to 4' 4L T8	2	2	146	80	2,635	371	1.07
4' 3L T12 to LED	21	21	91	33	2,635	3,426	1.07
4' 4L T12 to LED	41	41	129	33	2,635	11,072	1.07
4' 4L T12 to LED	21	21	146	33	2,635	6,675	1.07
4' 4L T12 to LED	1	1	129	33	2,374	243	1.07
U-tube 2L T12 to LED	1	1	79	32	2,374	119	1.07
4' 4L T12 to LED	1	1	129	33	2,374	243	1.07
U-tube 2L T12 to LED	2	2	79	32	2,374	238	1.07
4' 3L T12 to LED	5	5	91	33	2,635	816	1.07
4' 3L T12 to LED	2	2	91	33	2,635	326	1.07
4' 3L T8 to LED	12	12	88	33	2,635	1,857	1.07
U-tube 2L T12 to LED	1	1	79	32	2,374	119	1.07
4' 4L T12 to LED	90	90	146	33	2,374	25,774	1.07
4' 4L T8 to LED	1	1	109	33	5,215	423	1.07
4' 4L T12 to LED	42	42	146	33	2,374	12,028	1.07
4' 4L T12 to LED	2	2	146	33	2,374	573	1.07
4' 4L T12 to LED	1	1	146	33	5,215	629	1.07
4' 4L T8 to LED	1	1	109	33	5,215	423	1.07
T12 to 4' 1L T8	2	2	42	20	2,374	112	1.07
U-tube 2L T12 to LED	4	4	79	32	2,374	476	1.07
4' 4L T12 to LED	50	50	146	33	2,374	14,319	1.07
4' 4L T12 to LED	4	4	146	33	2,374	1,145	1.07
Incand. to LED	3	3	60	10	2,374	380	1.07
4' 4L T12 to LED	1	1	129	33	2,374	243	1.07
4' 4L T12 to LED	39	39	146	33	2,374	11,169	1.07
4' 4L T12 to LED	2	2	129	33	2,374	487	1.07
4' 4L T12 to LED	55	55	146	33	2,374	15,751	1.07
4' 4L T8 to LED	26	26	109	33	2,374	5,008	1.07
4' 4L T12 to LED	31	31	146	33	2,374	8,878	1.07
4' 4L T8 to LED	35	35	109	33	2,374	6,741	1.07
4' 4L T12 to LED	21	21	146	33	2,374	6,014	1.07
4' 4L T8 to LED	39	39	109	33	2,374	7,512	1.07
4' 4L T12 to LED	2	2	129	33	2,374	487	1.07
U-tube 2L T12 to LED	1	1	79	32	2,374	119	1.07
4' 4L T12 to LED	6	6	146	33	2,374	1,718	1.07
U-tube 2L T12 to LED	1	1	79	32	2,374	119	1.07
4' 4L T12 to LED	24	24	146	33	2,374	6,873	1.07
U-tube 2L T12 to LED	4	4	79	32	2,374	476	1.07
4' 4L T12 to LED	2	2	146	33	2,374	573	1.07
4' 4L T12 to LED	9	9	146	33	2,374	2,577	1.07
U-tube 2L T12 to LED	11	11	79	32	2,374	1,310	1.07
4' 3L T12 to LED	6	6	105	33	2,374	1,095	1.07
4' 4L T12 to LED	100	100	146	33	2,374	28,637	1.07
4' 4L T8 to LED	10	10	109	33	2,374	1,926	1.07
4' 4L T12 to LED	6	6	146	33	2,635	1,907	1.07
U-tube 2L T12 to LED	1	1	60	32	2,374	71	1.07
4' 4L T12 to LED	4	4	129	33	2,374	973	1.07
4' 4L T12 to LED	6	6	146	22	2,374	1,885	1.07
4' 3L T12 to LED	5	5	91	33	4,702	1,456	1.07
4' 4L T12 to LED	1	1	146	33	2,374	286	1.07
Incand. to LED	2	2	60	19	2,374	208	1.07
U-tube 2L T12 to LED	2	2	60	22	2,374	193	1.07

Measure	*Quantity (Fixtures)*		*Wattage*		*Hours*	*Realized kWh Savings*	*Heating Cooling Interaction Factor*
	Old	*New*	*Old*	*New*			
U-tube 2L T12 to LED	2	2	79	22	2,374	289	1.07
4' 4L T12 to LED	6	6	129	33	2,374	1,460	1.07
4' 4L T12 to LED	4	4	146	22	2,374	1,257	1.07
4' 4L T12 to LED	1	1	146	22	4,702	622	1.07
Incand. to LED	2	2	60	10	2,374	253	1.07
T12 to 4' 1L T8	51	51	42	20	2,374	2,843	1.07
T12 to 4' 4L T8	11	11	146	80	2,374	1,840	1.07
U-tube 2L T12 to LED	6	6	60	32	2,374	426	1.07
4' 3L T12 to LED	30	30	91	33	2,374	4,410	1.07
4' 4L T12 to LED	83	83	129	33	2,374	20,193	1.07
4' 4L T12 to LED	55	55	146	33	2,374	15,751	1.07
T12 to 4' 1L T8	1	1	42	20	2,374	56	1.07
4' 3L T12 to LED	3	3	91	33	2,374	441	1.07
4' 4L T12 to LED	15	15	146	33	2,374	4,296	1.07
4' 3L T12 to LED	6	6	91	33	2,635	979	1.07
4' 3L T12 to LED	16	16	91	33	2,374	2,352	1.07
4' 3L T12 to LED	2	2	91	22	5,215	768	1.07
4' 3L T12 to LED	6	6	91	33	5,215	1,937	1.07
U-tube 2L T12 to LED	1	1	60	32	2,374	71	1.07
4' 3L T12 to LED	131	131	91	33	2,374	19,255	1.07
4' 4L T12 to LED	1	1	146	33	2,374	286	1.07
4' 3L T8 to LED	6	6	90	33	2,374	867	1.07
4' 3L T12 to LED	4	4	91	33	5,215	1,292	1.07
4' 3L T12 to LED	12	12	91	33	2,635	1,958	1.07
4' 3L T8 to LED	6	6	90	33	2,635	962	1.07
4' 3L T12 to LED	3	3	91	33	2,374	441	1.07
U-tube 2L T12 to LED	1	1	79	32	2,374	119	1.07
4' 3L T12 to LED	46	46	91	33	2,374	6,761	1.07
4' 3L T8 to LED	4	4	88	33	2,374	558	1.07
4' 3L T8 to LED	4	4	88	22	5,215	1,470	1.07
4' 3L T8 to LED	6	6	90	33	5,215	1,904	1.07
Incand. to LED	2	2	60	10	2,374	253	1.07
T8 to 4' 1L T8	5	5	32	20	2,374	152	1.07
4' 3L T8 to LED	50	50	88	33	2,374	6,969	1.07
4' 4L T12 to LED	1	1	146	22	2,374	314	1.07
Incand. to LED	1	1	60	10	2,635	141	1.07
T12 to 4' 2L T8	1	1	78	38	2,374	101	1.07
4' 4L T12 to LED	1	1	146	22	8,760	1,160	1.07
4' 4L T12 to LED	6	6	146	33	2,374	1,718	1.07
MH to LED	5	5	92	45	4,305	1,012	1.00
MH to LED	1	1	190	45	4,305	624	1.00
Incand. to LED	1	1	100	18	4,305	353	1.00
U-tube 2L T12 to LED	1	1	79	32	2,374	119	1.07
4' 4L T12 to LED	8	8	146	33	2,374	2,291	1.07
T12 to 4' 1L T8	2	2	42	20	2,374	112	1.07
4' 4L T12 to LED	4	4	146	33	2,374	1,145	1.07
4' 4L T12 to LED	6	6	146	33	2,374	1,718	1.07
4' 4L T8 to LED	1	1	109	33	2,374	193	1.07
U-tube 2L T12 to LED	6	6	79	32	2,374	715	1.07
4' 4L T12 to LED	3	3	129	22	2,374	814	1.07
4' 4L T12 to LED	11	11	129	33	2,374	2,676	1.07
4' 4L T12 to LED	2	2	146	22	2,374	628	1.07
U-tube 2L T12 to LED	4	4	79	32	2,635	529	1.07
4' 4L T12 to LED	2	2	129	33	2,635	540	1.07
Incand. to LED	2	2	75	10	2,374	329	1.07
Incand. to LED	1	1	75	10	2,374	165	1.07
T12 to 4' 2L T8	3	3	78	38	2,374	304	1.07
4' 4L T12 to LED	1	1	129	33	2,374	243	1.07
T12 to 4' 4L T8	3	3	146	80	991	209	1.07

Measure	*Quantity (Fixtures)*		*Wattage*		*Hours*	*Realized kWh Savings*	*Heating Cooling Interaction Factor*
	Old	*New*	*Old*	*New*			
T12 to 4' 2L T8	1	1	78	38	2,374	101	1.07
4' 4L T12 to LED	1	1	129	22	2,374	271	1.07
Incand. to LED	4	4	60	10	2,374	507	1.07
U-tube 2L T12 to LED	1	1	79	32	2,374	119	1.07
4' 3L T12 to LED	2	2	91	33	5,215	646	1.07
T12 to 4' 4L T8	21	21	129	80	2,374	2,608	1.07
U-tube 2L T12 to LED	12	12	60	32	2,374	852	1.07
4' 3L T8 to LED	2	2	88	33	2,374	279	1.07
T12 to 4' 2L T8	4	4	63	38	2,374	253	1.07
T8 to 4' 2L T8	4	4	56	38	2,374	182	1.07
T12 to 4' 4L T8	7	7	146	80	2,374	1,171	1.07
4' 4L T12 to LED	57	57	129	33	2,374	13,868	1.07
4' 4L T12 to LED	2	2	129	33	2,635	540	1.07
4' 4L T12 to LED	6	6	146	33	991	717	1.07
4' 4L T12 to LED	2	2	146	22	2,635	698	1.07
4' 4L T12 to LED	2	2	146	22	2,635	698	1.07
4' 4L T12 to LED	1	1	146	22	2,635	349	1.07
4' 4L T12 to LED	2	2	146	22	2,635	698	1.07
4' 4L T8 to LED	1	1	109	22	2,635	245	1.07
4' 4L T12 to LED	5	5	146	22	2,635	1,744	1.07
4' 3L T12 to LED	1	1	91	22	2,635	194	1.07
T12 to 4' 2L T8	1	1	78	38	2,635	113	1.07
4' 3L T12 to LED	5	5	91	33	2,635	816	1.07
4' 3L T12 to LED	8	8	91	33	2,374	1,176	1.07
4' 3L T12 to LED	13	13	91	33	2,635	2,121	1.07
4' 3L T12 to LED	25	25	91	33	2,374	3,675	1.07
4' 3L T12 to LED	32	32	91	22	2,635	6,211	1.07
4' 4L T12 to LED	20	20	146	33	2,635	6,357	1.07
4' 4L T12 to LED	12	12	146	22	2,635	4,186	1.07
4' 4L T12 to LED	8	8	146	33	2,374	2,291	1.07
4' 4L T12 to LED	7	7	129	33	2,635	1,890	1.07
U-tube 2L T12 to LED	8	8	57	32	2,374	507	1.07
4' 4L T12 to LED	10	10	146	33	2,374	2,864	1.07
4' 4L T8 to LED	7	7	109	33	2,374	1,348	1.07
4' 4L T12 to LED	15	15	146	33	2,635	4,768	1.07
4' 4L T8 to LED	4	4	109	33	2,635	855	1.07
4' 4L T12 to LED	10	10	146	33	2,374	2,864	1.07
8' 1L T12 to 8' 2L T8	12	12	72	38	2,374	1,034	1.07
T12 to 4' 1L T8	1	1	42	20	2,635	62	1.07
T12 to 4' 2L T8	4	4	78	38	2,635	450	1.07
4' 4L T12 to LED	3	3	129	33	2,635	810	1.07
4' 4L T8 to LED	9	9	116	33	2,635	2,101	1.07
U-tube 2L T12 to LED	1	1	60	32	2,635	79	1.07
4' 3L T12 to LED	2	2	91	33	2,635	326	1.07
4' 4L T12 to LED	29	29	129	33	2,635	7,831	1.07
U-tube 2L T12 to LED	6	6	60	32	4,702	843	1.07
U-tube 2L T12 to LED	2	2	79	32	2,635	264	1.07
4' 3L T12 to LED	6	6	91	33	2,635	979	1.07
4' 3L T8 to LED	40	40	88	33	5,215	12,248	1.07
U-tube 2L T12 to LED	1	1	79	32	2,635	132	1.07
4' 4L T12 to LED	7	7	146	33	2,635	2,225	1.07
4' 4L T12 to LED	3	3	146	33	2,635	954	1.07
4' 4L T12 to LED	13	13	146	33	2,635	4,132	1.07
4' 4L T12 to LED	16	16	146	22	2,374	5,028	1.07
4' 4L T12 to LED	4	4	146	33	2,635	1,271	1.07
4' 3L T12 to LED	15	15	91	33	2,635	2,447	1.07
T12 to 4' 2L T8	1	1	63	38	4,702	126	1.07
T12 to 4' 2L T8	1	1	63	38	4,702	126	1.07
T12 to 4' 2L T8	2	2	63	38	4,702	251	1.07

Measure	*Quantity (Fixtures)*		*Wattage*		*Hours*	*Realized kWh Savings*	*Heating Cooling Interaction Factor*
	Old	*New*	*Old*	*New*			
T12 to 4' 2L T8	5	5	63	38	4,702	628	1.07
4' 3L T12 to LED	16	16	91	22	4,702	5,542	1.07
4' 3L T12 to LED	16	16	91	22	4,702	5,542	1.07
4' 3L T12 to LED	32	32	91	22	4,702	11,084	1.07
4' 4L T8 to LED	3	3	109	22	991	276	1.07
4' 4L T8 to LED	1	1	109	33	991	80	1.07
MH to LED	2	2	92	22	4,305	603	1.00
MH to LED	3	3	92	22	4,305	904	1.00
Incand. to LED	2	2	75	10	4,305	560	1.00
MH to LED	1	1	190	70	4,305	517	1.00
MH to LED	1	1	190	70	4,305	517	1.00
MH to LED	3	3	295	129	4,305	2,144	1.00
Incand. to LED	1	1	75	10	4,305	280	1.00
MH to LED	1	1	1,080	279	4,305	3,448	1.00
MH to LED	2	2	295	92	4,305	1,748	1.00
MH to LED	1	1	190	70	4,305	517	1.00
Incand. to LED	1	1	75	10	4,305	280	1.00
MH to LED	1	1	190	70	4,305	517	1.00
MH to LED	2	2	190	70	8,760	2,244	1.07
Incand. to LED	21	21	100	15	4,305	7,684	1.00
MH to LED	8	8	295	129	4,305	5,717	1.00
MH to LED	12	12	455	172	4,305	14,620	1.00
MH to LED	5	5	190	45	4,305	3,121	1.00
MH to LED	6	6	92	22	4,305	1,808	1.00
MH to LED	18	18	92	26	4,305	5,114	1.00
MH to LED	14	14	92	31	4,305	3,676	1.00
MH to LED	10	10	130	31	4,305	4,262	1.00
MH to LED	3	3	130	37	4,305	1,201	1.00
MH to LED	2	2	181	45	4,305	1,171	1.00
MH to LED	29	29	190	45	4,305	18,103	1.00
Incand. to LED	2	2	100	10	4,305	775	1.00
4' 4L T12 to LED	2	2	146	22	5,215	1,381	1.07
4' 4L T12 to LED	2	2	146	22	5,215	1,381	1.07
4' 4L T12 to LED	2	2	146	22	5,215	1,381	1.07
U-tube 2L T12 to LED	1	1	79	22	2,635	160	1.07
4' 4L T8 to LED	4	4	109	22	2,635	979	1.07
4' 4L T8 to LED	4	4	109	22	2,635	979	1.07
4' 4L T12 to LED	1	1	146	33	5,215	629	1.07
4' 4L T12 to LED	2	2	146	33	5,215	1,258	1.07
T12 to 4' 2L T8	1	1	78	38	5,215	223	1.07
U-tube 2L T12 to LED	1	1	79	22	2,635	160	1.07
4' 3L T12 to LED	4	4	91	22	2,635	776	1.07
4' 4L T12 to LED	2	2	129	22	2,635	602	1.07
4' 4L T12 to LED	1	1	146	22	2,635	349	1.07
4' 4L T12 to LED	3	3	129	33	5,215	1,603	1.07
U-tube 2L T12 to LED	2	2	60	22	2,635	214	1.07
4' 3L T12 to LED	4	4	91	22	2,635	776	1.07
4' 4L T12 to LED	3	3	146	44	2,635	861	1.07
4' 3L T12 to LED	11	11	91	22	2,635	2,135	1.07
4' 3L T8 to LED	8	8	88	22	5,215	2,940	1.07
4' 4L T12 to LED	1	1	146	33	5,215	629	1.07
4' 4L T12 to LED	5	5	146	33	5,215	3,146	1.07
Incand. to LED	1	1	75	10	4,702	326	1.07
4' 4L T12 to LED	1	1	146	22	4,702	622	1.07
T12 to 4' 1L T8	4	4	42	20	2,374	223	1.07
T12 to 4' 1L T8	1	1	42	20	4,702	110	1.07
U-tube 2L T12 to LED	6	6	60	22	4,702	1,145	1.07
4' 4L T12 to LED	3	3	129	22	4,702	1,611	1.07
T12 to 4' 2L T8	2	2	78	38	2,374	203	1.07

Measure	*Quantity (Fixtures)*		*Wattage*		*Hours*	*Realized kWh Savings*	*Heating Cooling Interaction Factor*
	Old	*New*	*Old*	*New*			
U-tube 2L T12 to LED	2	2	79	22	4,702	572	1.07
4' 4L T12 to LED	1	1	129	22	4,702	537	1.07
4' 4L T12 to LED	7	7	146	22	4,702	4,357	1.07
T12 to 4' 1L T8	4	4	42	20	4,702	442	1.07
U-tube 2L T12 to LED	1	1	79	22	4,702	286	1.07
4' 4L T12 to LED	6	6	146	22	4,702	3,735	1.07
T12 to 4' 1L T8	2	2	42	20	4,702	221	1.07
4' 4L T12 to LED	4	4	146	22	4,702	2,490	1.07
Incand. to LED	1	1	75	10	4,702	326	1.07
T12 to 4' 1L T8	3	3	42	20	4,702	331	1.07
4' 4L T12 to LED	1	1	129	22	4,702	537	1.07
4' 4L T12 to LED	1	1	146	22	4,702	622	1.07
4' 4L T12 to LED	1	1	146	22	4,702	622	1.07
4' 4L T12 to LED	2	2	146	22	4,702	1,245	1.07
4' 4L T12 to LED	4	4	146	22	4,702	2,490	1.07
Incand. to LED	2	2	60	19	4,702	412	1.07
T12 to 4' 2L T8	1	1	78	38	4,702	201	1.07
Incand. to LED	2	2	60	19	4,702	412	1.07
T12 to 4' 1L T8	1	1	42	20	4,702	110	1.07
T12 to 4' 2L T8	2	2	78	38	4,702	402	1.07
U-tube 2L T12 to LED	3	3	79	22	4,702	858	1.07
4' 4L T12 to LED	4	4	129	22	4,702	2,149	1.07
4' 4L T12 to LED	3	3	146	22	4,702	1,867	1.07
4' 4L T12 to LED	1	1	129	22	4,702	537	1.07
Incand. to LED	4	4	60	38	4,702	442	1.07
T12 to 4' 2L T8	2	2	63	38	4,702	251	1.07
4' 3L T12 to LED	1	1	91	22	4,702	346	1.07
T8 to 4' 2L T8	2	2	56	38	4,702	181	1.07
T12 to 4' 2L T8	2	2	63	38	4,702	251	1.07
T12 to 4' 2L T8	1	1	63	38	4,702	126	1.07
T12 to 4' 2L T8	1	1	63	38	4,702	126	1.07
4' 4L T8 to LED	1	1	109	22	4,702	437	1.07
4' 4L T12 to LED	1	1	146	22	4,702	622	1.07
Incand. to LED	2	2	60	19	4,702	412	1.07
Incand. to LED	1	1	75	10	4,702	326	1.07
U-tube 2L T12 to LED	1	1	79	22	4,702	286	1.07
Incand. to LED	1	1	75	10	4,702	326	1.07
4' 4L T12 to LED	2	2	129	33	2,374	487	1.07
4' 3L T12 to LED	8	8	91	33	2,374	1,176	1.07
T12 to 4' 2L T8	48	48	63	38	4,702	6,024	1.07
T12 to 4' 2L T8	16	16	78	38	4,702	3,213	1.07
T12 to 4' 2L T8	3	3	63	38	4,702	377	1.07
4' 3L T8 to LED	20	20	88	33	2,374	2,788	1.07
T12 to 4' 2L T8	23	23	146	58	4,702	10,161	1.07
T12 to 4' 2L T8	10	10	146	58	4,702	4,418	1.07
T12 to 4' 2L T8	40	40	146	38	991	4,569	1.07
T12 to 4' 2L T8	39	39	146	38	991	4,455	1.07
T12 to 4' 2L T8	28	28	78	38	991	1,185	1.07
T12 to 4' 2L T8	7	7	78	38	4,702	1,406	1.07
T12 to 4' 2L T8	19	19	146	58	991	1,768	1.07
T12 to 4' 2L T8	14	14	78	38	991	592	1.07
T8 to 4' 2L T8	7	7	56	38	991	133	1.07
T12 to 4' 2L T8	7	7	78	38	991	296	1.07
T12 to 4' 2L T8	7	7	78	38	991	296	1.07
T12 to 4' 2L T8	11	11	129	38	991	1,059	1.07
4' 4L T12 to LED	2	2	129	33	8,760	1,796	1.07
T12 to 4' 2L T8	16	16	63	38	991	423	1.07
T12 to 4' 2L T8	40	40	78	38	991	1,692	1.07
T12 to 4' 2L T8	8	8	146	38	991	914	1.07

Measure	*Quantity (Fixtures)*		*Wattage*		*Hours*	*Realized kWh Savings*	*Heating Cooling Interaction Factor*
	Old	*New*	*Old*	*New*			
4' 3L T12 to LED	21	21	91	33	5,215	6,781	1.07
4' 4L T12 to LED	6	6	146	33	5,215	3,775	1.07
T12 to 4' 2L T8	106	106	78	38	5,215	23,605	1.07
T12 to 4' 2L T8	1	1	78	38	5,215	223	1.07
4' 3L T12 to LED	5	5	91	22	5,215	1,921	1.07
T12 to 4' 2L T8	47	47	78	38	2,374	4,764	1.07
T8 to 4' 3L T8	8	8	88	55	5,215	1,470	1.07
T12 to 4' 2L T8	1	1	78	38	5,215	223	1.07
4' 3L T8 to LED	11	11	88	33	5,215	3,368	1.07
U-tube 2L T12 to LED	1	1	79	22	4,702	286	1.07
T12 to 4' 1L T8	1	1	42	20	4,702	110	1.07
4' 4L T12 to LED	2	2	146	22	4,702	1,245	1.07
4' 4L T8 to LED	2	2	109	22	4,702	873	1.07
4' 4L T8 to LED	2	2	109	22	4,702	873	1.07
4' 4L T12 to LED	10	10	146	22	4,702	6,225	1.07
4' 4L T12 to LED	3	3	146	22	4,702	1,867	1.07
4' 3L T12 to LED	1	1	105	22	4,702	417	1.07
4' 4L T12 to LED	3	3	146	22	4,702	1,867	1.07
4' 3L T12 to LED	2	2	91	22	4,702	693	1.07
U-tube 2L T12 to LED	8	8	79	22	4,702	2,289	1.07
4' 4L T12 to LED	4	4	146	22	4,702	2,490	1.07
4' 4L T12 to LED	3	3	146	22	4,702	1,867	1.07
U-tube 2L T12 to LED	6	6	60	22	4,702	1,145	1.07
4' 4L T12 to LED	1	1	146	22	4,702	622	1.07
U-tube 2L T12 to LED	9	9	60	22	4,702	1,717	1.07
U-tube 2L T12 to LED	17	17	60	22	4,702	3,243	1.07
4' 4L T12 to LED	1	1	129	22	4,702	537	1.07
4' 4L T12 to LED	1	1	129	22	4,702	537	1.07
U-tube 2L T12 to LED	30	30	79	22	4,702	8,584	1.07
U-tube 2L T12 to LED	3	3	60	22	4,702	572	1.07
U-tube 2L T12 to LED	3	3	60	22	4,702	572	1.07
U-tube 2L T12 to LED	10	10	60	22	4,702	1,908	1.07
T12 to 4' 2L T8	1	1	63	38	4,702	126	1.07
T12 to 4' 2L T8	32	32	78	38	4,702	6,426	1.07
U-tube 2L T12 to LED	7	7	79	22	4,702	2,003	1.07
8' 2L T12 to 8' 4L T8	2	2	123	74	4,702	492	1.07
4' 3L T12 to LED	1	1	91	22	4,702	346	1.07
4' 3L T12 to LED	8	8	91	22	4,702	2,771	1.07
4' 3L T12 to LED	4	4	91	22	4,702	1,386	1.07
4' 3L T8 to LED	3	3	88	33	2,374	418	1.07
T8 to 4' 2L T8	14	14	56	38	4,702	1,265	1.07
4' 2L T8 to LED	5	5	56	44	4,702	301	1.07
4' 2L T8 to LED	7	7	56	44	4,702	422	1.07
4' 4L T12 to LED	1	1	146	22	4,702	622	1.07
4' 4L T12 to LED	1	1	146	22	4,702	622	1.07
4' 4L T12 to LED	1	1	146	22	4,702	622	1.07
Incand. to LED	1	1	75	10	4,702	326	1.07
4' 4L T12 to LED	1	1	146	22	4,702	622	1.07
U-tube 2L T12 to LED	2	2	79	22	4,702	572	1.07
4' 4L T12 to LED	1	1	146	22	4,702	622	1.07
4' 3L T12 to LED	1	1	91	22	4,702	346	1.07
U-tube 2L T12 to LED	24	24	79	22	4,702	6,867	1.07
4' 4L T12 to LED	1	1	146	22	4,702	622	1.07
4' 4L T12 to LED	1	1	146	22	4,702	622	1.07
U-tube 2L T12 to LED	3	3	79	22	4,702	858	1.07
T12 to 4' 1L T8	1	1	42	20	4,702	110	1.07
U-tube 2L T12 to LED	10	10	60	22	4,702	1,908	1.07
4' 4L T12 to LED	1	1	146	22	4,702	622	1.07
4' 3L T12 to LED	4	4	91	33	2,374	588	1.07

Measure	*Quantity (Fixtures)*		*Wattage*		*Hours*	*Realized kWh Savings*	*Heating Cooling Interaction Factor*
	Old	*New*	*Old*	*New*			
U-tube 2L T12 to LED	5	5	60	22	2,635	534	1.07
T12 to 4' 2L T8	1	1	78	38	4,702	201	1.07
4' 4L T12 to LED	4	4	146	22	4,702	2,490	1.07
4' 2L T12 to LED	6	6	63	44	4,702	572	1.07
T12 to 4' 2L T8	44	44	78	38	4,702	8,835	1.07
4' 3L T12 to LED	1	1	91	22	2,635	194	1.07
4' 3L T12 to LED	1	1	91	22	2,635	194	1.07
4' 3L T12 to LED	9	9	91	22	4,702	3,117	1.07
T12 to 4' 2L T8	2	2	78	38	4,357	372	1.07
U-tube 2L T12 to LED	5	5	79	22	4,357	1,326	1.07
Incand. to LED	8	8	60	19	4,357	1,526	1.07
Incand. to LED	1	1	100	10	4,305	387	1.00
T12 to 4' 1L T8	4	4	42	20	4,702	442	1.07
U-tube 2L T12 to LED	1	1	79	22	4,702	286	1.07
4' 4L T12 to LED	3	3	146	22	4,702	1,867	1.07
T12 to 4' 2L T8	1	1	78	38	4,702	201	1.07
T12 to 4' 2L T8	2	2	78	38	8,760	748	1.07
U-tube 2L T12 to LED	3	3	60	22	4,702	572	1.07
U-tube 2L T12 to LED	11	11	60	22	4,702	2,098	1.07
U-tube 2L T12 to LED	7	7	79	22	4,702	2,003	1.07
U-tube 2L T12 to LED	4	4	60	32	8,760	1,047	1.07
U-tube 2L T12 to LED	3	3	79	32	8,760	1,319	1.07
4' 4L T12 to LED	34	34	129	33	8,760	30,525	1.07
U-tube 2L T12 to LED	4	4	60	22	2,635	428	1.07
U-tube 2L T12 to LED	1	1	60	22	4,702	191	1.07
T12 to 4' 2L T8	22	22	78	38	8,760	8,230	1.07
T12 to 4' 2L T8	4	4	78	38	4,702	803	1.07
U-tube 2L T12 to LED	1	1	79	22	4,702	286	1.07
4' 2L T12 to LED	12	12	63	44	4,702	1,145	1.07
T12 to 4' 2L T8	2	2	63	38	4,702	251	1.07
T12 to 4' 2L T8	1	1	63	38	4,702	126	1.07
8' 2L T12 to 8' 4L T8	1	1	197	112	4,702	427	1.07
T12 to 4' 1L T8	6	6	42	20	4,702	663	1.07
Total						1,171,350	

The table shown below presents expected and realized energy savings for the lighting controls installed under the Custom project.

Lighting Controls Savings Calculations

Measure	*Quantity*	*Controlled Wattage*	*Hours*		*Expected kWh Savings*	*Realized kWh Savings*	*Heating Cooling Interaction Factor*	*Realization Rate*
			Old	*New*				
Controls	145	95.61	4,702	4,454	27,948	3,679	1.07	13%
Controls	6	255	991	884	915	175	1.07	19%
Controls	84	76	2,374	1,780	3,743	4,059	1.07	108%
Controls	1	22	4,357	3,614	105	17	1.07	17%
Controls	30	103	2,635	2,303	2,701	1,096	1.07	41%
Controls	2	22	5,215	4,940	48	13	1.07	27%
Total					35,461	9,039		25%

The table shown below presents expected and realized energy savings for the lighting controls installed under the Prescriptive project.

Lighting Controls Savings Calculations

Measure	Quantity	Controlled Wattage	Hours		Realized kWh Savings	Heating Cooling Interaction Factor
			Old	New		
Controls	6	17	2,374	1,780	65	1.07
Controls	10	36	2,374	1,780	228	1.07
Controls	4	50	2,374	1,780	127	1.07
Controls	9	75	2,374	1,780	428	1.07
Controls	29	8	2,635	2,303	82	1.07
Controls	10	36	2,635	2,303	128	1.07
Controls	13	36	2,635	2,303	166	1.07
Controls	3	23	4,702	4,454	18	1.07
Controls	2	50	4,702	4,454	27	1.07
Controls	6	17	4,702	4,454	27	1.07
Controls	33	20	4,702	4,454	175	1.07
Controls	526	36	4,702	4,454	5,025	1.07
Controls	12	50	4,702	4,454	159	1.07
Controls	1	60	4,702	4,454	16	1.07
Controls	12	42	4,702	4,454	134	1.07
Controls	56	56	4,702	4,454	832	1.07
Controls	39	63	4,702	4,454	652	1.07
Controls	13	78	4,702	4,454	269	1.07
Controls	3	146	4,702	4,454	116	1.07
Total					8,675	

Results

Verified Gross Savings/Realization Rates By Custom Measure

Measure Category	kWh Savings			Realized Peak kW Reduction
	Expected	Realized	Realization Rate	
Lighting Retrofit	396,677	302,038	76%	55.36
Lighting Controls	35,461	9,039	25%	3.58
Total	432,137	311,077	72%	58.94

Verified Gross Savings/Realization Rates By Prescriptive Measure

Measure Category	kWh Savings			Realized Peak kW Reduction
	Expected	Realized	Realization Rate	
Lighting Retrofit	-	1,171,350	-	233.40
Lighting Controls	-	8,675	-	3.39
Total	1,282,862	1,180,025	92%	236.79

For the Custom project, the ex post savings analysis hours of operation verified during the M&V site visit (ranging from 990 to 8,759), not accounting for the effect of lighting controls, are less than the hours of operation used to perform the ex ante savings estimate (ranging from 782 to 8,760). The realization rate for the Custom lighting retrofit is 76%. The lighting controls ex ante energy savings estimate assumes a greater impact on lighting hours than calculated by the ex post energy savings analysis. The Custom lighting controls realization rate is 25%. The Prescriptive project-level realization rate is 92%.

Project Number 1382

Executive Summary

Under project 1382, the customer received incentives from Indiana Michigan Power for the scheduling of HVAC units and exhaust fans, installing a new HVAC unit, and repairing window and door infiltration. The realization rate for this project is 87%.

Project Description

The facility made improvements to HVAC units and exhaust fans scheduling, installed a new HVAC unit, and repaired window and door infiltration. Below is a list of buildings and their respective implemented measures:

Implemented Measures

Building	Measures
Building 1	Implement Energy saving control strategies. Scheduled start/stop, unoccupied temperature setback.
Kitchen and Canteen	Install controllers on each of the exhaust fans and connect to the EMCS. Schedule exhaust fans within EMCS. Kitchen and Canteen exhaust hoods
Vision Clinic	New Carrier Packaged VAV RTU with economizer, VFD for supply fan, and new DDC controls to be connected to EMCS
(7) Buildings	52 sets of door frame weather stripping, 59 door sweeps, 8 astragals for reducing building infiltration

Measurement and Verification Effort

During the M&V visit, ADM documented the setback schedules and set point changes. ADM also verified door and window sealing.

ADM utilized an eQuest DEER prototypical hospital model to calculate the savings for each measure. The model was run using TMY3 weather in Fort Wayne, Indiana. Savings for Building 1, the Kitchen and Canteen, and the Vision Clinic were calculated using parametric runs and normalizing the resulting savings using the ration of actual building area/prototypical model building area. The savings for the (7) Buildings was calculated using the following ASHRAE[12] equation for air leakage through a crack.

$$Q = A_L * sqrt(C_S * \Delta T + C_W * U^2)$$

Where:

Q	= Air Flow Rate, cfm
A_L	= Effective Air Leakage Area, in^2
C_S	= Stack Coefficient, $cfm^2/(in^4 * {}^oF)$
C_W	= Wind Coefficient, $cfm^2/(in^4 * {}^oF)$
ΔT	= Indoor – Outdoor Temperature Differential
U	= Wind Speed, mph

[12] ASHRAE Fundamentals (2009) 16.23-48

The resulting savings can be seen in the table below:

Measure Savings

Evaluation Measure	Ex Ante Savings (kWh/year)	Ex Post Savings (kWh/year)	Realization Rate
Building 1: Implement Energy saving control strategies. Scheduled start/stop, unoccupied temperature setback.	165,299	94,432	57%
Kitchen and Canteen: Install controllers on each of the exhaust fans and connect to the EMCS. Schedule exhaust fans within EMCS. Kitchen and Canteen exhaust hoods	36,011	39,849	111%
Vision Clinic: New Carrier Packaged VAV RTU with economizer, VFD for supply fan, and new DDC controls to be connected to EMCS.	72,424	99,197	137%
(7) Buildings: Polyurethane sealant for penetrations, 52 sets of door frame weather stripping, 59 door sweeps, 8 astragals for reducing building infiltration	44,056	42,745	97%

Results

Verified Gross Savings/Realization Rates

Measure Category	*kWh Savings*			*kW Savings*
	Expected	*Realized*	*Realization Rate*	*Realized*
HVAC Fan Scheduling	317,790	276,222	87%	462.66
Total	317,790	276,222	87%	462.66

The overall project realization rate is 87%.

The ex ante analysis utilized engineering calculations that estimate heating and cooling energy usage for each month. This methodology doesn’t account for actual building and equipment interactive effects. The calculations also appeared to overestimate the energy savings for the setback measures. The assumed unoccupied loads seem too low. Further review of the ex ante calculations could not be performed because the calculators were not provided.

The ex post analysis uses eQuest DEER prototypical simulation for a hospital. This methodology is able to account for the interactive effects of changing the temperature schedules, changing the exhaust fan schedules, and modifying rooftop units.

Project Number 1385

Executive Summary

Under project 1385, the customer received incentives from Indiana Michigan Power for retrofitting lighting in the interior and exterior of their facility and installing occupancy sensors. The realization rate for this project is 114%.

Project Description

The customer retrofitted the following fixtures:

- (3) HID fixtures with (3) LED fixtures
- (590) 4' 6L T8 fixtures with (590) LED fixtures
- (500) Occupancy Sensors

Measurement and Verification Effort

During the M&V visit, ADM staff verified equipment installation, baseline and post-retrofit connected load, and placed four photo-sensor loggers at the site (from 2/20/16 to 3/14/16) to monitor lighting operation. These data were used to calculate energy savings.

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*

Lighting occupancy sensor energy savings are calculated as:

$$kWh_{savings} = \sum_{Area} \left[HCIF \times W \times N \times \left(t_{base} - t_{as-built} \right) / 1000 \right]$$

Where:

$kWh_{savings}$	= *Annual energy savings*
N	= *Number of occupancy sensors*
W	= *Wattage controlled by each occupancy sensor*
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	Expected kWh Savings	Realized kWh Savings	Heating Cooling Interaction Factor	Realization Rate
	Old	New	Old	New					
HID to LED	3	3	290	169	4,305	1,590	1,563	1.00	98%
4' 6L T8 to LED	590	590	221	84	8,520	689,603	687,666	1.00	100%
Total						691,193	689,229		100%

The table shown below presents expected and realized energy savings for the lighting controls installed under the project.

Lighting Controls Savings Calculations

Measure	Quantity	Controlled Wattage	Hours		Expected kWh Savings	Realized kWh Savings	Heating Cooling Interaction Factor	Realization Rate
			Old	New				
Controls	500	84	8,520	3,316	107,654	218,552	1.00	203%
Total					107,654	218,552		203%

Results

Verified Gross Savings/Realization Rates By Measure

Measure Category	kWh Savings			Realized Peak kW Reduction
	Expected	Realized	Realization Rate	
Lighting Retrofit	691,193	689,229	100%	80.73
Lighting Controls	107,654	218,552	203%	28.08
Total	798,847	907,781	114%	108.82

The project-level realization rate is 114%. For the lighting retrofit, the realization rate is highly accurate. For the lighting controls, the ex ante savings estimation assumes a lesser impact on lighting hours than was measured and verified on-site.

Project Number 1413

Executive Summary

Under project 1413, the customer received incentives from Indiana Michigan Power for the scheduling of HVAC units. The realization rate for this project is 89%.

Project Description

The facility made improvements to the existing scheduling of HVAC units. Below is a list of buildings and their respective implemented measures:

Implemented Measures

Building	Measures
Building 4 (Vacant/Storage)	Heating and cooling setback schedule
Building 5 (Administration)	Heating and cooling setback schedule
Building 9 (Print Shop/Mail Room)	Heating and cooling setback schedule
Building 12 (Mental Health)	Heating and cooling setback schedule
Building 124 (Computer Room)	See Description
Building 127 (Telephone Room)	See Description
Building 47 (Theatre)	Supply fan on/off control and heating and cooling setback schedules
Building 16, 124, 127, 138, 172, 185 (Office/Medical Buildings)	Min airflow/fan ratio for VAV systems with HW reheat
Building 137 (Storage)	Heating and cooling setback schedule
Building T504 (Paint Shop)	Heating and cooling setback schedule
Building T516 (Auto Shop)	Heating and cooling setback schedule
Building 58 (Grounds Shop)	Heating and cooling setback schedule
Building 97 (Mason Shop)	Heating and cooling setback schedule

Measurement and Verification Effort

During the M&V visit, ADM documented the setback schedule and set point changes. ADM also verified the installation of the new VFDs.

ADM utilized an eQuest DEER prototypical hospital model to calculate the savings for each measure. The model was run using TMY3 weather in Grissom, Indiana. For all of the measures, savings were calculated using parametric runs and normalizing the resulting savings using the ratio of actual building area/prototypical model building area. The resulting savings can be seen in the table below:

Measure Savings

Evaluation Measure	**Ex Ante Savings (kWh/year)**	**Ex Post Savings (kWh/year)**	**Realization Rate**
(5) Buildings with GSHP Systems: Connect device level controllers and DDC field panels to central EMCS. Implement energy savings control strategies. Scheduled start/stop, unoccupied temperature setback.	336,909	91,828	27%
Building 124 & 127: Install a variable speed outside air supply fan and ducting to supply OA when OA temp is below 60F. Connect to EMCS. When OA supply fan is on DX systems will be off.	79,018	11,442	14%
Building 47: Connect device level controllers and DDC field panels to central EMCS. Implement energy savings control strategies. Scheduled start/stop, unoccupied temperature setback.	11,753	18,300	156%
(4) Buildings: Replace Air Flow Monitoring Stations and connect to EMCS. Implement energy savings control strategies. Scheduled start/stop, unoccupied temperature setback.	506,134	719,798	142%
(6) Buildings: Install programmable thermostat control for each window AC unit. Install programmable thermostat for each electric unit heater. Implement energy savings control strategies. Scheduled start/stop, unoccupied temperature setback.	19,535	9,214	47%

Results

Verified Gross Savings/Realization Rates

Measure Category	*kWh Savings*			*kW Savings*
	Expected	*Realized*	*Realization Rate*	*Realized*
HVAC Fan Scheduling	953,349	850,582	89%	558.46
Total	953,349	850,582	89%	558.46

The overall project realization rate is 89%.

The ex ante analysis utilized engineering calculations that estimate heating and cooling energy usage for each month. This methodology doesn't account for actual building and equipment interactive effects. Further review of the ex ante calculations could not be performed because the calculators were not provided.

The ex post analysis uses eQuest DEER prototypical simulation for a hospital. This methodology is able to account for the interactive effects of changing the temperature schedules, changing the exhaust fan schedules, and modifying rooftop units.

Appendix B: C&I Custom and Prescriptive Questionnaire for Decision Maker Survey

1. What is your job title or role?

    1. (Facilities Manager)
    2. (Energy Manager)
    3. (Other facilities management/maintenance position)
    4. (Chief Financial Officer)
    5. (Other financial/administrative position)
    6. (Proprietor/Owner)
    7. (President/CEO)
    8. (Manager)
    9. (Other) [RECORD VERBATIM]
    99. (Refused)

2. Does your company have the following policies or procedures in place at [LOCATION]?

    [FOR EACH, 1 = Yes, 2 = No, 98 = Don't know, 99 = Refused]

    a. A person or persons responsible for monitoring or managing energy usage
    b. Defined energy savings goals
    c. A specific policy requiring that energy efficiency be considered when purchasing equipment
    d. Carbon reduction goals

AWARENESS

3. How did you FIRST learn about Indiana Michigan Power's incentives for efficient equipment or upgrades?

    1. (From a Trade Ally/contractor/equipment vendor/ energy consultant)
    2. (From an Indiana Michigan Power Account Representative)
    3. (From a program representative / Lockheed Martin)
    4. (From a search engine (Google, Yahoo, Bing))
    5. (At an event/trade show)
    6. (Received an email blast or electronic newsletter)
    7. (Received an informational brochure)
    8. (From a program sponsored webinar)
    9. (From mobile advertising)
    10. (From *Indiana Michigan*'s website)
    11. (From advertisements)
    12. (Friends or colleagues)
    13. (Through past experience with the program)
    14. (Other (please explain))
    98. (Don't know)

99. (Refused)

[DISPLAY Q4 ONLY IF INCENTIVE TYPE = PRESCRIPTIVE]

4. In addition to the incentives for specific prescriptive equipment upgrades you received, did you know you could qualify for incentives by proposing a custom energy-upgrade project that fits your specific facility needs?

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

[DISPLAY Q5 ONLY IF Q4 = 1]

5. Why didn't you choose the custom option that offers incentives for non-prescriptive equipment? (MULTISELCT)

   1. (All of the equipment I was interested in was listed on the Prescriptive application.)
   2. (I didn't want to do another application for custom equipment)
   3. (The custom application was too complicated.)
   4. (Other (Specify)) (Specify)
   98. (Don't know)
   99. (Refused)

[DISPLAY Q6 ONLY IF PROJECT = PRESCRIPTIVE OR CUSTOM OR RETRO-COMMISSIONING]

6. Is your firm considering undertaking any new construction or major building renovation projects within the next five years? [Such as adding a new wing, gutting an existing building, or building an entirely new building.]

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

[DISPLAY Q7 IF Q6 =1]

7. Are you in the design phase now?

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

[DISPLAY Q **8** IF Q**6** =1]

8. Are you aware that Indiana Michigan offers custom incentives for new construction projects?

   1. Yes
   2. No

98. (Don't know)
99. (Refused)

[DISPLAY Q**9** and Q10 ONLY IF PROJECT = RETRO-COMMISSIONING]

9. You recently received incentives for a retro-commissioning project. Which of these other Indiana Michigan Power program incentives are you aware of? (MULTISELECT)

   1. Custom incentives for new construction projects
   2. Prescriptive incentives for specific measures such as lighting, VFDs, refrigeration, and commercial kitchen equipment
   3. Custom incentives for non-prescriptive measures
   4. None of the above

10. Using a scale of 1 to 5, where 1 means not at all and 5 means completely, how well did the Retro-commissioning program's range of incentive options fit your needs?

    1. [RECORD 1-5]
    98. (Don't know)
    99. (Refused)

[DISPLAY Q11 ONLY IF Q10 < 5]

11. In what way did the range of incentive options offered fail to meet your needs completely?_______

PROGRAM DELIVERY EFFICIENCY

5.3.1 Application Process [do not display]

12. 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 vendor or contractor initiated it
    3. The idea arose in discussion between your organization and your vendor or contractor
    4. Some other way. Please describe: ______
    99. (Don't Know)
    99. (Refused)

13. Which of the following people worked on completing your application for program incentives (including gathering required documentation)?

    [FOR EACH, 1 = Yes, 2 = No, 98 = Don't know, 99 = Refused]

    a. Yourself
    b. Another member of your company
    c. A contractor
    d. An equipment vendor
    e. A designer or architect

[DISPLAY Q14 IF Q13a = 1]

14. And how did you submit your application worksheets?

    1. (As an email attachment)
    2. (By fax)
    3. (By postal mail)
    4. (Online)
    5. (Other – Specify)
    98. (Don't know)
    99. (Refused)

[DISPLAY Q15 IF Q13a = 1]

15. Thinking back to the application process, please rate <u>the clarity of information</u> on how to complete the application using a scale where 1 means not at all clear and 5 means completely clear.

1. [RECORD 1 – 5]
98. (Don't Know)
99. (Refused)

[DISPLAY Q16 ONLY IF Q15< 4]

16. What information, including instructions on forms, needs to be further clarified? _______

[DISPLAY Q17 IF Q13a = 1]

17. Using a 5-point scale, where 1 means "completely unacceptable" and 5 means "completely acceptable," how would you rate . . .

    1. [RECORD 1 – 5]
    98. (Don't Know/Not Applicable)
    99. (Refused)

    a. the ease of finding forms on Indiana Michigan Power's website
    b. the ease of using the electronic application worksheets
    c. the time it took to approve the application
    d. the effort required to provide required invoices or other supporting documentation
    e. the overall application process

[DISPLAY Q18 IF Q13a = 1]

18. 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

99. Refused

[DISPLAY Q19 ONLY IF PROJECT = RETRO-COMMISSIONING]

19. 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)
    99. (Refused)

[DISPLAY Q20 ONLY IF INCENTIVE_TYPE <> PRESCRIPTIVE]

20. After initial submission, were you (or anyone acting on your behalf) required to resubmit or provide additional documentation before your application was approved?

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

[DISPLAY Q21 ONLY IF Q20=1]

21. Why did you have to resubmit your application or provide additional documentation?

    1. [RECORD VERBATIM]
    98. (Don't know)
    99. (Refused)

22. How did the incentive amount compare to what you expected? Would you say…

    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)
    99. (Refused)

EQUIPMENT SELECTION

[DISPLAY Q23 IF PROJECT = PRESCRIPTIVE or CUSTOM or NEW CONSTRUCTION]

23. Using a scale where 1 means provided no input and 5 means provided critical input, how did each of the following types of people affect your decision to install the efficient equipment?

    1. [RECORD 1 – 5]
    98. (Don't Know/Not Applicable)
    99. (Refused)

a. Vendor (retailer)
b. Contractor (installer)
c. Designer or architect
d. Utility staff member, such as an account representative
e. Program representative

[DISPLAY Q24 IF PROJECT = RETRO-COMMISSIONING]

24. Using a scale where 1 means provided no input and 5 means provided critical input, how did each of the following affect your decision to install the efficient equipment?

1. [RECORD 1 – 5]
98. (Don't Know/Not Applicable)
99. (Refused)

a. Audit results
b. Contractor (installer)
c. Your Retro-commissioning Service Provider
d. Indiana Michigan Power staff member, such as an account representative
e. Program Representative

[DISPLAY Q0 IF (PROJECT= PRESCRIPTIVE or CUSTOM or RETRO-COMMISSIONING)]

25. Who installed your program-qualified equipment or efficiency upgrades? Was it…

1. Your own staff
2. A contractor you've worked with before
3. A contractor recommended by the Indiana Michigan program (registered trade ally)
4. A new contractor that someone else recommended
5. Someone else [RECORD VERBATIM]
98. (Don't know)
99. (Refused)

MEASUREMENT AND VERIFICATION

26. After your project was completed, did a program representative inspect the work done through the program?

1. Yes

2. No
98. (Don't know)
99. (Refused)

[DISPLAY Q27 If Q26=1]

27. Using the scale where 1 means you do not agree at all and 5 means you completely agree, please rate your agreement with the following statements:

1. [RECORD 1 – 5]
98. (Don't Know/Not Applicable)
99. (Refused)

a. The inspector was courteous

b. The inspector was efficient

CUSTOMER SATISFACTION [DO NOT DISPLAY HEADING; DISPLAY INTRO]

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.

28. In the course of doing this project did you have any interactions with program staff?

1. Yes
2. No
98. (Don't Know/Not Applicable)
99. (Refused)

29. Using a scale where 1 means not at all satisfied and 5 means very satisfied, how satisfied are you with:

1. [RECORD 1 – 5]
98. (Don't Know/Not Applicable)
99. (Refused)

a. [DISPLAY IF Q28 = 1] how long it took program staff to address your questions or concerns

b. [DISPLAY IF Q28 = 1] how thoroughly they addressed your question or concern

c. the equipment that was installed

d. [DISPLAY IF Q25 = 2,3,4] the quality of the installation

e. the steps you had to take to get through the program

f. the amount of time it took to get your rebate or incentive

g. the range of equipment that qualifies for incentives

h. the program, overall

[DISPLAY IF ANY IN Q29 <3]

30. Please describe the ways in which you were not satisfied with the aspects of the program mentioned above?_______

NET-TO-GROSS SECTION

5.3.2 Free-Ridership [Do Not Display]

[DISPLAY Q31 IF PROJECT <> NEW CONSTRUCTION]

31. Has your organization purchased any significant energy efficient equipment in the last three years for which you DID NOT apply for a financial incentive through an energy efficiency program at the [LOCATION] location?

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

32. Now I would like to ask you some questions about your decision to [INSTALL] the [MEASURE]. In deciding to do a project of this type, there are usually a number of reasons why it may be undertaken. In your own words, can you tell me why this project was implemented? (IF NEEDED: Were there any other reasons? MULTIPLE RESPONSE. UP TO THREE.)

    1 (To replace old or outdated equipment)
    2 (As part of a planned remodeling, build-out, or expansion)
    3 (To gain more control over how the equipment was used)
    4 (The maintenance downtime and associated expenses for the old equipment were too high)
    5 (Had process problems and were seeking a solution)
    6 (To improve equipment performance)
    7 (To improve the product quality)
    8 (To comply with codes set by regulatory agencies)
    9 (To comply with organizational policies regarding regular/normal maintenance/replacement policy)
    10 (To get a rebate from the program)
    11 (To protect the environment)
    12 (To reduce energy costs)
    13 (To reduce energy use/power outages)
    14 (To update to the latest technology)
    00 (Other) [RECORD VERBATIM]
    98 (Don't know)
    99 (Refused)

[DISPLAY Q33 IF PROJECT <> NEW CONSTRUCTION]

33. Before you KNEW about the program, had you [INSTALLED] a project similar to the [MEASURE] project at the [LOCATION] location?

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

[DISPLAY Q34 IF PROJECT<> NEW CONSTRUCTION]

34. Before PARTICIPATING in the program, had you completed a project similar to the [MEASURE] project at the [LOCATION] location?

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

35. Did you have plans to [INSTALL] the [MEASURE] at the [LOCATION] location before participating in the program?

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

[DISPLAY Q**0** IF Q35 = 1]

36. Would you have gone ahead with this planned project even if you had not participated in the program?

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

37. Prior to completing this project, did you have previous experience with the program?

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

[DISPLAY Q38 IF Q37 = 1]

38. How important was previous experience with Indiana-Michigan-offered programs in making your decision to [INSTALL] the [MEASURE] at the [LOCATION] location? Would you say that it was…

    1. Very important
    2. Somewhat important
    3. Only slightly important
    4. Not at all important
    98. (Don't know)
    99. (Refused)

39. Did a program representative or other Indiana Michigan Power representative recommend that you [INSTALL] the [MEASURE] at the [LOCATION] location?

    1. Yes
    2. No
    98. (Don’t know)
    99. (Refused)

    [DIPLAY Q0 IF Q39 =1]

40. If the program representative had not recommended [INSTALLING] the [MEASURE], 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)
    99. (Refused)

41. Would your organization been financially able to [INSTALL] the [MEASURE] at the [LOCATION] location without the financial incentive from the program?

    1. Yes
    2. No
    98. (Don’t know)
    99. (Refused)

42. If the financial incentive from the program had not been available, how likely is it that you would have [INSTALLED] the [MEASURE] at the [LOCATION] location 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)
    99. (Refused)

[DISPLAY Q43 IF MEASURE_QUANT > 1]

43. We would like to know whether the availability of information and financial incentives through the program affected the quantity (or number of units) of [MEASURE] that you purchased and [INSTALLED] at the [LOCATION].

    Did you purchase and install more [MEASURE] than you otherwise would have without the program?

    1. Yes
    2. No, program did not affect quantity purchased and installed.
    98. (Don't know)
    99. (Refused)

[DISPLAY Q44 IF ENERGY_EQUIP = YES]

44. We would like to know whether the availability of information and financial incentives through the program affected the level of energy efficiency you chose for [MEASURE2] at the [LOCATION].

    Did you choose equipment that was more energy efficient than you would have chosen because of the program?

    1. Yes
    2. No, program did not affect level of efficiency chosen for equipment.
    98. (Don't know)
    99. (Refused)

[DISPLAY Q**0** IF Q**0** = 1]

45. What kind of equipment, if any, would you have installed if you had not participated in the program?

    1. [VERBATIM]
    98. (Don't know)
    99. (Refused)

46. We would like to know whether the availability of information and financial incentives through the program affected the timing of the [MEASURE] project at the [LOCATION].

    Did you [INSTALL] the [MEASURE] earlier than you otherwise would have without the program?

    1. Yes
    2. No, program did not affect did not affect timing of project.
    98. (Don't know)
    99. (Refused)

[DISPLAY Q**0** IF Q**0** = 1]

47. When would you otherwise have completed the project?

    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)
    99. (Refused)

[DISPLAY Q48 IF MSAME = 1]

48. Our records show that your organization also received an incentive from Indiana Michigan Power’s program for [NSAME] other [MEASURE] projects completed at a different location. Was it a single decision to complete all of those [MEASURE] projects for which you received an incentive from the program or did each project go through its own decision process?

    1 Single Decision
    2 Each project went through its own decision process
    00 (Other) [RECORD VERBATIM]
    98 (Don’t know)
    99 (Refused)

[DISPLAY Q49 IF FSAME = 1]

49. Our records show that your organization also received an incentive Indiana Michigan Power’s program for a [FDESC] project at [LOCATION]. Was the decision making process for that project the same as for the [MEASURE2] project we have been talking about?

    1 Same decision making process
    2 Different decision making process
    00 (Other) [RECORD VERBATIM]
    98 (Don’t know)
    99 (Refused)

5.3.3 Spillover

50. Since your participation in the program did you implement any ADDITIONAL energy efficiency measures at this facility or at your other facilities within Indiana Michigan Power’s service territory that did NOT receive incentives through Indiana Michigan programs?

    1. Yes
    3. No
    98. (Don't know)
    99. (Refused)

[DISPLAY Q51 IF Q50 = 1]

51. What energy efficient equipment did you purchase?

[DISPLAY Q52 IF Q50 = 1]

52. What motivated you to install this equipment?

[DISPLAY Q53 IF Q50 = 1]

53. Using a scale of 0 to 10, where 0 is not at all important and 10 is extremely important, how important was your experience with the program in your decision to implement this project?

    [RECORD 0 TO 10]
    98 (Don't know)
    99 (Refused)

[DISPLAY Q54 IF Q50 = 1]

54. If you had not participated in the <PROGRAM>, how likely is it that your organization would still have implemented this measure, using a 0 to 10, scale where 0 means you definitely WOULD NOT have implemented this measure and 10 means you definitely WOULD have implemented this measure?

    [RECORD 0 TO 10]
    98 (Don't know)
    99 (Refused)

[DISPLAY Q55 IF Q50 = 1]

55. 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)
    7. (Other reason (please describe)
    98. (Don't know)
    99. (Refused)

Firmographic

56. What is the type of work that your firm or organization does at [LOCATION]?

    1. (Industrial)
    2. (Restaurant (not fast food))
    3. (Fast food restaurant)
    4. (Retail)
    5. (Office)
    6. (Grocery and convenience)
    7. (School)
    8. (Lodging)
    9. (Warehouse)
    10. (Other – specify)
    98. (Don't know)
    99. (Refused)

Appendix C: C&I Custom Decision Maker Survey Responses

As part of the evaluation work effort, a survey was conducted with decision makers for facilities that received incentives under the C&I Custom and Prescriptive Programs. The survey provided the information used in Sections 2.3 and 3.3 to estimate free ridership for projects in the C&I Custom and Prescriptive Programs. 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 Custom Program, and (3) the influence that the C&I Custom 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 for participants in the C&I Custom Program. 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=16)*	*Percent of Respondents*
What is your job title or role?	Facilities Manager	3	19%
	Energy Manager	1	6%
	Other facilities management/maintenance position	1	6%
	Chief Financial Officer	0	0%
	Other financial/administrative position	0	0%
	Proprietor/Owner	2	13%
	President/CEO	1	6%
	Manager	2	13%
	Other	6	38%
	REFUSED	0	0%

	Response	*(n=16)*	*Percent of Respondents*
Does your company have the following policies or procedures in place at <LOCATION>? A person or persons responsible for monitoring or managing energy usage	Yes	9	56%
	No	7	44%
	REFUSED	0	0%
	DON'T KNOW	0	0%

	Response	*(n=16)*	*Percent of Respondents*
Does your company have the following policies or procedures in place at <LOCATION>?	Yes	8	50%
	No	8	50%
	REFUSED	0	0%

Defined energy savings goals	DON'T KNOW	0	0%

Does your company have the following policies or procedures in place at <LOCATION>? A specific policy requiring that energy efficiency be considered when purchasing equipment	*Response*	*(n=16)*	*Percent of Respondents*
	Yes	10	63%
	No	6	38%
	REFUSED	0	0%
	DON'T KNOW	0	0%

Does your company have the following policies or procedures in place at <LOCATION>? Carbon reduction goals	*Response*	*(n=16)*	*Percent of Respondents*
	Yes	6	38%
	No	10	63%
	REFUSED	0	0%
	DON'T KNOW	0	0%

How did you FIRST learn about Indiana Michigan Powers SBDI Program?	*Response*	*(n=16)*	*Percent of Respondents*
	From a Trade Ally/contractor/equipment vendor/ energy consultant	0	0%
	From an Indiana Michigan Power Account Representative	5	31%
	From a program representative / Lockheed Martin	1	6%
	From a search engine Google, Yahoo, Bing	0	0%
	At an event/trade show	0	0%
	Received an email blast or electronic newsletter	1	6%
	Received an informational brochure	0	0%
	From a program sponsored webinar	0	0%
	From mobile advertising	0	0%
	From Indiana Michigan's website	3	19%
	From advertisements	0	0%
	Friends or colleagues	3	19%
	Through past experience with the program	0	0%
	Other	3	19%
	Don't know	0	0%
	Refused	0	0%

In addition to the incentives for specific prescriptive equipment upgrades you received, did you know you could qualify for incentives by proposing a custom energy-upgrade project that fits your specific facility needs?	*Response*	*(n=0)*	*Percent of Respondents*
	Yes	0	#DIV/0!
	No	0	#DIV/0!
	Don't know	0	#DIV/0!
	Refused	0	#DIV/0!

	Response	*(n=0)*	*Percent of Respondents*
Why didn´t you choose the custom option that offers incentives for non-prescriptive equipment?	All of the equipment I was interested in was listed on the Prescriptive application.	0	#DIV/0!
	I didn't want to do another application for custom equipment	0	#DIV/0!
	The custom application was too complicated.	0	#DIV/0!
	Other Specify	0	#DIV/0!
	Don't know	0	#DIV/0!
	Refused	0	#DIV/0!

	Response	*(n=15)*	*Percent of Respondents*
Is your firm considering undertaking any new construction or major building renovation projects within the next five years? [Such as adding a new wing, gutting an existing building, or building an entirely new building.]	Yes	10	67%
	No	5	33%
	Don't know	0	0%
	Refused	0	0%

	Response	*(n=10)*	*Percent of Respondents*
Are you in the design phase now?	Yes	4	40%
	No	6	60%
	Don't know	0	0%
	Refused	0	0%

	Response	*(n=10)*	*Percent of Respondents*
Are you aware that Indiana Michigan offers custom incentives for new construction projects?	Yes	6	60%
	No	4	40%
	Don't know	0	0%
	Refused	0	0%

	Response	*(n=0)*	*Percent of Respondents*
You recently received incentives for a retro-commissioning project. Which of these other Indiana Michigan Power program incentives are you aware of?	Custom incentives for new construction projects	0	#DIV/0!
	Prescriptive incentives for specific measures such as lighting, VFDs, refrigeration, and commercial kitchen equipment	0	#DIV/0!
	Custom incentives for non-prescriptive measures	0	#DIV/0!
	None of the above	0	#DIV/0!

	Response	*(n=0)*	*Percent of Respondents*
Using a scale of 1 to 5, where 1 means not at all and 5 means completely, how well did the Retro-	1 - not at all	0	#DIV/0!
	2	0	#DIV/0!

commissioning program´s range of incentive options fit your needs?	3	0	#DIV/0!
	4	0	#DIV/0!
	5 - completely	0	#DIV/0!
	Don't know	0	#DIV/0!
	Refused	0	#DIV/0!

Regarding your organization´s decision to participate in the incentive program, who initiated the discussion about the incentive opportunity? Would you say…	*Response*	*(n=16)*	*Percent of Respondents*
	Your organization initiated it	7	44%
	Your vendor or contractor initiated it	8	50%
	The idea arose in discussion between your organization and your vendor or contractor	0	0%
	Some other way.	1	6%
	Don't know	0	0%
	Refused	0	0%

Which of the following people worked on completing your application for program incentives (including gathering required documentation)? Yourself	*Response*	*(n=16)*	*Percent of Respondents*
	Yes	14	88%
	No	2	13%
	Don’t know	0	0%
	Refused	0	0%

Which of the following people worked on completing your application for program incentives (including gathering required documentation)? Another member of your company	*Response*	*(n=16)*	*Percent of Respondents*
	Yes	4	25%
	No	11	69%
	Don’t know	1	6%
	Refused	0	0%

Which of the following people worked on completing your application for program incentives (including gathering required documentation)? A contractor	*Response*	*(n=16)*	*Percent of Respondents*
	Yes	9	56%
	No	6	38%
	Don’t know	1	6%
	Refused	0	0%

Which of the following people worked on completing your application for program	*Response*	*(n=16)*	*Percent of Respondents*
	Yes	8	50%
	No	8	50%

incentives (including gathering required documentation)? An equipment vendor	Don’t know	0	0%
	Refused	0	0%

Which of the following people worked on completing your application for program incentives (including gathering required documentation)? A designer or architect	*Response*	*(n=16)*	*Percent of Respondents*
	Yes	3	19%
	No	13	81%
	Don’t know	0	0%
	Refused	0	0%

And how did you submit your application worksheets?	*Response*	*(n=14)*	*Percent of Respondents*
	As an email attachment	9	64%
	By fax	0	0%
	By postal mail	0	0%
	Online	3	21%
	Other – Specify	2	14%
	Don’t know	0	0%
	Refused	0	0%

Thinking back to the application process, please rate the clarity of information on how to complete the application using a scale where 1 means not at all clear and 5 means completely clear.	*Response*	*(n=14)*	*Percent of Respondents*
	1 - not at all clear	0	0%
	2	1	7%
	3	1	7%
	4	7	50%
	5 - completely clear	4	29%
	Don’t know	1	7%
	Refused	0	0%

Using a 5-point scale, where 1 means "completely unacceptable" and 5 means "completely acceptable," how would you rate . . . The ease of finding forms on Indiana Michigan Power´s website	*Response*	*(n=14)*	*Percent of Respondents*
	1 - completely unacceptable	0	0%
	2	0	0%
	3	3	21%
	4	5	36%
	5 - completely acceptable	5	36%
	Don’t know	1	7%
	Refused	0	0%

Using a 5-point scale, where 1 means	*Response*	*(n=14)*	*Percent of Respondents*

"completely unacceptable" and 5 means "completely acceptable," how would you rate . . . The ease of using the electronic worksheets	1 - completely unacceptable	0	0%
	2	0	0%
	3	1	7%
	4	7	50%
	5 - completely acceptable	4	29%
	Don’t know	2	14%
	Refused	0	0%

Using a 5-point scale, where 1 means "completely unacceptable" and 5 means "completely acceptable," how would you rate . . . The time it took to approve the application	*Response*	*(n=14)*	*Percent of Respondents*
	1 - completely unacceptable	0	0%
	2	1	7%
	3	1	7%
	4	8	57%
	5 - completely acceptable	4	29%
	Don’t know	0	0%
	Refused	0	0%

Using a 5-point scale, where 1 means "completely unacceptable" and 5 means "completely acceptable," how would you rate . . . The effort to provide required invoices or other supporting documentation	*Response*	*(n=14)*	*Percent of Respondents*
	1 - completely unacceptable	0	0%
	2	2	14%
	3	1	7%
	4	6	43%
	5 - completely acceptable	5	36%
	Don’t know	0	0%
	Refused	0	0%

Using a 5-point scale, where 1 means "completely unacceptable" and 5 means "completely acceptable," how would you rate . . . The overall application process	*Response*	*(n=14)*	*Percent of Respondents*
	1 - completely unacceptable	0	0%
	2	0	0%
	3	2	14%
	4	8	57%
	5 - completely acceptable	4	29%
	Don’t know	0	0%
	Refused	0	0%

Which of the following people worked on completing your application for program incentives (including gathering required documentation)? An equipment vendor	*Response*	*(n=16)*	*Percent of Respondents*
	Yes	8	50%
	No	8	50%
	Don’t know	0	0%
	Refused	0	0%

	Response	*(n=14)*	*Percent of Respondents*
Did you have a clear sense of whom you could go to for assistance with the application process?	Yes	11	79%
	No	2	14%
	Don't know	1	7%
	Refused	0	0%

	Response	*(n=0)*	*Percent of Respondents*
Did you have a clear sense of who you could go to for assistance in finding a Retro-commissioning Service provider?	Yes	0	#DIV/0!
	No	0	#DIV/0!
	Don't know	0	#DIV/0!
	Refused	0	#DIV/0!

	Response	*(n=16)*	*Percent of Respondents*
After initial submission, were you (or anyone acting on your behalf) required to resubmit or provide additional documentation before your application was approved?	Yes	1	6%
	No	14	88%
	Don't know	1	6%
	Refused	0	0%

	Response	*(n=16)*	*Percent of Respondents*
How did the incentive amount compare to what you expected? Would you say…	It was much less	1	6%
	It was somewhat less	0	0%
	It was about the amount expected	12	75%
	It was somewhat more	2	13%
	It was much more	0	0%
	Don't know	1	6%
	Refused	0	0%

	Response	*(n=16)*	*Percent of Respondents*
[PARTICIANTS THAT DID NOT COMPLETE RETRO-COMMISSIONING PROJECTS] Using a scale where 1 means provided no input and 5 means provided critical input, how did each of the following types of people affect your decision to install the efficient equipment? Vendor	1 - provided no input	6	38%
	2	0	0%
	3	3	19%
	4	2	13%
	5 - provided critical input	5	31%
	Don't know	0	0%
	Refused	0	0%

[PARTICIANTS THAT DID NOT COMPLETE RETRO-COMMISSIONING PROJECTS] Using a scale where 1 means provided no input and 5 means provided critical input, how did each of the following types of people affect your decision to install the efficient equipment? Contractor	*Response*	*(n=16)*	*Percent of Respondents*
	1 - provided no input	7	44%
	2	2	13%
	3	3	19%
	4	2	13%
	5 - provided critical input	2	13%
	Don’t know	0	0%
	Refused	0	0%

[PARTICIANTS THAT DID NOT COMPLETE RETRO-COMMISSIONING PROJECTS] Using a scale where 1 means provided no input and 5 means provided critical input, how did each of the following types of people affect your decision to install the efficient equipment? Designer or architect	*Response*	*(n=16)*	*Percent of Respondents*
	1 - provided no input	7	44%
	2	1	6%
	3	2	13%
	4	1	6%
	5 - provided critical input	1	6%
	Don’t know	4	25%
	Refused	0	0%

[PARTICIANTS THAT DID NOT COMPLETE RETRO-COMMISSIONING PROJECTS] Using a scale where 1 means provided no input and 5 means provided critical input, how did each of the following types of people affect your decision to install the efficient equipment? Utiliaty staff member, such as an account representative	*Response*	*(n=16)*	*Percent of Respondents*
	1 - provided no input	5	31%
	2	1	6%
	3	2	13%
	4	2	13%
	5 - provided critical input	4	25%
	Don’t know	2	13%
	Refused	0	0%

[PARTICIANTS THAT DID NOT COMPLETE RETRO-COMMISSIONING	*Response*	*(n=16)*	*Percent of Respondents*
	1 - provided no input	4	25%
	2	0	0%

PROJECTS] Using a scale where 1 means provided no input and 5 means provided critical input, how did each of the following types of people affect your decision to install the efficient equipment? Program representative	3	3	19%
	4	3	19%
	5 - provided critical input	4	25%
	Don't know	2	13%
	Refused	0	0%

[PARTICIANTS THAT COMPLETED RETRO-COMMISSIONING PROJECTS] Using a scale where 1 means provided no input and 5 means provided critical input, how did each of the following types of people affect your decision to install the efficient equipment? Audit results	*Response*	*(n=0)*	*Percent of Respondents*
	1 - provided no input	0	#DIV/0!
	2	0	#DIV/0!
	3	0	#DIV/0!
	4	0	#DIV/0!
	5 - provided critical input	0	#DIV/0!
	Don't know	0	#DIV/0!
	Refused	0	#DIV/0!

[PARTICIANTS THAT COMPLETED RETRO-COMMISSIONING PROJECTS] Using a scale where 1 means provided no input and 5 means provided critical input, how did each of the following types of people affect your decision to install the efficient equipment? Contractor	*Response*	*(n=0)*	*Percent of Respondents*
	1 - provided no input	0	#DIV/0!
	2	0	#DIV/0!
	3	0	#DIV/0!
	4	0	#DIV/0!
	5 - provided critical input	0	#DIV/0!
	Don't know	0	#DIV/0!
	Refused	0	#DIV/0!

[PARTICIANTS THAT COMPLETED RETRO-COMMISSIONING PROJECTS] Using a scale where 1 means provided no input and 5 means provided critical input, how did each of the following types of people affect your decision to install the efficient equipment?	*Response*	*(n=0)*	*Percent of Respondents*
	1 - provided no input	0	#DIV/0!
	2	0	#DIV/0!
	3	0	#DIV/0!
	4	0	#DIV/0!
	5 - provided critical input	0	#DIV/0!
	Don't know	0	#DIV/0!
	Refused	0	#DIV/0!

RCx service provider			

[PARTICIANTS THAT COMPLETED RETRO-COMMISSIONING PROJECTS] Using a scale where 1 means provided no input and 5 means provided critical input, how did each of the following types of people affect your decision to install the efficient equipment? Utiliaty staff member, such as an account representative	*Response*	*(n=0)*	*Percent of Respondents*
	1 - provided no input	0	#DIV/0!
	2	0	#DIV/0!
	3	0	#DIV/0!
	4	0	#DIV/0!
	5 - provided critical input	0	#DIV/0!
	Don’t know	0	#DIV/0!
	Refused	0	#DIV/0!

[PARTICIANTS THAT COMPLETED RETRO-COMMISSIONING PROJECTS] Using a scale where 1 means provided no input and 5 means provided critical input, how did each of the following types of people affect your decision to install the efficient equipment? Program representative	*Response*	*(n=0)*	*Percent of Respondents*
	1 - provided no input	0	#DIV/0!
	2	0	#DIV/0!
	3	0	#DIV/0!
	4	0	#DIV/0!
	5 - provided critical input	0	#DIV/0!
	Don’t know	0	#DIV/0!
	Refused	0	#DIV/0!

Who installed your program-qualified equipment or efficiency upgrades? Was it…	*Response*	*(n=15)*	*Percent of Respondents*
	Your own staff	3	20%
	A contractor you’ve worked with before	9	60%
	A contractor recommended by the Indiana Michigan program (registered trade ally)	0	0%
	A new contractor that someone else recommended	3	20%
	Someone else	0	0%
	Don’t know	0	0%
	Refused	0	0%

After your project was completed, did a program representative inspect the work done through the program?	*Response*	*(n=16)*	*Percent of Respondents*
	Yes	9	56%
	No	6	38%
	Don’t know	1	6%
	Refused	0	0%

Using the scale where 1 means you do not agree at all and 5 means you completely agree, please rate your agreement with the following statements: The inspector was courteous	*Response*	*(n=9)*	*Percent of Respondents*
	1 - do not agree at all	1	11%
	2	0	0%
	3	0	0%
	4	0	0%
	5 - completely agree	8	89%
	Don’t know	0	0%
	Refused	0	0%

Using the scale where 1 means you do not agree at all and 5 means you completely agree, please rate your agreement with the following statements: The inspector was efficient	*Response*	*(n=9)*	*Percent of Respondents*
	1 - do not agree at all	0	0%
	2	0	0%
	3	0	0%
	4	1	11%
	5 - completely agree	8	89%
	Don’t know	0	0%
	Refused	0	0%

In the course of doing this project did you have any interactions with program staff?	*Response*	*(n=16)*	*Percent of Respondents*
	Yes	11	69%
	No	5	31%
	Don’t know	0	0%
	Refused	0	0%

Using a scale of one to five, where one is very dissatisfied, five is very satisfied, and a three is neither particularly dissatisfied nor satisfied, please rate how satisfied or dissatisfied you are with each of the following …. How long it took program staff to adddress your questions or concerns	*Response*	*(n=11)*	*Percent of Respondents*
	1 - Very dissatisfied	0	0%
	2	0	0%
	3 - Neither satisfied nor dissatisfied	0	0%
	4	5	45%
	5 - Very satisfied	6	55%
	Don’t know	0	0%
	Refused	0	0%

Using a scale of one to five, where one is very dissatisfied, five is very satisfied, and a three is neither particularly dissatisfied nor satisfied, please rate how satisfied or dissatisfied you are with each of the following ….	*Response*	*(n=11)*	*Percent of Respondents*
	1 - Very dissatisfied	0	0%
	2	0	0%
	3 - Neither satisfied nor dissatisfied	0	0%
	4	3	27%
	5 - Very satisfied	8	73%
	Don’t know	0	0%

How thoroughly [program staff] addressed your questions or concerns	Refused	0	0%

Using a scale of one to five, where one is very dissatisfied, five is very satisfied, and a three is neither particularly dissatisfied nor satisfied, please rate how satisfied or dissatisfied you are with each of the following …. The equipment that was installed	*Response*	*(n=16)*	*Percent of Respondents*
	1 - Very dissatisfied	0	0%
	2	0	0%
	3 - Neither satisfied nor dissatisfied	0	0%
	4	4	25%
	5 - Very satisfied	12	75%
	Don't know	0	0%
	Refused	0	0%

Using a scale of one to five, where one is very dissatisfied, five is very satisfied, and a three is neither particularly dissatisfied nor satisfied, please rate how satisfied or dissatisfied you are with each of the following …. The quality of the installation	*Response*	*(n=12)*	*Percent of Respondents*
	1 - Very dissatisfied	0	0%
	2	0	0%
	3 - Neither satisfied nor dissatisfied	0	0%
	4	5	42%
	5 - Very satisfied	7	58%
	Don't know	0	0%
	Refused	0	0%

Using a scale of one to five, where one is very dissatisfied, five is very satisfied, and a three is neither particularly dissatisfied nor satisfied, please rate how satisfied or dissatisfied you are with each of the following …. The steps you had to take to get through the program	*Response*	*(n=16)*	*Percent of Respondents*
	1 - Very dissatisfied	0	0%
	2	1	6%
	3 - Neither satisfied nor dissatisfied	3	19%
	4	4	25%
	5 - Very satisfied	8	50%
	Don't know	0	0%
	Refused	0	0%

Using a scale of one to five, where one is very dissatisfied, five is very satisfied, and a three is neither particularly dissatisfied nor satisfied, please rate how satisfied or dissatisfied you are with each of the following …. The amout of time it took	*Response*	*(n=16)*	*Percent of Respondents*
	1 - Very dissatisfied	0	0%
	2	1	6%
	3 - Neither satisfied nor dissatisfied	3	19%
	4	5	31%
	5 - Very satisfied	6	38%
	Don't know	0	0%
	Refused	0	0%

to get your rebate or incentive			

Using a scale of one to five, where one is very dissatisfied, five is very satisfied, and a three is neither particularly dissatisfied nor satisfied, please rate how satisfied or dissatisfied you are with each of the following …. The range of equipment that qualifies for incentives	*Response*	*(n=16)*	*Percent of Respondents*
	1 - Very dissatisfied	0	0%
	2	4	25%
	3 - Neither satisfied nor dissatisfied	1	6%
	4	4	25%
	5 - Very satisfied	6	38%
	Don't know	0	0%
	Refused	0	0%

Using a scale of one to five, where one is very dissatisfied, five is very satisfied, and a three is neither particularly dissatisfied nor satisfied, please rate how satisfied or dissatisfied you are with each of the following …. The range of equipment that qualifies for incentives	*Response*	*(n=16)*	*Percent of Respondents*
	1 - Very dissatisfied	0	0%
	2	1	6%
	3 - Neither satisfied nor dissatisfied	2	13%
	4	7	44%
	5 - Very satisfied	6	38%
	Don't know	0	0%
	Refused	0	0%

Has your organization purchased any significant energy efficient equipment in the last three years for which you DID NOT apply for a financial incentive through an energy efficiency program at the <LOCATION> location?	*Response*	*(n=15)*	*Percent of Respondents*
	Yes	5	33%
	No	8	53%
	Don't know	2	13%
	Refused	0	0%

In deciding to do a project of this type, there are usually a number of reasons why it may be undertaken. In your own words, can you tell me why this project was implemented?	*Response*	*(n=16)*	*Percent of Respondents*
	To replace old or outdated equipment	2	13%
	As part of a planned remodeling, build-out, or expansion	1	6%
	To gain more control over how the equipment was used	0	0%
	The maintenance downtime and associated expenses for the old equipment were too high	0	0%
	Had process problems and were seeking a solution	0	0%
	To improve equipment performance	1	6%
	To improve the product quality	0	0%
	To comply with codes set by regulatory agencies	1	6%

	To comply with organizational policies regarding regular/normal maintenance/replacement policy	1	6%
	To get a rebate from the program	2	13%
	To protect the environment	1	6%
	To reduce energy costs	8	50%
	To reduce energy use/power outages	1	6%
	To update to the latest technology	0	0%
	Other	0	0%
	Don't know	0	0%
	Refused	0	0%

Before you KNEW about the program, had you <INSTALLED> a project similar to the <MEASURE> project at the <LOCATION> location?	*Response*	*(n=15)*	*Percent of Respondents*
	Yes	7	47%
	No	8	53%
	Don't know	0	0%
	Refused	0	0%

Before PARTICIPATING in the program, had you completed a project similar to the <MEASURE> project at the <LOCATION> location?	*Response*	*(n=15)*	*Percent of Respondents*
	Yes	7	47%
	No	8	53%
	Don't know	0	0%
	Refused	0	0%

Did you have plans to install the [MEASURE] at the [LOCATION] before participating in the Program?	*Response*	*(n=16)*	*Percent of Respondents*
	Yes	10	63%
	No	6	38%
	Don't know	0	0%
	Refused	0	0%

Would you have gone ahead with this planned installation even if you had not participated in the program?	*Response*	*(n=10)*	*Percent of Respondents*
	Yes	7	70%
	No	3	30%
	Don't know	0	0%
	Refused	0	0%

Prior to completing this project, did you have previous experience with the program?	*Response*	*(n=16)*	*Percent of Respondents*
	Yes	5	31%
	No	11	69%
	Don't know	0	0%
	Refused	0	0%

How important was previous experience with	*Response*	*(n=5)*	*Percent of Respondents*

the program in making your decision to install the [MEASURE] at the [LOCATION]?	Very important	2	40%
	Somewhat important	3	60%
	Only slightly important	0	0%
	Not at all important	0	0%
	Don’t know	0	0%
	Refused	0	0%

Did a program representative or other Indiana Michigan Power representative recommend that you install the [MEASURE] at the [LOCATION] location?	*Response*	*(n=16)*	*Percent of Respondents*
	Yes	3	19%
	No	12	75%
	Don’t know	1	6%
	Refused	0	0%

If the program representative had not recommended installing the [MEASURE], how likely is it that you would have installing it anyway?	*Response*	*(n=3)*	*Percent of Respondents*
	Definitely would have	1	33%
	Probably would have	2	67%
	Probably would not have	0	0%
	Definitely would not have	0	0%
	Don’t know	0	0%
	Refused	0	0%

Would your organization have been financially able to install the [MEASURE] at the [LOCATION] without the financial incentive from the program?	*Response*	*(n=16)*	*Percent of Respondents*
	Yes	10	63%
	No	6	38%
	Don’t know	0	0%
	Refused	0	0%

If the financial incentive from the program had not been available, how likely is it that you would have installed the <MEASURE> at the <LOCATION> location anyway?	*Response*	*(n=16)*	*Percent of Respondents*
	Definitely would have installed	4	25%
	Probably would have installed	4	25%
	Probably would not have installed	7	44%
	Definitely would not have installed	1	6%
	Don’t know	0	0%
	Refused	0	0%

We would like to know whether the availability of information and financial incentives through the program affected the quantity (or number of	*Response*	*(n=15)*	*Percent of Respondents*
	Yes	10	67%
	No, program did not affect quantity purchased and installed.	5	33%
	Don’t know	0	0%

units) of [MEASURE] that you purchased and installed at the [LOCATION]. Did you install more energy efficient [MEASURE] than you otherwise would have without the program?	Refused	0	0%

We would like to know whether the availability of information and financial incentives through the program affected the level of energy efficiency you chose for [MEASURE]. Did you choose equipment that was more energy efficient than you would have chosen because of the program?	*Response*	*(n=11)*	*Percent of Respondents*
	Yes	3	27%
	No, program did not affect level of efficiency chosen for equipment.	8	73%
	Don't know	0	0%
	Refused	0	0%

We would like to know whether the availability of the onsite assessment and the discount through the program affected the timing of the [MEASURE] project at the [LOCATION]. Did you install the [MEASURE] earlier than you otherwise would have without the program?	*Response*	*(n=16)*	*Percent of Respondents*
	Yes	9	56%
	No, program did not affect did not affect timing of purchase and installation.	7	44%
	Don't know	0	0%
	Refused	0	0%

When would you otherwise have completed the project?	*Response*	*(n=9)*	*Percent of Respondents*
	Less than 6 months later	0	0%
	6-12 months later	2	22%
	1-2 years later	4	44%
	3-5 years later	1	11%
	More than 5 years later	2	22%
	Don't know	0	0%
	Refused	0	0%

Our records show that your organization also received a discount from Indiana Michigan Power's program	*Response*	*(n=2)*	*Percent of Respondents*
	Single decision	0	0%
	Each project went through its own decision	2	100%

for [NSAME] other [MEASURE] projects completed at a different location. Was it a single decision to complete all of those [MEASURE] projects for which you received an incentive from the program or did each project go through its own decision process?	process		
	Other	0	0%
	Don't know	0	0%
	Refused	0	0%

	Response	*(n=2)*	*Percent of Respondents*
Our records show that your organization also received a discount from Indiana Michigan Power's program for a <FDESC> project at <LOCATION>. Was the decision making process for that project the same as for the <MEASURE> project we have been talking about?	Same decision making process	2	100%
	Different decision making process	0	0%
	Other	0	0%
	Don't know	0	0%
	Refused	0	0%

	Response	*(n=16)*	*Percent of Respondents*
Since your participation in the program did you implement any ADDITIONAL energy efficiency measures at this facility or at your other facilities within Indiana Michigan Power's service territory that did NOT receive incentives or discount through Indiana Michigan programs?	Yes	2	13%
	No	13	81%
	Don't know	1	6%
	Refused	0	0%

	Response	*(n=2)*	*Percent of Respondents*
Using a scale of 0 to 10, where 0 is not at all important and 10 is extremely important, how important was your experience with the program in your decision to implement this project?	0 - not at all important	0	0%
	1	0	0%
	2	0	0%
	3	0	0%
	4	1	50%
	5	0	0%
	6	0	0%
	7	0	0%
	8	0	0%
	9	0	0%

	10 - extremely important	0	0%
	Don't know	1	50%
	Refused	0	0%

If you had not participated in the <PROGRAM>, how likely is it that your organization would still have implemented this measure, using a 0 to 10, scale where 0 means you definitely WOULD NOT have implemented this measure and 10 means you definitely WOULD have implemented this measure?	*Response*	*(n=2)*	*Percent of Respondents*
	0 - Definitely would not have	0	0%
	1	0	0%
	2	0	0%
	3	0	0%
	4	0	0%
	5	0	0%
	6	0	0%
	7	0	0%
	8	1	50%
	9	0	0%
	10 - Defintiely would have	0	0%
	Don't know	1	50%
	Refused	0	0%

Why didn't you apply for or receive incentives for those items?	*Response*	*(n=2)*	*Percent of Respondents*
	Didn't know whether equipment qualified for financial incentives	0	0%
	Equipment did not qualify for financial incentives	0	0%
	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	1	50%
	Didn't know about financial incentives until after equipment was purchased	0	0%
	Other reason (please describe):	0	0%
	Refused	1	50%
	Don't know	0	0%

Which of the following best describes your business type:	*Response*	*(n=16)*	*Percent of Respondents*
	Industrial	2	13%
	Restaurant not fast food	0	0%
	Fast food restaurant	0	0%
	Retail	2	13%
	Office	0	0%
	Grocery and convenience	1	6%
	School	0	0%
	Lodging	0	0%
	Warehouse	0	0%
	Other – specify	10	63%
	Don't know	0	0%

	Refused	0	0%
	Don't know	0	0%

	Response	*(n=16)*	*Percent of Respondents*
Does your organization own or occupy, own and rent to someone else, or rent the facility where the project(s) took place?	Less than 5,000	3	19%
	5,001 to 10,000	0	0%
	10,001 to 20,000	1	6%
	20,001 to 50,000	0	0%
	50,001 to 75,000	0	0%
	75,001 to 100,000	1	6%
	100,001 to 250,000	2	13%
	250,001 to 500,000	2	13%
	500,001 to 1,000,000	2	13%
	More than 1,000,000	3	19%
	Refused	2	13%
	Don't know	0	0%

Appendix D: C&I Prescriptive Decision Maker Survey Responses

As part of the evaluation work effort, a survey was conducted with decision makers for facilities that received incentives under the C&I Custom and Prescriptive Programs. The survey provided the information used in Sections 2.3 and 3.3 to estimate free ridership for projects in the C&I Custom and Prescriptive Programs. 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 Custom Program, and (3) the influence that the C&I Custom 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 for participants in the C&I Prescriptive Program. 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=33)*	*Percent of Respondents*
What is your job title or role?	Facilities Manager	3	9%
	Energy Manager	0	0%
	Other facilities management/maintenance position	0	0%
	Chief Financial Officer	0	0%
	Other financial/administrative position	2	6%
	Proprietor/Owner	2	6%
	President/CEO	8	24%
	Manager	6	18%
	Other	11	33%
	REFUSED	1	3%

	Response	*(n=33)*	*Percent of Respondents*
Does your company have the following policies or procedures in place at <LOCATION>? A person or persons responsible for monitoring or managing energy usage	Yes	14	42%
	No	19	58%
	REFUSED	0	0%
	DON'T KNOW	0	0%

Does your company have the following policies or procedures in place at <LOCATION>? Defined energy savings goals	*Response*	*(n=33)*	*Percent of Respondents*
	Yes	16	48%
	No	17	52%
	REFUSED	0	0%
	DON'T KNOW	0	0%

Does your company have the following policies or procedures in place at <LOCATION>? A specific policy requiring that energy efficiency be considered when purchasing equipment	*Response*	*(n=33)*	*Percent of Respondents*
	Yes	18	55%
	No	14	42%
	REFUSED	0	0%
	DON'T KNOW	0	0%

Does your company have the following policies or procedures in place at <LOCATION>? Carbon reduction goals	*Response*	*(n=33)*	*Percent of Respondents*
	Yes	7	21%
	No	24	73%
	REFUSED	0	0%
	DON'T KNOW	0	0%

How did you FIRST learn about Indiana Michigan Powers SBDI Program?	*Response*	*(n=33)*	*Percent of Respondents*
	From a Trade Ally/contractor/equipment vendor/ energy consultant	2	6%
	From an Indiana Michigan Power Account Representative	9	27%
	From a program representative / Lockheed Martin	1	3%
	From a search engine Google, Yahoo, Bing	0	0%
	At an event/trade show	1	3%
	Received an email blast or electronic newsletter	0	0%
	Received an informational brochure	1	3%
	From a program sponsored webinar	0	0%
	From mobile advertising	0	0%
	From Indiana Michigan’s website	3	9%
	From advertisements	2	6%
	Friends or colleagues	3	9%
	Through past experience with the program	0	0%
	Other	11	33%
	Don’t know	0	0%
	Refused	0	0%

In addition to the incentives for specific	*Response*	*(n=33)*	*Percent of Respondents*

prescriptive equipment upgrades you received, did you know you could qualify for incentives by proposing a custom energy-upgrade project that fits your specific facility needs?	Yes	17	52%
	No	16	48%
	Don't know	0	0%
	Refused	0	0%

	Response	*(n=17)*	*Percent of Respondents*
Why didn´t you choose the custom option that offers incentives for non-prescriptive equipment?	All of the equipment I was interested in was listed on the Prescriptive application.	5	29%
	I didn't want to do another application for custom equipment	1	6%
	The custom application was too complicated.	2	12%
	Other Specify	5	29%
	Don't know	4	24%
	Refused	0	0%

	Response	*(n=32)*	*Percent of Respondents*
Is your firm considering undertaking any new construction or major building renovation projects within the next five years? [Such as adding a new wing, gutting an existing building, or building an entirely new building.]	Yes	8	25%
	No	22	69%
	Don't know	2	6%
	Refused	0	0%

	Response	*(n=8)*	*Percent of Respondents*
Are you in the design phase now?	Yes	4	50%
	No	4	50%
	Don't know	0	0%
	Refused	0	0%

	Response	*(n=8)*	*Percent of Respondents*
Are you aware that Indiana Michigan offers custom incentives for new construction projects?	Yes	2	25%
	No	6	75%
	Don't know	0	0%
	Refused	0	0%

	Response	*(n=0)*	*Percent of Respondents*
You recently received incentives for a retro-commissioning	Custom incentives for new construction projects	0	-

project. Which of these other Indiana Michigan Power program incentives are you aware of?	Prescriptive incentives for specific measures such as lighting, VFDs, refrigeration, and commercial kitchen equipment	0	-
	Custom incentives for non-prescriptive measures	0	-
	None of the above	0	-

Using a scale of 1 to 5, where 1 means not at all and 5 means completely, how well did the Retro-commissioning program´s range of incentive options fit your needs?	*Response*	*(n=0)*	*Percent of Respondents*
	1 - not at all	0	-
	2	0	-
	3	0	-
	4	0	-
	5 - completely	0	-
	Don't know	0	-
	Refused	0	-

Regarding your organization´s decision to participate in the incentive program, who initiated the discussion about the incentive opportunity? Would you say…	*Response*	*(n=33)*	*Percent of Respondents*
	Your organization initiated it	10	30%
	Your vendor or contractor initiated it	11	33%
	The idea arose in discussion between your organization and your vendor or contractor	5	15%
	Some other way.	6	18%
	Don't know	1	3%
	Refused	0	0%

Which of the following people worked on completing your application for program incentives (including gathering required documentation)? Yourself	*Response*	*(n=33)*	*Percent of Respondents*
	Yes	24	73%
	No	9	27%
	Don't know	0	0%
	Refused	0	0%

Which of the following people worked on completing your application for program incentives (including gathering required documentation)? Another member of your company	*Response*	*(n=33)*	*Percent of Respondents*
	Yes	9	27%
	No	24	73%
	Don't know	0	0%
	Refused	0	0%

Which of the following people worked on	*Response*	*(n=33)*	*Percent of Respondents*

completing your application for program incentives (including gathering required documentation)? A contractor	Yes	13	39%
	No	20	61%
	Don't know	0	0%
	Refused	0	0%

Which of the following people worked on completing your application for program incentives (including gathering required documentation)? An equipment vendor	*Response*	*(n=33)*	*Percent of Respondents*
	Yes	16	48%
	No	16	48%
	Don't know	1	3%
	Refused	0	0%

Which of the following people worked on completing your application for program incentives (including gathering required documentation)? A designer or architect	*Response*	*(n=33)*	*Percent of Respondents*
	Yes	3	9%
	No	30	91%
	Don't know	0	0%
	Refused	0	0%

And how did you submit your application worksheets?	*Response*	*(n=24)*	*Percent of Respondents*
	As an email attachment	16	67%
	By fax	0	0%
	By postal mail	2	8%
	Online	2	8%
	Other – Specify	1	4%
	Don't know	3	13%
	Refused	0	0%

Thinking back to the application process, please rate the clarity of information on how to complete the application using a scale where 1 means not at all clear and 5 means completely clear.	*Response*	*(n=24)*	*Percent of Respondents*
	1 - not at all clear	1	4%
	2	1	4%
	3	4	17%
	4	10	42%
	5 - completely clear	5	21%
	Don't know	3	13%
	Refused	0	0%

Using a 5-point scale, where 1 means "completely unacceptable" and 5 means "completely acceptable," how would you rate . . . The ease of finding forms on Indiana Michigan Power´s website	*Response*	*(n=24)*	*Percent of Respondents*
	1 - completely unacceptable	0	0%
	2	0	0%
	3	1	4%
	4	7	29%
	5 - completely acceptable	10	42%
	Don’t know	6	25%
	Refused	0	0%

Using a 5-point scale, where 1 means "completely unacceptable" and 5 means "completely acceptable," how would you rate . . . The ease of using the electronic worksheets	*Response*	*(n=24)*	*Percent of Respondents*
	1 - completely unacceptable	0	0%
	2	0	0%
	3	0	0%
	4	8	33%
	5 - completely acceptable	11	46%
	Don’t know	5	21%
	Refused	0	0%

Using a 5-point scale, where 1 means "completely unacceptable" and 5 means "completely acceptable," how would you rate . . . The time it took to approve the application	*Response*	*(n=24)*	*Percent of Respondents*
	1 - completely unacceptable	0	0%
	2	0	0%
	3	4	17%
	4	5	21%
	5 - completely acceptable	13	54%
	Don’t know	2	8%
	Refused	0	0%

Using a 5-point scale, where 1 means "completely unacceptable" and 5 means "completely acceptable," how would you rate . . . The effort to provide required invoices or other supporting documentation	*Response*	*(n=24)*	*Percent of Respondents*
	1 - completely unacceptable	0	0%
	2	1	4%
	3	4	17%
	4	3	13%
	5 - completely acceptable	15	63%
	Don’t know	1	4%
	Refused	0	0%

Using a 5-point scale, where 1 means "completely unacceptable" and 5 means "completely acceptable," how	*Response*	*(n=24)*	*Percent of Respondents*
	1 - completely unacceptable	0	0%
	2	0	0%
	3	4	17%

would you rate . . . The overall application process	4	7	29%
	5 - completely acceptable	13	54%
	Don't know	0	0%
	Refused	0	0%

Which of the following people worked on completing your application for program incentives (including gathering required documentation)? An equipment vendor	*Response*	*(n=33)*	*Percent of Respondents*
	Yes	16	48%
	No	16	48%
	Don't know	1	3%
	Refused	0	0%

Did you have a clear sense of whom you could go to for assistance with the application process?	*Response*	*(n=24)*	*Percent of Respondents*
	Yes	21	88%
	No	3	13%
	Don't know	0	0%
	Refused	0	0%

Did you have a clear sense of who you could go to for assistance in finding a Retro-commissioning Service provider?	*Response*	*(n=0)*	*Percent of Respondents*
	Yes	0	-
	No	0	-
	Don't know	0	-
	Refused	0	-

After initial submission, were you (or anyone acting on your behalf) required to resubmit or provide additional documentation before your application was approved?	*Response*	*(n=0)*	*Percent of Respondents*
	Yes	0	-
	No	0	-
	Don't know	0	-
	Refused	0	-

How did the incentive amount compare to what you expected? Would you say…	*Response*	*(n=33)*	*Percent of Respondents*
	It was much less	1	3%
	It was somewhat less	2	6%
	It was about the amount expected	25	76%
	It was somewhat more	3	9%
	It was much more	0	0%
	Don't know	2	6%
	Refused	0	0%

[PARTICIANTS THAT DID NOT COMPLETE RETRO-COMMISSIONING PROJECTS] Using a scale where 1 means provided no input and 5 means provided critical input, how did each of the following types of people affect your decision to install the efficient equipment? Vendor	*Response*	*(n=33)*	*Percent of Respondents*
	1 - provided no input	5	15%
	2	3	9%
	3	6	18%
	4	3	9%
	5 - provided critical input	15	45%
	Don’t know	1	3%
	Refused	0	0%

[PARTICIANTS THAT DID NOT COMPLETE RETRO-COMMISSIONING PROJECTS] Using a scale where 1 means provided no input and 5 means provided critical input, how did each of the following types of people affect your decision to install the efficient equipment? Contractor	*Response*	*(n=33)*	*Percent of Respondents*
	1 - provided no input	7	21%
	2	3	9%
	3	3	9%
	4	5	15%
	5 - provided critical input	10	30%
	Don’t know	5	15%
	Refused	0	0%

[PARTICIANTS THAT DID NOT COMPLETE RETRO-COMMISSIONING PROJECTS] Using a scale where 1 means provided no input and 5 means provided critical input, how did each of the following types of people affect your decision to install the efficient equipment? Designer or architect	*Response*	*(n=33)*	*Percent of Respondents*
	1 - provided no input	18	55%
	2	3	9%
	3	0	0%
	4	1	3%
	5 - provided critical input	1	3%
	Don’t know	10	30%
	Refused	0	0%

[PARTICIANTS THAT DID NOT COMPLETE RETRO-	*Response*	*(n=33)*	*Percent of Respondents*
	1 - provided no input	14	42%

COMMISSIONING PROJECTS] Using a scale where 1 means provided no input and 5 means provided critical input, how did each of the following types of people affect your decision to install the efficient equipment? Utiliaty staff member, such as an account representative	2	3	9%
	3	1	3%
	4	3	9%
	5 - provided critical input	7	21%
	Don't know	5	15%
	Refused	0	0%

[PARTICIANTS THAT DID NOT COMPLETE RETRO-COMMISSIONING PROJECTS] Using a scale where 1 means provided no input and 5 means provided critical input, how did each of the following types of people affect your decision to install the efficient equipment? Program representative	*Response*	*(n=33)*	*Percent of Respondents*
	1 - provided no input	15	45%
	2	2	6%
	3	0	0%
	4	4	12%
	5 - provided critical input	7	21%
	Don't know	5	15%
	Refused	0	0%

[PARTICIANTS THAT COMPLETED RETRO-COMMISSIONING PROJECTS] Using a scale where 1 means provided no input and 5 means provided critical input, how did each of the following types of people affect your decision to install the efficient equipment? Audit results	*Response*	*(n=0)*	*Percent of Respondents*
	1 - provided no input	0	-
	2	0	-
	3	0	-
	4	0	-
	5 - provided critical input	0	-
	Don't know	0	-
	Refused	0	-

[PARTICIANTS THAT COMPLETED RETRO-COMMISSIONING	*Response*	*(n=0)*	*Percent of Respondents*
	1 - provided no input	0	-
	2	0	-

PROJECTS] Using a scale where 1 means provided no input and 5 means provided critical input, how did each of the following types of people affect your decision to install the efficient equipment? Contractor	3	0	-
	4	0	-
	5 - provided critical input	0	-
	Don’t know	0	-
	Refused	0	-

[PARTICIANTS THAT COMPLETED RETRO-COMMISSIONING PROJECTS] Using a scale where 1 means provided no input and 5 means provided critical input, how did each of the following types of people affect your decision to install the efficient equipment? RCx service provider	*Response*	*(n=0)*	*Percent of Respondents*
	1 - provided no input	0	-
	2	0	-
	3	0	-
	4	0	-
	5 - provided critical input	0	-
	Don’t know	0	-
	Refused	0	-

[PARTICIANTS THAT COMPLETED RETRO-COMMISSIONING PROJECTS] Using a scale where 1 means provided no input and 5 means provided critical input, how did each of the following types of people affect your decision to install the efficient equipment? Utiliaty staff member, such as an account representative	*Response*	*(n=0)*	*Percent of Respondents*
	1 - provided no input	0	-
	2	0	-
	3	0	-
	4	0	-
	5 - provided critical input	0	-
	Don’t know	0	-
	Refused	0	-

[PARTICIANTS THAT COMPLETED RETRO-COMMISSIONING PROJECTS]	*Response*	*(n=0)*	*Percent of Respondents*
	1 - provided no input	0	-
	2	0	-
	3	0	-

Using a scale where 1 means provided no input and 5 means provided critical input, how did each of the following types of people affect your decision to install the efficient equipment? Program representative	4	0	-
	5 - provided critical input	0	-
	Don't know	0	-
	Refused	0	-

	Response	*(n=32)*	*Percent of Respondents*
Who installed your program-qualified equipment or efficiency upgrades? Was it…	Your own staff	11	34%
	A contractor you've worked with before	16	50%
	A contractor recommended by the Indiana Michigan program (registered trade ally)	2	6%
	A new contractor that someone else recommended	2	6%
	Someone else	1	3%
	Don't know	0	0%
	Refused	0	0%

	Response	*(n=33)*	*Percent of Respondents*
After your project was completed, did a program representative inspect the work done through the program?	Yes	13	39%
	No	12	36%
	Don't know	8	24%
	Refused	0	0%

	Response	*(n=13)*	*Percent of Respondents*
Using the scale where 1 means you do not agree at all and 5 means you completely agree, please rate your agreement with the following statements: The inspector was courteous	1 - do not agree at all	0	0%
	2	0	0%
	3	1	8%
	4	3	23%
	5 - completely agree	8	62%
	Don't know	1	8%
	Refused	0	0%

	Response	*(n=13)*	*Percent of Respondents*
Using the scale where 1 means you do not agree at all and 5 means you completely agree, please rate your agreement with the following statements: The inspector was efficient	1 - do not agree at all	0	0%
	2	0	0%
	3	1	8%
	4	4	31%
	5 - completely agree	7	54%
	Don't know	1	8%
	Refused	0	0%

In the course of doing this project did you have any interactions with program staff?	*Response*	*(n=33)*	*Percent of Respondents*
	Yes	11	33%
	No	21	64%
	Don't know	1	3%
	Refused	0	0%

Using a scale of one to five, where one is very dissatisfied, five is very satisfied, and a three is neither particularly dissatisfied nor satisfied, please rate how satisfied or dissatisfied you are with each of the following …. How long it took program staff to adddress your questions or concerns	*Response*	*(n=11)*	*Percent of Respondents*
	1 - Very dissatisfied	0	0%
	2	0	0%
	3 - Neither satisfied nor dissatisfied	1	9%
	4	0	0%
	5 - Very satisfied	10	91%
	Don't know	0	0%
	Refused	0	0%

Using a scale of one to five, where one is very dissatisfied, five is very satisfied, and a three is neither particularly dissatisfied nor satisfied, please rate how satisfied or dissatisfied you are with each of the following …. How thoroughly [program staff] addressed your questions or concerns	*Response*	*(n=11)*	*Percent of Respondents*
	1 - Very dissatisfied	0	0%
	2	0	0%
	3 - Neither satisfied nor dissatisfied	1	9%
	4	1	9%
	5 - Very satisfied	9	82%
	Don't know	0	0%
	Refused	0	0%

Using a scale of one to five, where one is very dissatisfied, five is very satisfied, and a three is neither particularly dissatisfied nor satisfied, please rate how satisfied or dissatisfied you are with each of the following ….	*Response*	*(n=33)*	*Percent of Respondents*
	1 - Very dissatisfied	0	0%
	2	0	0%
	3 - Neither satisfied nor dissatisfied	1	3%
	4	3	9%
	5 - Very satisfied	29	88%
	Don't know	0	0%
	Refused	0	0%

The equipment that was installed			

Using a scale of one to five, where one is very dissatisfied, five is very satisfied, and a three is neither particularly dissatisfied nor satisfied, please rate how satisfied or dissatisfied you are with each of the following …. The quality of the installation	*Response*	*(n=20)*	*Percent of Respondents*
	1 - Very dissatisfied	0	0%
	2	0	0%
	3 - Neither satisfied nor dissatisfied	1	5%
	4	2	10%
	5 - Very satisfied	17	85%
	Don't know	0	0%
	Refused	0	0%

Using a scale of one to five, where one is very dissatisfied, five is very satisfied, and a three is neither particularly dissatisfied nor satisfied, please rate how satisfied or dissatisfied you are with each of the following …. The steps you had to take to get through the program	*Response*	*(n=33)*	*Percent of Respondents*
	1 - Very dissatisfied	0	0%
	2	1	3%
	3 - Neither satisfied nor dissatisfied	5	15%
	4	11	33%
	5 - Very satisfied	15	45%
	Don't know	0	0%
	Refused	0	0%

Using a scale of one to five, where one is very dissatisfied, five is very satisfied, and a three is neither particularly dissatisfied nor satisfied, please rate how satisfied or dissatisfied you are with each of the following …. The amout of time it took to get your rebate or incentive	*Response*	*(n=33)*	*Percent of Respondents*
	1 - Very dissatisfied	0	0%
	2	2	6%
	3 - Neither satisfied nor dissatisfied	5	15%
	4	5	15%
	5 - Very satisfied	19	58%
	Don't know	0	0%
	Refused	0	0%

Using a scale of one to five, where one is very dissatisfied, five is	*Response*	*(n=33)*	*Percent of Respondents*
	1 - Very dissatisfied	0	0%

very satisfied, and a three is neither particularly dissatisfied nor satisfied, please rate how satisfied or dissatisfied you are with each of the following …. The range of equipment that qualifies for incentives	2	0	0%
	3 - Neither satisfied nor dissatisfied	7	21%
	4	9	27%
	5 - Very satisfied	12	36%
	Don't know	0	0%
	Refused	0	0%

Using a scale of one to five, where one is very dissatisfied, five is very satisfied, and a three is neither particularly dissatisfied nor satisfied, please rate how satisfied or dissatisfied you are with each of the following …. The range of equipment that qualifies for incentives	*Response*	*(n=33)*	*Percent of Respondents*
	1 - Very dissatisfied	0	0%
	2	0	0%
	3 - Neither satisfied nor dissatisfied	4	12%
	4	7	21%
	5 - Very satisfied	21	64%
	Don't know	0	0%
	Refused	0	0%

Has your organization purchased any significant energy efficient equipment in the last three years for which you DID NOT apply for a financial incentive through an energy efficiency program at the <LOCATION> location?	*Response*	*(n=32)*	*Percent of Respondents*
	Yes	12	38%
	No	17	53%
	Don't know	3	9%
	Refused	0	0%

In deciding to do a project of this type, there are usually a number of reasons why it may be undertaken. In your own words, can you tell me why this project was implemented?	*Response*	*(n=33)*	*Percent of Respondents*
	To replace old or outdated equipment	11	33%
	As part of a planned remodeling, build-out, or expansion	1	3%
	To gain more control over how the equipment was used	0	0%
	The maintenance downtime and associated expenses for the old equipment were too high	3	9%
	Had process problems and were seeking a solution	0	0%
	To improve equipment performance	3	9%
	To improve the product quality	1	3%
	To comply with codes set by regulatory agencies	0	0%

	To comply with organizational policies regarding regular/normal maintenance/replacement policy	0	0%
	To get a rebate from the program	1	3%
	To protect the environment	6	18%
	To reduce energy costs	18	55%
	To reduce energy use/power outages	1	3%
	To update to the latest technology	5	15%
	Other	0	0%
	Don't know	0	0%
	Refused	0	0%

Before you KNEW about the program, had you <INSTALLED> a project similar to the <MEASURE> project at the <LOCATION> location?	*Response*	*(n=32)*	*Percent of Respondents*
	Yes	8	25%
	No	24	75%
	Don't know	0	0%
	Refused	0	0%

Before PARTICIPATING in the program, had you completed a project similar to the <MEASURE> project at the <LOCATION> location?	*Response*	*(n=32)*	*Percent of Respondents*
	Yes	6	19%
	No	26	81%
	Don't know	0	0%
	Refused	0	0%

Did you have plans to install the [MEASURE] at the [LOCATION] before participating in the Program?	*Response*	*(n=33)*	*Percent of Respondents*
	Yes	15	45%
	No	18	55%
	Don't know	0	0%
	Refused	0	0%

Would you have gone ahead with this planned installation even if you had not participated in the program?	*Response*	*(n=15)*	*Percent of Respondents*
	Yes	12	80%
	No	3	20%
	Don't know	0	0%
	Refused	0	0%

Prior to completing this project, did you have previous experience with the program?	*Response*	*(n=33)*	*Percent of Respondents*
	Yes	7	21%
	No	26	79%
	Don't know	0	0%
	Refused	0	0%

How important was previous experience with the program in making your decision to install the [MEASURE] at the [LOCATION]?	*Response*	*(n=7)*	*Percent of Respondents*
	Very important	3	43%
	Somewhat important	2	29%
	Only slightly important	0	0%
	Not at all important	2	29%
	Don't know	0	0%
	Refused	0	0%

Did a program representative or other Indiana Michigan Power representative recommend that you install the [MEASURE] at the [LOCATION] location?	*Response*	*(n=33)*	*Percent of Respondents*
	Yes	9	27%
	No	24	73%
	Don't know	0	0%
	Refused	0	0%

If the program representative had not recommended installing the [MEASURE], how likely is it that you would have installing it anyway?	*Response*	*(n=9)*	*Percent of Respondents*
	Definitely would have	3	33%
	Probably would have	5	56%
	Probably would not have	0	0%
	Definitely would not have	1	11%
	Don't know	0	0%
	Refused	0	0%

Would your organization have been financially able to install the [MEASURE] at the [LOCATION] without the financial incentive from the program?	*Response*	*(n=33)*	*Percent of Respondents*
	Yes	27	82%
	No	4	12%
	Don't know	2	6%
	Refused	0	0%

If the financial incentive from the program had not been available, how likely is it that you would have installed the <MEASURE> at the <LOCATION> location anyway?	*Response*	*(n=33)*	*Percent of Respondents*
	Definitely would have installed	12	36%
	Probably would have installed	11	33%
	Probably would not have installed	7	21%
	Definitely would not have installed	3	9%
	Don't know	0	0%
	Refused	0	0%

We would like to know whether the availability of information and	*Response*	*(n=33)*	*Percent of Respondents*
	Yes	16	48%
	No, program did not affect quantity purchased and	17	52%

financial incentives through the program affected the quantity (or number of units) of [MEASURE] that you purchased and installed at the [LOCATION]. Did you install more energy efficient [MEASURE] than you otherwise would have without the program?	installed.		
	Don't know	0	0%
	Refused	0	0%

We would like to know whether the availability of information and financial incentives through the program affected the level of energy efficiency you chose for [MEASURE]. Did you choose equipment that was more energy efficient than you would have chosen because of the program?	*Response*	*(n=33)*	*Percent of Respondents*
	Yes	10	30%
	No, program did not affect level of efficiency chosen for equipment.	22	67%
	Don't know	1	3%
	Refused	0	0%

We would like to know whether the availability of the onsite assessment and the discount through the program affected the timing of the [MEASURE] project at the [LOCATION]. Did you install the [MEASURE] earlier than you otherwise would have without the program?	*Response*	*(n=33)*	*Percent of Respondents*
	Yes	11	33%
	No, program did not affect did not affect timing of purchase and installation.	21	64%
	Don't know	1	3%
	Refused	0	0%

When would you otherwise have completed the project?	*Response*	*(n=11)*	*Percent of Respondents*
	Less than 6 months later	2	18%
	6-12 months later	3	27%
	1-2 years later	5	45%

	3-5 years later	0	0%
	More than 5 years later	1	9%
	Don’t know	0	0%
	Refused	0	0%

Our records show that your organization also received a discount from Indiana Michigan Power's program for [NSAME] other [MEASURE] projects completed at a different location. Was it a single decision to complete all of those [MEASURE] projects for which you received an incentive from the program or did each project go through its own decision process?	*Response*	*(n=4)*	*Percent of Respondents*
	Single decision	2	50%
	Each project went through its own decision process	2	50%
	Other	0	0%
	Don’t know	0	0%
	Refused	0	0%

Our records show that your organization also received a discount from Indiana Michigan Power's program for a <FDESC> project at <LOCATION>. Was the decision making process for that project the same as for the <MEASURE> project we have been talking about?	*Response*	*(n=4)*	*Percent of Respondents*
	Same decision making process	4	100%
	Different decision making process	0	0%
	Other	0	0%
	Don’t know	0	0%
	Refused	0	0%

Since your participation in the program did you implement any ADDITIONAL energy efficiency measures at this facility or at your other facilities within Indiana Michigan Power's service territory that did NOT receive incentives or discount through Indiana Michigan	*Response*	*(n=33)*	*Percent of Respondents*
	Yes	5	15%
	No	27	82%
	Don’t know	1	3%
	Refused	0	0%

programs?			

	Response	*(n=5)*	*Percent of Respondents*
Using a scale of 0 to 10, where 0 is not at all important and 10 is extremely important, how important was your experience with the program in your decision to implement this project?	0 - not at all important	0	0%
	1	0	0%
	2	0	0%
	3	0	0%
	4	0	0%
	5	1	20%
	6	0	0%
	7	0	0%
	8	1	20%
	9	0	0%
	10 - extremely important	3	60%
	Don’t know	0	0%
	Refused	0	0%

	Response	*(n=5)*	*Percent of Respondents*
If you had not participated in the <PROGRAM>, how likely is it that your organization would still have implemented this measure, using a 0 to 10, scale where 0 means you definitely WOULD NOT have implemented this measure and 10 means you definitely WOULD have implemented this measure?	0 - Definitely would not have	0	0%
	1	0	0%
	2	0	0%
	3	0	0%
	4	0	0%
	5	1	20%
	6	2	40%
	7	0	0%
	8	0	0%
	9	0	0%
	10 - Defintiely would have	2	40%
	Don’t know	0	0%
	Refused	0	0%

	Response	*(n=5)*	*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	0	0%
	Too much paperwork for the financial incentive application	1	20%
	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	2	40%
	Other reason (please describe):	1	20%
	Refused	1	20%

	Don't know	0	0%

	Response	*(n=33)*	*Percent of Respondents*
Which of the following best describes your business type:	Industrial	1	3%
	Restaurant not fast food	1	3%
	Fast food restaurant	1	3%
	Retail	5	15%
	Office	2	6%
	Grocery and convenience	0	0%
	School	0	0%
	Lodging	2	6%
	Warehouse	2	6%
	Other – specify	19	58%
	Don’t know	0	0%
	Refused	0	0%
	Don't know	0	0%

	Response	*(n=33)*	*Percent of Respondents*
Does your organization own or occupy, own and rent to someone else, or rent the facility where the project(s) took place?	Less than 5,000	2	6%
	5,001 to 10,000	5	15%
	10,001 to 20,000	4	12%
	20,001 to 50,000	5	15%
	50,001 to 75,000	2	6%
	75,001 to 100,000	2	6%
	100,001 to 250,000	3	9%
	250,001 to 500,000	1	3%
	500,001 to 1,000,000	0	0%
	More than 1,000,000	0	0%
	Refused	8	24%
	Don't know	1	3%

Appendix E: C&I Small Business Direct Install Project-Level Analyses

This section contains the project-level analyses for the customers who participated in the Commercial and Industrial Small Business Direct Install Program. The analyses are summarized by measure type.

2015 SBDI Case Lighting Site-Level Analyses

Executive Summary

The following projects received incentives from AEP Indiana Michigan Power for retrofitting refrigerated case lighting such as T12 to LED and T8 to LED measures:

Project ID	*Expected kWh*	*Realized kWh*	*Realization Rate*
1084	5,992	8,448	141%
1108	8,095	13,228	163%
1256	7,008	7,800	111%
1278	4,962	5,929	119%
1482	8,514	7,401	87%

Project Description

The following table summarizes the retrofits for each project:

Project ID	*Pre-Retrofit Lamps*	*Post-Retrofit Lamps*
1084	(9 cooler doors) T12	(9 cooler doors) LED
1108	(14 cooler doors) T12 (3 freezer doors) T12	(14 cooler doors) LED (3 freezer doors) LED
1256	(9 cooler doors) T12 (1 freezer door) T12	(9 cooler doors) LED (1 freezer door) LED
1278	(8 cooler doors) T12	(8 cooler doors) LED
1482	(9 cooler doors) T12 (5 freezer doors) T12	(9 cooler doors) LED (5 freezer doors) LED

Measurement and Verification Effort and Results

During the M&V visit, ADM verified case lighting installations. ADM used scheduling data collected via on-site interviews in order to develop an operational profile.

Case lighting retrofit energy savings are calculated as:

$$\Delta kWh = (WATTSbase - WATTSee) / 1000 * Ndoors * HOURS * (1 + WHFe) * ESFMC$$

$$\Delta kW = (WATTSbase - WATTSee) / 1000 * Ndoors * (1 + WHFd) * DSFMC * CF$$

Where:

WATTSbase	*= connected wattage per door of the baseline fixtures*
WATTSee	*= connected wattage per door of the high efficiency fixtures*
1000	*= conversion factor from watts to kilowatts*
Ndoors	*= number of doors*
HOURS	*= annual operating hours; assume 6,205 operating hours per year*
ESFMC	*= Energy Savings Factor; additional savings percentage achieved with a motion sensor*
WHFe	*= waste heat factor for energy to account for cooling savings from efficient lighting*
WHFd	*= waste heat factor for energy to account for cooling savings from efficient lighting*
DSFMC	*= Demand Savings Factor; additional savings percentage achieved with a motion sensor*
CF	*= Summer Peak Coincidence Factor*

The following sections present the parameters used in the savings calculations and the final results for each project.

1084

Algorithm Parameters

Measure	*Ndoors*	*Wattage*		*Hours*	*WHFe*	*ESFMC*	*Realized kWh Savings*
		Old	*New*				
T12 to LED (refrigerator)	9	113	37	8,760	0.41	1.00	8,448
Total							8,448

Final Results

Measure Category	*kWh Savings*			*Ex Post kW Savings*
	Ex Ante	*Ex Post*	*Realization Rate*	
Case Lighting Retrofit	5,992	8,448	141%	0.89
Total	5,992	8,448	141%	0.89

The project-level realization rate is 141%. For the lighting retrofit, the realization rate is high because the WHFs used in ex ante calculations (0) do not match those used in ex post calculations (0.41 for refrigerated spaces, 0.52 for freezers). In addition, a coincidence factor of 1 is used in ex ante calculations, while a coincidence factor of 0.92 is used in ex post calculations.

1108

Algorithm Parameters

Measure	*Ndoors*	*Wattage*		*Hours*	*WHFe*	*ESFMC*	*Realized kWh Savings*
		Old	*New*				
T12 to LED (refrigerator)	14	97.7	36.0	8,760	0.41	1.00	10,672
T12 to LED (freezer)	3	101.3	37.3	8,760	0.52	1.00	2,557
Total							13,228

Final Results

Measure Category	*kWh Savings*			*Ex Post kW Savings*
	Ex Ante	*Ex Post*	*Realization Rate*	
Case Lighting Retrofit	8,094	13,228	163%	1.39
Total	8,094	13,228	163%	1.39

The project-level realization rate is 163%. For the lighting retrofit, the realization rate is high mainly because the WHFs used in ex ante calculations (0) are lower than those used in ex post calculations (0.41 for refrigerated spaces, 0.52 for freezers). The baseline wattages used in the ex post analysis are higher for refrigerated spaces (97.7W) and freezer spaces (101.3W) than those used in the ex ante calculation (90.0W and 93.3W, respectively). Additionally, a coincidence factor (CF) of 1 is used in ex ante calculations, while a CF of 0.92 is used in ex post calculations.

1256

Algorithm Parameters

Measure	*Ndoors*	*Wattage*		*Hours*	*WHFe*	*ESFMC*	*Realized kWh Savings*
		Old	*New*				
T12 to LED (refrigerator)	9	93	34	8,760	0.41	1.00	6,522
T12 to LED(freezer)	1	152	56	8,760	0.52	1.00	1,278
Total							7,800

Final Results

Measure Category	*kWh Savings*			*Ex Post kW Savings*
	Ex Ante	*Ex Post*	*Realization Rate*	
Case Lighting Retrofit	7,008	7,800	111%	0.82
Total	7,008	7,800	111%	0.82

The project-level realization rate is 111%. For the lighting retrofit, the realization rate is high mainly because the WHFs used in ex ante calculations (0) are lower those used in ex post calculations (0.41 for refrigerated spaces, 0.52 for freezers). On the other hand, the baseline wattages in the ex post calculation were lower for the refrigerated doors (93W) and higher for the freezer doors (152W) compared with the value used in the ex ante calculation (119W), resulting in an overall lower realization. In addition, a coincidence factor of 1 is used in ex ante calculations, while a coincidence factor of 0.92 is used in ex post calculations.

1278

Algorithm Parameters

Measure	*Ndoors*	*Wattage*		*Hours*	*WHFe*	*ESFMC*	*Realized kWh Savings*
		Old	*New*				
T12 to LED (refrigerator)	8	95	35	8,760	0.41	1.00	5,929
HID to LED	19	453	120	2,422	0.00	-	15,324
Total							21,253

Final Results

Measure Category	*kWh Savings*			*Ex Post kW Savings*
	Ex Ante	*Ex Post*	*Realization Rate*	
Case Lighting Retrofit	4,962	5,929	119%	0.62
Lighting Retrofit	25,688	15,324	60%	0.00
Total	30,650	21,253	69%	0.62

The realization rate for the case lighting retrofit is 119%. The realization rate is high because the WHF's used in ex ante calculations (0) do not match those used in ex post calculations (0.41 for refrigerated spaces). On the other hand, the baseline wattage used in the ex post analysis was lower than that used in the ex ante calculation, resulting in a lower realization rate.

This project also had an exterior lighting measure, which is located in the Lighting Site-Level Analyses section, below.

1482

Algorithm Parameters

Measure	*Ndoors*	*Wattage*		*Hours*	*WHFe*	*ESFMC*	*Realized kWh Savings*
		Old	*New*				
T8 to LED (refrigerator)	9	84	31	6,640	0.41	1.00	4,494
T8 to LED(freezer)	5	91	34	6,640	0.52	1.00	2,907
Total							7,401

Final Results

Measure Category	*kWh Savings*			*Ex Post kW Savings*
	Ex Ante	*Ex Post*	*Realization Rate*	
Case Lighting Retrofit	8,514	7,401	87%	1.03
Total	8,514	7,401	87%	1.03

The project-level realization rate is 87%. For the lighting retrofit, the realization rate is low mainly because the ex ante calculations use 8,760 for the hours of operation, while a verified hours of operation equal to 6,640 is used in ex post calculations. The baseline wattages used in the ex post calculation are lower than those used in the ex ante calculation (84W and 91W versus 94W and 102W, respectively). Additionally, the verified installed wattages are greater in the ex post calculation than in the ex ante calculation (31W and 34W versus 27.4W and 27.4W, respectively).

On the other hand, the ex ante calculation uses WHF_e of zero, compared with the ex post WHF_e values of 0.41 and 0.52 for refrigerator and freezer spaces, respectively, which increases the realization rate.

2015 SBDI Lighting Site-Level Analyses

Executive Summary

The following projects received incentives from AEP Indiana Michigan Power for retrofitting various lighting measures such as incandescent to LED, Exterior HID to LED, HID to high-bay fluorescent, and T12 lamps to T8 lamps:

Project ID	*Expected kWh*	*Realized kWh*	*Realization Rate*
851-S	17,016	15,545	91%
854-S	17,016	13,221	78%
857-S	12,877	9,084	71%
860-S	30,713	20,395	66%
1076	8,408	10,495	125%
1078	37,528	32,592	87%
1086	17,028	24,997	147%
1093	24,624	24,739	100%
1094	4,348	4,373	101%
1098	50,825	28,478	56%
1199	46,615	32,704	70%
1201	53,361	40,063	75%
1277	20,640	10,127	49%
1278	25,688	15,324	60%
1370	21,156	21,176	100%
1450	41,954	46,654	111%
1467	10,174	2,910	29%
1476	21,827	21,827	100%

Project Description

The following table summarizes the retrofits for each project:

Project ID	*Pre-Retrofit Lamps*	*Post-Retrofit Lamps*
851-S	(9) 65W Incandescent (65) 65W Incandescent	(9) 11W LED (65) 7W LED
854-S	(74) 65W Incandescent	(74) 10W LED
857-S	(34) 65W Incandescent (17) 65W Incandescent	(34) 10W LED (17) 10.5W LED
860-S	(130) 65W Incandescent	(130) 9.5W LED
1076	(59) 60W Incandescent	(59) 12.5W LED
1078	(118) 60W Incandescent (65) 75W Incandescent	(118) 10.5W LED (65) 10.5W LED
1086	(34) 75W Incandescent (16) 75W Incandescent (45) 60W Incandescent (30) 60W Incandescent	(34) 11W LED (16) 12W LED (45) 12W LED (30) 10W LED
1093	(6) 1080W HID	(6) 120W LED
1094	(3) 458W HID	(3) 119W LED
1098	(125) 75W Incandescent (54) 60W Incandescent	(125) 11W LED (54) 10W LED
1199	(186) 60W Incandescent (12) 75W Incandescent	(186) 10W LED (12) 11W LED
1201	(13) 60W Incandescent (66) 75W Incandescent (94) 75W Incandescent	(13) 10W LED (66) 10W LED (94) 12W LED
1277	(5) 1078W HID	(5) 120W LED
1278	(19) 453W HID	(19) 120W LED
1370	(24) 360W HID	(24) 155W LED
1450	(104) 65W Incandescent (24) 50W Incandescent (14) 90W Incandescent (4) 65W Incandescent	(104) 11W LED (24) 7W LED (14) 17W LED (4) 11W LED
1467	(2) 458W HID	(2) 120W LED
1476	(2) 458W HID (5) 1080W HID	(2) 120W LED (5) 200W LED

Measurement and Verification Effort and Results

During the M&V visits, ADM verified lighting installations. ADM used scheduling data collected via on-site interviews in order to develop an operational profile.

Lighting retrofit energy savings are calculated as:

$$\Delta kWH = (WATTSbase - WATTSee) * HOURS * (1 + WHFe) / 1000$$

$$\Delta kW = (WATTSbase - WATTSee) * CF * (1 + WHFd) / 1000$$

Where:

WATTSbase	*= connected wattage of the baseline fixtures*
WATTSee	*= connected wattage of the high efficiency fixtures*
HOURS	*= annual operating hours of the lighting.*
WHFe	*= lighting Waste Heat Factor for energy*
1+WHFe	*= Heating-Cooling Interactive Factor (HCIF)*
1 / 1000	*= conversion factor from watts to kilowatts*
WHFd	*= lighting Waste Heat Factor for demand*
1+WHFd	*= Heating-Cooling Interactive Factor (HCIF)*
CF	*= Summer Peak Coincidence Factor for measure*

The following sections present the parameters used in the savings calculations and the final results for each project.

851-S

Algorithm Parameters

Measure	*Quantity*	*Wattage*		*Hours*	*WHFe*	*Realized kWh Savings*
		Old	*New*			
Incand to LED	9	65	11	3,357	0.088	1,775
Incand to LED	65	65	7	3,357	0.088	13,770
Total						15,545

Final Results

Measure Category	*kWh Savings*			*Ex Post kW Savings*
	Ex Ante	*Ex Post*	*Realization Rate*	
Lighting Retrofit	17,016	15,545	91%	4.24
Total	17,016	15,545	91%	4.24

The project-level realization rate is 91%. The realization rate is low mainly because the hours used to determine ex ante estimations (4,380) were higher than those used in the Indiana TRM (3,357).

Values used for CF, WHF_e, and WHF_d while performing ex ante calculations (1, 0, and 0) were substituted with the appropriate values from the Indiana TRM (0.650, 0.133, and 0.200, respectively), and since the installed lamps had a lower wattage (7W and 11W) than the expected wattage (12.5W), a portion of the realization rate was salvaged.

854-S

Algorithm Parameters

Measure	*Quantity*	*Wattage*		*Hours*	*WHFe*	*Realized kWh Savings*
		Old	*New*			
Incand to LED	74	65	10	2,867	0.133	13,221
Total						13,221

Final Results

Measure Category	*kWh Savings*			*Ex Post kW Savings*
	Ex Ante	*Ex Post*	*Realization Rate*	
Lighting Retrofit	17,016	13,221	78%	3.17
Total	17,016	13,221	78%	3.17

The project-level realization rate is 78%. The realization rate is low mainly because the hours used to determine ex ante estimations (4,380) were higher than those used in the Indiana TRM (2,867).

Values used for CF, WHF_e, and WHF_d while performing ex ante calculations (1, 0, and 0) were substituted with the appropriate values from the Indiana TRM (0.650, 0.133, and 0.200, respectively), and since the installed lamps had a lower verified wattage (10W) than the expected wattage (12.5W), a portion of the realization rate was salvaged.

857-S

Algorithm Parameters

Measure	*Quantity*	*Wattage*		*Hours*	*WHFe*	*Realized kWh Savings*
		Old	*New*			
Incand to LED	34	65	10.0	2,867	0.133	6,074
Incand to LED	17	65	10.5	2,867	0.133	3,010
Total						9,084

Final Results

Measure Category	*kWh Savings*			*Ex Post kW Savings*
	Ex Ante	*Ex Post*	*Realization Rate*	
Lighting Retrofit	12,877	9,084	71%	2.18
Total	12,877	9,084	71%	2.18

The project-level realization rate is 71%. The realization rate is low mainly because the hours used to determine ex ante estimations (4,380) were higher than those used in the Indiana TRM (2,867). Verified retrofit quantities on-site also were lower than those used in the ex ante calculation (51 versus 56).

Values used for CF, WHF_e, and WHF_d while performing ex ante calculations (1, 0, and 0) were substituted with the appropriate values from the Indiana TRM (0.650, 0.133, and 0.200, respectively), and since the installed lamps had a lower wattage (10W and 10.5W) than the expected wattage (12.5W), a portion of the realization rate was salvaged.

860-S

Algorithm Parameters

Measure	*Quantity*	*Wattage*		*Hours*	*WHFe*	*Realized kWh Savings*
		Old	*New*			
Incand to LED	130	65	9.5	3,754	-0.247	20,395
Total						20,395

Final Results

Measure Category	*kWh Savings*			*Ex Post kW Savings*
	Ex Ante	*Ex Post*	*Realization Rate*	
Lighting Retrofit	30,713	20,395	66%	3.20
Total	30,713	20,395	66%	3.20

The project-level realization rate is 66%. The realization rate is low because the hours used to determine ex ante estimations (4,500) were higher than those provided in the Indiana TRM (3,754). In addition, values used for CF, WHF_e, and WHF_d while performing ex ante calculations (1, 0, and 0) were substituted with the appropriate values from the Indiana TRM (0.370, -0.247, and 0.200, respectively). On the other hand, since the installed lamps had a lower wattage (9.5W) than the expected wattage (12.5W), a portion of the realization rate was salvaged.

1076

Algorithm Parameters

Measure	*Quantity*	*Wattage*		*Hours*	*WHFe*	*Realized kWh Savings*
		Old	*New*			
Incand to LED	59	60	12.5	3,754	-0.0024	10,495
Total						10,495

Final Results

Measure Category	*kWh Savings*			*Ex Post kW Savings*
	Ex Ante	*Ex Post*	*Realization Rate*	
Lighting Retrofit	8,408	10,495	125%	1.24
Total	8,408	10,495	125%	1.24

The project-level realization rate is 125%. The realization rate is high mainly because the hours used to determine ex ante estimations (3,000) were lower than those used in the Indiana TRM (3,754), However, the values used for CF, WHF_e, and WHF_d while performing ex ante calculations (1, 0, and 0) were substituted with the appropriate values from the Indiana TRM (0.3700,-0.0024, and 0.2000, respectively), which decreased the realization rate.

1078

Algorithm Parameters

Measure	*Quantity*	*Wattage*		*Hours*	*WHFe*	*Realized kWh Savings*
		Old	*New*			
Incand to LED	118	60	10.5	2,867	0.133	18,973
Incand to LED	65	75	10.5	2,867	0.133	13,619
Total						32,592

Final Results

Measure Category	*kWh Savings*			*Ex Post kW Savings*
	Ex Ante	*Ex Post*	*Realization Rate*	
Lighting Retrofit	37,528	32,592	87%	7.83
Total	37,528	32,592	87%	7.83

The project-level realization rate is 87%. The realization rate is low because the hours used in the ex ante calculations (3,640) were higher than those used in the Indiana TRM (2,867). However, values used for CF, WHFe, and WHFd while performing ex ante calculations (1, 0, and 0) were substituted with the appropriate values from the Indiana TRM (0.650, 0.133, and 0.200, respectively), which increased the realization rate.

1086

Algorithm Parameters

Measure	*Quantity*	*Wattage*		*Hours*	*WHFe*	*Realized kWh Savings*
		Old	*New*			
Incand to LED	34	75	11	3,357	0.088	7,948
Incand to LED	16	75	12	3,357	0.088	3,682
Incand to LED	45	60	12	3,357	0.088	7,889
Incand to LED	30	60	10	3,357	0.088	5,479
Total						24,997

Final Results

Measure Category	*kWh Savings*			*Ex Post kW Savings*
	Ex Ante	*Ex Post*	*Realization Rate*	
Lighting Retrofit	17,028	24,997	147%	6.82
Total	17,028	24,997	147%	6.82

The project-level realization rate is 147%. The realization rate is high because the hours used to determine ex ante estimations (2,450) were lower than those used in the Indiana TRM (3,357), and values used for CF, WHFe, and WHFd while performing ex ante calculations (1, 0, and 0) were substituted with the appropriate values from the Indiana TRM (0.830, 0.088, and 0.200, respectively.

1093

Algorithm Parameters

Measure	*Quantity*	*Wattage*		*Hours*	*WHFe*	*Realized kWh Savings*
		Old	*New*			
HID to LED	6	1080	120	4,295	0.00	24,739
Total						24,739

Final Results

Measure Category	*kWh Savings*			*Ex Post kW Savings*
	Ex Ante	*Ex Post*	*Realization Rate*	
Lighting Retrofit	24,624	24,739	100%	0.00
Total	24,624	24,739	100%	0.00

The project-level realization rate is 100%. The verified lighting hours of operation (4,295) are slightly greater than those used to perform ex ante estimation (4,275).

1094

Algorithm Parameters

Measure	*Quantity*	*Wattage*		*Hours*	*WHFe*	*Realized kWh Savings*
		Old	*New*			
HID to LED	3	458	119	4,300	0.00	4,373
Total						4,373

Final Results

Measure Category	*kWh Savings*			*Ex Post kW Savings*
	Ex Ante	*Ex Post*	*Realization Rate*	
Lighting Retrofit	4,348	4,373	101%	0.00
Total	4,348	4,373	101%	0.00

The project-level realization rate is 101%. The Indiana TRM lighting hours of operation (4,300) are slightly greater than those used to perform ex ante estimation (4,275).

1098

Algorithm Parameters

Measure	*Quantity*	*Wattage*		*Hours*	*WHFe*	*Realized kWh Savings*
		Old	*New*			
Incand to LED	125	75	11	2,413	0.103	21,292
Incand to LED	54	60	10	2,413	0.103	7,186
Total						28,478

Final Results

Measure Category	*kWh Savings*			*Ex Post kW Savings*
	Ex Ante	*Ex Post*	*Realization Rate*	
Lighting Retrofit	50,825	28,478	56%	8.35
Total	50,825	28,478	56%	8.35

The project-level realization rate is 56%. The realization rate is low because the verified lighting hours of operation (2,413) are much lower than those used to perform ex ante estimation (4,750). However, the values used for CF, WHFe, and WHFd while performing ex ante calculations (1, 0, and 0) were substituted with the appropriate values from the Indiana TRM (0.650, 0.103, and 0.200, respectively), which increased the realization rate.

1199

Algorithm Parameters

Measure	*Quantity*	*Wattage*		*Hours*	*WHFe*	*Realized kWh Savings*
		Old	*New*			
Incand to LED	186	60	10	2,867	0.133	30,209
Incand to LED	12	75	11	2,867	0.133	2,495
Total						32,704

Final Results

Measure Category	*kWh Savings*			*Ex Post kW Savings*
	Ex Ante	*Ex Post*	*Realization Rate*	
Lighting Retrofit	46,615	32,704	70%	7.85
Total	46,615	32,704	70%	7.85

The project-level realization rate is 70%. The realization rate is low because the hours used to determine ex ante estimations (4,630) were higher than those used in the Indiana TRM (2,867). However, the values used for CF, WHF_e, and WHF_d while performing ex ante calculations (1, 0, and 0) were substituted with the appropriate values from the Indiana TRM (0.650, 0.133, and 0.200, respectively), which raised the realization rate.

1201

Algorithm Parameters

Measure	*Quantity*	*Wattage*		*Hours*	*WHFe*	*Realized kWh Savings*
		Old	*New*			
Incand to LED	13	60	10	8,760	-0.159	4,789
Incand to LED	66	75	10	8,760	-0.159	31,605
Incand to LED	94	75	12	737	-0.159	3,669
Total						40,063

Final Results

Measure Category	*kWh Savings*			*Ex Post kW Savings*
	Ex Ante	*Ex Post*	*Realization Rate*	
Lighting Retrofit	53,361	40,063	75%	8.47
Total	53,361	40,063	75%	8.47

The project-level realization rate is 75%. The realization rate is low because the annual hours used to determine ex ante estimations (4,900) were higher for the most impactful measure than those provided by the site contact (737). In addition, the values used for CF, WHF_e, and WHF_d while performing ex ante calculations (1, 0, and 0) were substituted with the appropriate values from the Indiana TRM (0.650, -0.159, and 0.200, respectively).

1277

Algorithm Parameters

Measure	*Quantity*	*Wattage*		*Hours*	*WHFe*	*Realized kWh Savings*
		Old	*New*			
HID to LED	5	1078	120	2,114	0	10,127
Total						10,127

Final Results

Measure Category	*kWh Savings*			*Ex Post kW Savings*
	Ex Ante	*Ex Post*	*Realization Rate*	
Lighting Retrofit	20,640	10,127	49%	0.25
Total	20,640	10,127	49%	0.25

The project-level realization rate is 49%. The realization rate is low because the hours used to conduct ex ante estimations (4,300) were higher than the operational hours verified on-site (2,114).

1278

Algorithm Parameters

Measure	*Quantity*	*Wattage*		*Hours*	*WHFe*	*Realized kWh Savings*
		Old	*New*			
HID to LED	19	453	120	2,422	0.00	15,324
T12 to LED (refrigerator)	8	95	35	8,760	0.41	5,929
Total						21,253

Final Results

Measure Category	*kWh Savings*			*Ex Post kW Savings*
	Ex Ante	*Ex Post*	*Realization Rate*	
Lighting Retrofit	25,688	15,324	60%	0.00
Case Lighting Retrofit	4,962	5,929	119%	0.62
Total	30,650	21,253	69%	0.62

The realization rate for the lighting retrofit is 60%. The realization rate is low mainly because the verified lighting hours of operation (2,422) differed from those used to perform ex ante estimation (4,000). In addition, a CF of 1 was used in the ex ante estimation. This was changed to 0.052 for the ex post analysis. This project also had a refrigerated case lighting measure, which is located in the Case Lighting Site-Level Analyses section, above.

1370

Algorithm Parameters

Measure	*Quantity*	*Wattage*		*Hours*	*WHFe*	*Realized kWh Savings*
		Old	*New*			
HID to LED	24	360	155	4,304	0	21,176
Total						21,176

Final Results

Measure Category	*kWh Savings*			*Ex Post kW*
	Ex Ante	*Ex Post*	*Realization Rate*	
Lighting Retrofit	21,156	21,176	100%	0
Total	21,156	21,176	100%	0

The project-level realization rate is 100%. The verified lighting hours of operation (4,304) are slightly greater than those used to perform ex ante estimation (4,300).

1450

Algorithm Parameters

Measure	*Quantity*	*Wattage*		*Hours*	*WHFe*	*Realized kWh Savings*
		Old	*New*			
Incand to LED	104	65	11	5,701	0.088	34,831
Incand to LED	24	50	7	5,701	0.088	6,401
Incand to LED	14	90	17	4,380	0.000	4,476
Incand to LED	4	65	11	4,380	0.000	946
Total						46,654

Final Results

Measure Category	*kWh Savings*			*Ex Post kW Savings*
	Ex Ante	*Ex Post*	*Realization Rate*	
Lighting Retrofit	41,954	46,654	111%	6.62
Total	41,954	46,654	111%	6.62

The project-level realization rate is 111%. For the lighting retrofit, the realization rate is high because the waste heat factor for energy, *WHFe*, in the ex post analysis is greater than that used in the ex ante estimation (0.088 and 0, respectively). Additionally, the verified lighting hours of operation for the interior lighting (5,701) are greater than those used to perform ex ante estimation (5,460).

1467

Algorithm Parameters

Measure	*Quantity*	*Wattage*		*Hours*	*WHFe*	*Realized kWh Savings*
		Old	*New*			
HID to LED	2	458	120	4,304	0.00	2,910
Total						2,910

Final Results

Measure Category	*kWh Savings*			*Ex Post kW*
	Ex Ante	*Ex Post*	*Realization Rate*	
Lighting Retrofit	10,174	2,910	29%	0.00
Total	10,174	2,910	29%	0.00

The project-level realization rate is 29%. The realization rate is low because only two of the seven claimed and documented LED fixtures were installed. The verified hours of operation (4,304) are slightly higher than the expected hours of operation (4,300).

1476

Algorithm Parameters

Measure	*Quantity*	*Wattage*		*Hours*	*WHFe*	*Realized kWh Savings*
		Old	*New*			
HID to LED	2	458	120	4,300	0	2,907
HID to LED	5	1080	200	4,300	0	18,920
Total						21,827

Final Results

Measure Category	*kWh Savings*			*Ex Post kW*
	Ex Ante	*Ex Post*	*Realization Rate*	
Lighting Retrofit	21,827	21,827	100%	0
Total	21,827	21,827	100%	0

The project-level realization rate is 100%.

Appendix F: C&I Small Business Direct Install Questionnaire for Decision Maker Survey:

What is your job title or role? [DO NOT READ LIST]

Facilities Manager
Energy Manager
Other facilities management/maintenance position
Chief Financial Officer
Other financial/administrative position
Proprietor/Owner
President/CEO
Manager
Other (Specify) ____
REFUSED

How did you learn about I&M's SBDI incentives for efficient equipment or upgrades? [DO NOT READ LIST. SELECT ALL THAT APPLY]

1. Advertising/Website/Mailing
2. Received a free audit from an I&M Technical Specialist
3. From an I&M Program Representative
4. From a contractor
5. Friends or colleagues
6. From an equipment vendor or building contractor
7. Through past experience with a different I&M program
8. Other (please explain)
9. DON'T KNOW
10. REFUSED

Which of the following would you say is the best way to reach companies like yours with information about incentives for energy savings opportunities? [READ LIST. SELECT ALL THAT APPLY]

1. Visits from contractors or program staff
2. Bill Inserts
3. Email
4. Direct Mail
5. Phone
6. Other _________
7. DON'T KNOW
8. REFUSED

Which of the following factors influenced your decision to install the incentivized equipment? [READ LIST. SELECT ALL THAT APPLY]

1. Saving money on energy bills
2. Conserving energy/Protecting the environment
3. Replacing equipment that was broken
4. Acquiring the latest equipment
5. Participation was very easy
6. Something else (Please explain)
7. NOT SURE
8. REFUSED

Which of the following financial methods, if any, does your organization typically use to evaluate energy efficiency improvements? [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. Something else _________
6. REFUSED

Which of the following considerations have the greatest effect on the equipment your business chooses to purchase? [READ LIST. SELECT ALL THAT APPLY]

1. A recommendation by a trusted vendor or contractor
2. Purchasing a familiar brand
3. The equipment's effect on greenhouse gasses
4. Having an Energy Star or other environmental label
5. Robust Warranty
6. Speed associated with the purchase (how quickly it can be on site)
7. Something else ___________
8. REFUSED

How well did the SBDI program's range of energy saving equipment options fit your needs?

Not at all 1	2	3	4	Completely 5	Don't know	REFUSED

[DISPLAY Q8 ONLY IF Q7 < 4]

Why did the equipment types offered not meet your needs completely?_______

PROGRAM DELIVERY EFFICIENCY [DO NOT DISPLAY IN SURVEY]

According to our records, [TRADE ALLY NAME] provided the on-site audit and installed the energy saving improvements at your business. Did any other contractors approach you about participating in the SBDI Program?

1. Yes
2. No
3. DON'T KNOW
4. REFUSED

Why did you choose to work with [TRADE ALLY NAME] instead of the other contractors?

When [TRADE ALLY NAME] first approached you about the program, did you have any concerns about participating or was it an easy decision?

1. I had some concerns
2. It was an easy decision
3. DON'T KNOW
4. REFUSED

[DISPLAY Q12 AND Q13 IF Q11= 1]

What were your concerns?

Why did you decide to participate despite your concerns?

On the scale provided, please indicate how much you agree or disagree with the following statements regarding your experience with the [TRADE ALLY NAME] and the SBDI Program (SBDI):

	1 – Strongly Disagree	2	3 – Neutral	4	5 – Strongly Agree	NOT SURE	REFUSED
a. [TRADE ALLY NAME] was professional and courteous	()	()	()	()	()	()	()
b. I trusted [TRADE ALLY NAME]'s recommendations	()	()	()	()	()	()	()
c. [TRADE ALLY NAME] knew the program well and could answer most of my questions	()	()	()	()	()	()	()
d. I would recommend the SBDI Program to other small businesses	()	()	()	()	()	()	()
e. I would recommend [TRADE ALLY NAME] as a contractor to consider	()	()	()	()	()	()	()

[DISPLAY Q15 IF Q14a, Q14b, Q14c, Q14e <3]

What could [TRADE ALLY NAME] have done differently that would have improved your assessment of the service they provided?

[DISPLAY Q16 IF Q14d <3]

Why would you not recommend the SBDI Program to other small businesses?

Do you have any additional comments regarding your experience working with [TRADE ALLY NAME]?

EQUIPMENT SELECTION [DO NOT DISPLAY]

The following questions will be about the equipment you installed.

The SBDI Program allows some qualifying equipment to be installed the same day as the on-site energy assessment. Was any energy saving equipment installed on the day of the on-site energy assessment?

1. Yes, some measures were installed the same day
2. No
3. I don't know
4. REFUSED

[DISPLAY Q19 IF Q18 =1]

Which of the following measures were installed on the same day as the on-site energy assessment? **[YES/NO/DON'T KNOW]** [DISPLAY INSTALLED MEASURES]

1. Interior/Exterior lights
2. LED Refrigerated Case Lighting
3. Sensors
4. Strip Curtain (Cooler or Freezer)
5. Anti-Sweat Heater Controls
6. Auto Door Closers
7. Night Covers
8. Refrigerated Case Doors
9. Pressure Controls
10. Motors and Controls
11. Do not recall
12. REFUSED

[DISPLAY Q20 IF ANY Q19 =2]

How long did you have to wait for the additional equipment to be installed after the on-site assessment was performed? Would you say…

1. Less than 1 week
2. 1-2 weeks
3. 3-4 weeks

4. 5-6 weeks
5. More than 6 weeks
6. DON'T KNOW
7. REFUSED

Using a scale of one to five, where one is very dissatisfied, five is very satisfied, and a three is neither particularly dissatisfied nor satisfied, please rate how satisfied or dissatisfied you are with each of the following ….

	1 – Very Dissatisfied	2	3	4	5 – Very Satisfied	NOT SURE	REFUSED
a. …the audit of your facility	()	()	()	()	()	()	()
b. …the proposal you received from your contractor	()	()	()	()	()	()	()
c. …the amount of time between the audit and the installation of the equipment	()	()	()	()	()	()	()
d. … the equipment that was installed	()	()	()	()	()	()	()
e. … the quality of the installation	()	()	()	()	()	()	()

[DISPLAY Q21 IF ANY IN Q20 <3]

Why were you dissatisfied?

Was any additional equipment recommended to you during the on-site energy assessment that you chose NOT to install?

1. Yes
2. No
3. DON'T KNOW
4. REFUSED

[DISPLAY Q24 IF Q23 = 1]

Which of the following types of equipment were recommended, but *not* installed? [DISPLAY MEASURES NOT INSTALLED]

1. Interior/Exterior lights
2. LED Refrigerated Case Lighting
3. Sensors
4. Strip Curtain (Cooler or Freezer)
5. Anti-Sweat Heater Controls
6. Auto Door Closers
7. Night Covers
8. Refrigerated Case Doors
9. Pressure Controls
10. Motors and Controls

11. REFUSED

[DISPLAY Q25 IF Q23 = 1]

Why did you not install that recommended equipment?

CUSTOMER SATISFACTION [DO NOT DISPLAY HEADING; READ INTRO]

The following few questions pertain to your experience with the program, program staff, contractor, and equipment installed.

Was the process for participating in the program clearly explained to you?

1. Yes
2. No
3. DON'T KNOW
4. REFUSED

[DISPLAY Q27 IF Q26 =2]

What needed to be more clearly explained to you?

On the scale provided, please indicate how satisfied are you with:

	1 – Not at all satisfied	2	3	4	5 – Very satisfied	NOT SURE	REFUSED
f. the steps you had to take to get through the program	()	()	()	()	()	()	()
g. the amount of time it took to get your rebate or incentive	()	()	()	()	()	()	()
h. The amount of the rebates	()	()	()	()	()	()	()
i. the range of equipment that qualifies for incentives	()	()	()	()	()	()	()
j. how long it took your contractor to address your questions or concerns	()	()	()	()	()	()	()
k. how thoroughly your contractor addressed your question or concern	()	()	()	()	()	()	()
l. Savings on your monthly bill	()	()	()	()	()	()	()
m. the program, overall	()	()	()	()	()	()	()

[DISPLAY Q29 IF ANY IN Q28 <3]

Why were you dissatisfied?

NET-TO-GROSS SECTION [DO NOT DISPLAY]

Free-Ridership [Do Not Display]

Before you knew about the Small Business Direct Install Program, had you purchased and installed any energy efficient equipment at your facility?

1. Yes
2. No
3. DON'T KNOW
4. REFUSED

Has your organization purchased any significant energy efficient equipment in the last three years for which you did not apply for a financial incentive through an I&M energy efficiency program?

1. Yes. Our organization purchased energy efficient equipment but did not apply for incentive.
2. No. Our organization purchased significant energy efficient equipment and applied for an incentive.
3. No significant energy efficient equipment was purchased by our organization.
4. DON'T KNOW
5. REFUSED

Before participating in the SBDI Program, had you installed any equipment or measure similar to the energy efficient [question("value"), id="220"]?

1. Yes
2. No
3. DON'T KNOW
4. REFUSED

Did you have plans to install the energy efficient [Measure/Equipment type] before participating in the SBDI Program?

1. Yes
2. No
3. DON'T KNOW
4. REFUSED

[DISPLAY Q34 IF Q33= 1]

Would you have gone ahead with this planned installation even if you had not participated in the program?

1. Yes
2. No
3. DON'T KNOW
4. REFUSED

How important was previous experience with the SBDI Program in making your decision to install the energy efficient [Measure/Equipment type]? **[DO NOT SHOW FOR 2014 SINCE PROGRAM IS NEW]**

1. Did not have previous experience with program
2. Very important
3. Somewhat important
4. Only slightly important
5. Not at all important
6. DON'T KNOW
7. REFUSED

Did a program representative recommend that you that you receive the onsite assessment or that you install the energy [Measure/Equipment type]?

1. Yes
2. No
3. DON'T KNOW
4. REFUSED

[DISPLAY Q37 IF Q36 = 1]

If the SBDI Program representative had not recommended the onsite assessment or 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
5. DON'T KNOW
6. REFUSED

Would you have been financially able to install the energy efficient [Measure/Equipment type] without the financial incentive from the SBDI Program?

1. Yes
2. No
3. DON'T KNOW
4. REFUSED

If the onsite assessment had not been performed and the financial incentive from the SBDI Program had not been available, how likely is it that you would have installed energy efficient [Measure/Equipment type?

1. Definitely would have installed
2. Probably would have installed
3. Probably would not have installed
4. Definitely would not have installed
5. DON'T KNOW
6. REFUSED

We would like to know whether the availability of information and financial incentives through the SBDI Program affected the quantity (or number of units) of energy efficient [Measure/Equipment Type] that you purchased and installed.

Did you install more energy efficient [Measure/Equipment Type] than you otherwise would have without the program?

1. Yes
2. No, program did not affect quantity purchased and installed.
3. DON'T KNOW
4. REFUSED

We would like to know whether the availability of information and financial incentives through the SBDI Program affected the level of energy efficiency you chose for energy efficient [Measure/Equipment Type].

Did you choose equipment that was more energy efficient than you would have chosen because of the program?

1. Yes
2. No, program did not affect level of efficiency chosen for equipment.
3. DON'T KNOW
4. REFUSED

[DISPLAY 42 IF Q41 = 1]

How much more efficient [Measure/Equipment Type] did you install? (i.e., "xx% more efficient")

We would like to know whether the availability of information and financial incentives through the SBDI Program affected the timing of your purchase and installation of energy efficient [Measure/Equipment Type].

Did you purchase and install the 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.
3. DON'T KNOW
4. REFUSED

[DISPLAY Q44 IF Q43 = 1]

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
6. DON'T KNOW
7. REFUSED

Spillover [DO NOT DISPLAY]

Because of your experience with SBDI 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
4. DON'T KNOW
5. REFUSED

[DISPLAY Q46 IF Q45 = 2 OR 4]

We'd like to call you in a few months for a very short follow-up about other efficiency equipment purchases. If that would be all right. please provide us with the best person to contact and their phone number

Name

Phone number

[DISPLAY Q47 - Q52 IF Q45 = 1)]

What energy efficient equipment did you purchase?

What motivated you to install this equipment?

Was this equipment installed at the same facility (or facilities) as the equipment for which you received a rebate?

1. Yes
2. No; Where was the equipment installed?: _________________
3. DON'T KNOW
4. REFUSED

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. Neither important or unimportant
4. Somewhat unimportant
5. Unimportant
6. DON'T KNOW
7. REFUSED

How important was your past participation in any programs offered by Ameren Missouri to your decision to implement the additional energy efficiency measures?

1. Very important
2. Somewhat important
3. Neither important or unimportant
4. Somewhat unimportant
5. Unimportant
6. DON'T KNOW

7. REFUSED

. 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
7. Other reason (please describe): _________________
8. REFUSED

FIRMOGRAPHIC [DO NOT DISPLAY]

[Note to reviewer: The customer database has many fields indicating much of the "firmographic" data we will want to capture. However, we have not yet established how much of it is populated. Therefore, we propose the following questions. If the database provides sufficient firmographic data, we will be able to eliminate some or all of these questions.]

Which of the following best describes your business type:

1. Industrial
2. Restaurant
3. Retail
4. Office
5. Grocery and convenience
6. School
7. Lodging
8. Warehouse
9. Residential
10. Other – specify: ____
11. NOT SURE
12. REFUSED

Do you have any other comments that you would like to relay to I&M about energy efficiency in the commercial and industrial sector or about their programs?

Appendix G: C&I Small Business Direct Install 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 Small Business Direct Install Program. The survey provided the information used in Section 4.3 to estimate free ridership for projects in the Small Business Direct Install 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 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 SBDI Program, and (3) the influence that the SBDI Program had on his or her decision to install energy efficient refrigeration measures.

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=15)*	*Percent of Respondents*
What is your job title or role?	Facilities Manager	0	0%
	Energy Manager	0	0%
	Other facilities management/maintenance position	0	0%
	Chief Financial Officer	0	0%
	Other financial/administrative position	0	0%
	Proprietor/Owner	6	40%
	President/CEO	1	7%
	Manager	6	40%
	Other	2	13%
	REFUSED	0	0%

	Response	*(n=15)*	*Percent of Respondents*
Did you first learn of the program from a program contractor?	Yes	13	87%
	No	1	7%
	REFUSED	0	0%
	DON'T KNOW	1	7%

	Response	*(n=1)*	*Percent of Respondents*
How did you FIRST learn about Indiana Michigan Powers SBDI Program?	Advertising/Website/Mailing	0	0%
	Received a free audit from an I&M Technical Specialist	0	0%
	From an I&M Program Representative	0	0%
	From a contractor	0	0%

	Friends or colleagues	0	0%
	From an equipment vendor or building contractor	0	0%
	Through past experience with a different I&M program	0	0%
	Other (please explain)	1	100%
	REFUSED	0	0%
	DON'T KNOW	0	0%

	Response	*(n=15)*	*Percent of Respondents*
What do you think is the best way to reach companies like yours with information about incentives for energy savings opportunities?	Visits from contractors or program staff	9	60%
	Bill Inserts	4	27%
	Email	6	40%
	Direct Mail	5	33%
	Phone	5	33%
	Website Updates	2	13%
	Other	1	7%
	REFUSED	0	0%
	DON'T KNOW	0	0%

	Response	*(n=15)*	*Percent of Respondents*
In deciding to do an efficiency project of this type, there are usually a number of reasons why it may be undertaken. In your own words, can you tell me why you did this efficiency project?	Saving money on energy bills	8	53%
	Conserving energy/Protecting the environment	5	33%
	Replacing equipment that was broken	2	13%
	Acquiring the latest equipment	4	27%
	Participation was very easy	0	0%
	Something else (Please explain)	2	13%
	REFUSED	0	0%
	DON'T KNOW	0	0%

	Response	*(n=15)*	*Percent of Respondents*
Which of the following financial methods, if any, does your organization typically use to evaluate energy efficiency improvements?	Initial Cost	13	87%
	Simple payback (provide numeric payback time if possible)	11	73%
	Internal rate of return (provide numeric rate of return if possible)	8	53%
	Life cycle cost	10	67%
	Something else	0	0%
	REFUSED	0	0%
	DON'T KNOW	0	0%

	Response	*(n=15)*	*Percent of Respondents*
Using a scale where 0 means not at all, and 4 means completely, how well did the program's range of energy saving equipment options fit your	0 - Not at all	0	0%
	1	0	0%
	2	2	13%
	3	6	40%

needs?	4 - Completely	7	47%
	REFUSED	0	0%
	DON'T KNOW	0	0%

When [TRADE ALLY NAME] first approached you about the program, did you have any concerns about participating or was it an easy decision?	*Response*	*(n=15)*	*Percent of Respondents*
	I had some concerns	2	13%
	It was an easy decision	13	87%
	REFUSED	0	0%
	DON'T KNOW	0	0%

Did the contractor you worked with provide you with any program marketing materials such as a brochure or flyer when they discussed the program with you?	*Response*	*(n=15)*	*Percent of Respondents*
	Yes	7	47%
	No	7	47%
	REFUSED	0	0%
	DON'T KNOW	1	7%

Using a scale of 0 to 4, where 0 means not at all influential and four means very influential, how influential were the program marketing materials?	*Response*	*(n=7)*	*Percent of Respondents*
	0 - Not at all influential	0	0%
	1	0	0%
	2	2	29%
	3	0	0%
	4 - Very influential	5	71%
	REFUSED	0	0%
	DON'T KNOW	0	0%

Please indicate how much you agree or disagree with the following statements regarding your experience with the [TRADE ALLY NAME] and the SBDI Program (SBDI): [TRADE ALLY NAME] was professional and courteous	*Response*	*(n=15)*	*Percent of Respondents*
	1 - Completely disagree	0	0%
	2	0	0%
	3	0	0%
	4	5	33%
	5 - Completely agree	9	60%
	REFUSED	0	0%
	DON'T KNOW	1	7%

Please indicate how much you agree or disagree with the following statements regarding your experience with the [TRADE ALLY NAME] and the SBDI Program (SBDI): [TRADE ALLY NAME]'s recommendations made sense for my business	*Response*	*(n=15)*	*Percent of Respondents*
	1 - Completely disagree	0	0%
	2	0	0%
	3	1	7%
	4	5	33%
	5 - Completely agree	8	53%
	REFUSED	0	0%
	DON'T KNOW	1	7%

Please indicate how much you agree or disagree with the following statements regarding your experience with the [TRADE ALLY NAME] and the SBDI Program (SBDI): [TRADE ALLY NAME] knew the program well and could answer most of my questions	*Response*	*(n=15)*	*Percent of Respondents*
	1 - Completely disagree	0	0%
	2	0	0%
	3	1	7%
	4	2	13%
	5 - Completely agree	11	73%
	REFUSED	0	0%
	DON'T KNOW	1	7%

Please indicate how much you agree or disagree with the following statements regarding your experience with the [TRADE ALLY NAME] and the SBDI Program (SBDI): I would recommend [TRADE ALLY NAME] as a contractor to consider	*Response*	*(n=15)*	*Percent of Respondents*
	1 - Completely disagree	0	0%
	2	0	0%
	3	0	0%
	4	5	33%
	5 - Completely agree	9	60%
	REFUSED	0	0%
	DON'T KNOW	1	7%

Did the contractor you worked with clearly explain the participation process to you?	*Response*	*(n=15)*	*Percent of Respondents*
	Yes	14	93%
	No	1	7%
	REFUSED	0	0%
	DON'T KNOW	0	0%

Now I'd like to ask you some questions regarding program qualifying equipment. Does your facility have any commercial refrigerators or freezers?	*Response*	*(n=14)*	*Percent of Respondents*
	Yes	10	71%
	No	4	29%
	REFUSED	0	0%
	DON'T KNOW	0	0%

Were you aware that the program also offered discounts to help businesses reduce the energy used by commercial refrigerators and freezers?	*Response*	*(n=10)*	*Percent of Respondents*
	Yes	2	20%
	No	8	80%
	REFUSED	0	0%
	DON'T KNOW	0	0%

Can I provide your name and contact information to program staff so they might reach out to inform you of	*Response*	*(n=8)*	*Percent of Respondents*
	Yes	6	75%
	No	0	0%

future incentive opportunities?	REFUSED	2	25%
	DON'T KNOW	0	0%

According to our records, [MEASURES] were installed at your facility. Were any of those measures installed on the same day you received the onsite energy assessment?	*Response*	*(n=15)*	*Percent of Respondents*
	Yes	2	13%
	No	13	87%
	REFUSED	0	0%
	DON'T KNOW	0	0%

How long did you have to wait for the additional equipment to be installed after the on-site assessment was performed? Would you say…	*Response*	*(n=2)*	*Percent of Respondents*
	Less than 1 week	1	50%
	1-2 weeks	0	0%
	3-4 weeks	0	0%
	5-6 weeks	0	0%
	More than 6 weeks	0	0%
	All equipment was installed the same day	1	50%
	REFUSED	0	0%
	DON'T KNOW	0	0%

Was any additional equipment recommended to you during the on-site energy assessment that you chose NOT to install?	*Response*	*(n=15)*	*Percent of Respondents*
	Yes	2	13%
	No	11	73%
	REFUSED	0	0%
	DON'T KNOW	2	13%

Using a scale of one to five, where one is very dissatisfied, five is very satisfied, and a three is neither particularly dissatisfied nor satisfied, please rate how satisfied or dissatisfied you are with each of the following …. The proposal you received from your contractor	*Response*	*(n=15)*	*Percent of Respondents*
	1 - Very dissatisfied	0	0%
	2	0	0%
	3 - Neither satisfied nor dissatisfied	0	0%
	4	5	33%
	5 - Very satisfied	10	67%
	REFUSED	0	0%
	DON'T KNOW	0	0%

Using a scale of one to five, where one is very dissatisfied, five is very satisfied, and a three is neither particularly dissatisfied nor satisfied, please rate how satisfied or dissatisfied you are with	*Response*	*(n=15)*	*Percent of Respondents*
	1 - Very dissatisfied	0	0%
	2	0	0%
	3 - Neither satisfied nor dissatisfied	0	0%
	4	7	47%

each of the following …. The amount of time between the audit and the installation of the equipment	5 - Very satisfied	8	53%
	REFUSED	0	0%
	DON'T KNOW	0	0%

Using a scale of one to five, where one is very dissatisfied, five is very satisfied, and a three is neither particularly dissatisfied nor satisfied, please rate how satisfied or dissatisfied you are with each of the following …. The equipment that was installed	*Response*	*(n=15)*	*Percent of Respondents*
	1 - Very dissatisfied	0	0%
	2	0	0%
	3 - Neither satisfied nor dissatisfied	0	0%
	4	3	20%
	5 - Very satisfied	12	80%
	REFUSED	0	0%
	DON'T KNOW	0	0%

Using a scale of one to five, where one is very dissatisfied, five is very satisfied, and a three is neither particularly dissatisfied nor satisfied, please rate how satisfied or dissatisfied you are with each of the following …. The quality of the installation	*Response*	*(n=15)*	*Percent of Respondents*
	1 - Very dissatisfied	0	0%
	2	0	0%
	3 - Neither satisfied nor dissatisfied	1	7%
	4	3	20%
	5 - Very satisfied	11	73%
	REFUSED	0	0%
	DON'T KNOW	0	0%

Using a scale of one to five, where one is very dissatisfied, five is very satisfied, and a three is neither particularly dissatisfied nor satisfied, please rate how satisfied or dissatisfied you are with each of the following …. The amount of the discount	*Response*	*(n=15)*	*Percent of Respondents*
	1 - Very dissatisfied	1	7%
	2	0	0%
	3 - Neither satisfied nor dissatisfied	0	0%
	4	5	33%
	5 - Very satisfied	9	60%
	REFUSED	0	0%
	DON'T KNOW	0	0%

Using a scale of one to five, where one is very dissatisfied, five is very satisfied, and a three is neither particularly dissatisfied nor satisfied, please rate how satisfied or dissatisfied you are with each of the following ….	*Response*	*(n=15)*	*Percent of Respondents*
	1 - Very dissatisfied	0	0%
	2	0	0%
	3 - Neither satisfied nor dissatisfied	1	7%
	4	5	33%
	5 - Very satisfied	9	60%
	REFUSED	0	0%
	DON'T KNOW	0	0%

The program overall			

Has your business purchased any significant energy efficient equipment in the last three years for which you DID NOT apply for a financial incentive through an energy efficiency program at the <LOCATION> location?	*Response*	*(n=15)*	*Percent of Respondents*
	Yes	2	13%
	No	10	67%
	REFUSED	0	0%
	DON'T KNOW	3	20%

Before participating in the SBDI Program, had you installed any equipment or measure similar to the energy efficient [MEASURE] at the [LOCATION]?	*Response*	*(n=15)*	*Percent of Respondents*
	Yes	1	7%
	No	14	93%
	REFUSED	0	0%
	DON'T KNOW	0	0%

Did you have plans to install the [MEASURE] at the [LOCATION] before participating in the SBDI Program?	*Response*	*(n=15)*	*Percent of Respondents*
	Yes	6	40%
	No	8	53%
	REFUSED	0	0%
	DON'T KNOW	1	7%

Would you have gone ahead with this planned installation even if you had not participated in the program?	*Response*	*(n=6)*	*Percent of Respondents*
	Yes	2	33%
	No	3	50%
	REFUSED	0	0%
	DON'T KNOW	1	17%

Prior to completing this project, did you have previous experience with an Indiana Michigan program?	*Response*	*(n=1)*	*Percent of Respondents*
	Yes	0	0%
	No	0	0%
	REFUSED	0	0%
	DON'T KNOW	0	0%

How important was previous experience with the SBDI Program in making your decision to install the [MEASURE] at the [LOCATION]?	*Response*	*(n=0)*	*Percent of Respondents*
	Very important	0	-
	Somewhat important	0	-
	Only slightly important	0	-
	Not at all important	0	-
	REFUSED	0	-
	DON'T KNOW	0	-

If the program contractor that provided the energy assessment of your facility had not recommended installing the [MEASURE], how likely is it that you would have installing it anyway?	*Response*	*(n=15)*	*Percent of Respondents*
	Definitely would have installed	3	20%
	Probably would have installed	3	20%
	Probably would not have installed	5	33%
	Definitely would not have installed	4	27%
	REFUSED	0	0%
	DON'T KNOW	0	0%

Would you have been financially able to install the [MEASURE] at the [LOCATION] without the financial incentive from the SBDI Program?	*Response*	*(n=15)*	*Percent of Respondents*
	Yes	5	33%
	No	10	67%
	REFUSED	0	0%
	DON'T KNOW	0	0%

If the discount and onsite assessment from the program had not been available, how likely is it that you would have <INSTALLED> the <MEASURE> at the <LOCATION> location anyway?	*Response*	*(n=15)*	*Percent of Respondents*
	Definitely would have installed	2	13%
	Probably would have installed	4	27%
	Probably would not have installed	6	40%
	Definitely would not have installed	3	20%
	REFUSED	0	0%
	DON'T KNOW	0	0%

We would like to know whether the availability of information and financial incentives through the SBDI Program affected the quantity (or number of units) of [MEASURE] that you purchased and installed at the [LOCATION]. Did you install more energy efficient [Measure/Equipment Type] than you otherwise would have without the program?	*Response*	*(n=15)*	*Percent of Respondents*
	Yes	6	40%
	No, program did not affect quantity purchased and installed.	9	60%
	REFUSED	0	0%
	DON'T KNOW	0	0%

We would like to know whether the availability of information and financial incentives through the SBDI Program affected the level of energy efficiency	*Response*	*(n=15)*	*Percent of Respondents*
	Yes	10	67%
	No, program did not affect level of efficiency chosen for equipment.	3	20%
	REFUSED	0	0%

you chose for [MEASURE]. Did you choose equipment that was more energy efficient than you would have chosen because of the program?	DON'T KNOW	2	13%

	Response	*(n=15)*	*Percent of Respondents*
We would like to know whether the availability of the onsite assessment and the discount through the program affected the timing of the [MEASURE] project at the [LOCATION]. Did you install the [MEASURE] earlier than you otherwise would have without the program?	Yes	11	73%
	No, program did not affect did not affect timing of purchase and installation.	3	20%
	REFUSED	0	0%
	DON'T KNOW	1	7%

	Response	*(n=11)*	*Percent of Respondents*
When would you otherwise have completed the project?	Less than 6 months later	3	27%
	6-12 months later	0	0%
	1-2 years later	1	9%
	3-5 years later	3	27%
	More than 5 years later	1	9%
	REFUSED	1	9%
	DON'T KNOW	2	18%

	Response	*(n=2)*	*Percent of Respondents*
Our records show that your organization also received a discount from Indiana Michigan Power's program for [NSAME] other [MEASURE] projects completed at a different location. Was it a single decision to complete all of those [MEASURE] projects for which you received an incentive from the program or did each project go through its own decision process?	Single decision	2	100%
	Each project went through its own decision process	0	0%
	Other	0	0%
	REFUSED	0	0%
	DON'T KNOW	0	0%

	Response	*(n=1)*	*Percent of Respondents*
Our records show that your organization also received a discount from Indiana	Same decision making process	1	100%

Michigan Power's program for a <FDESC> project at <LOCATION>. Was the decision making process for that project the same as for the <MEASURE> project we have been talking about?	Different decision making process	0	0%
	Other	0	0%
	REFUSED	0	0%
	DON'T KNOW	0	0%

Since your participation in the program did you implement any ADDITIONAL energy efficiency measures at this facility or at your other facilities within Indiana Michigan Power's service territory that did NOT receive incentives or discount through Indiana Michigan programs?	*Response*	*(n=15)*	*Percent of Respondents*
	Yes	1	7%
	No	13	87%
	REFUSED	0	0%
	DON'T KNOW	1	7%

Using a scale of 0 to 10, where 0 is not at all important and 10 is extremely important, how important was your experience with the program in your decision to implement this project?	*Response*	*(n=1)*	*Percent of Respondents*
	0 - not at all important	0	0%
	1	0	0%
	2	0	0%
	3	0	0%
	4	0	0%
	5	0	0%
	6	0	0%
	7	0	0%
	8	1	100%
	9	0	0%
	10 - extremely important	0	0%
	REFUSED	0	0%
	DON'T KNOW	0	0%

If you had not participated in the <PROGRAM>, how likely is it that your organization would still have implemented this measure, using a 0 to 10, scale where 0 means you definitely WOULD NOT have implemented this measure and 10 means you definitely WOULD have implemented this measure?	*Response*	*(n=1)*	*Percent of Respondents*
	0 - Definitely would not have	0	0%
	1	0	0%
	2	0	0%
	3	1	100%
	4	0	0%
	5	0	0%
	6	0	0%
	7	0	0%
	8	0	0%

	9	0	0%
	10 - Defintiely would have	0	0%
	REFUSED	0	0%
	DON'T KNOW	0	0%

	Response	*(n=1)*	*Percent of Respondents*
Why didn't you apply for or receive incentives for those items?	Didn't know whether equipment qualified for financial incentives	1	100%
	Equipment did not qualify for financial incentives	0	0%
	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 reason (please describe):	0	0%
	REFUSED	0	0%
	DON'T KNOW	0	0%

	Response	*(n=0)*	*Percent of Respondents*
Which of the following best describes your business type:	Industrial	0	-
	Restaurant	0	-
	Retail	0	-
	Office	0	-
	Grocery and convenience	0	-
	School	0	-
	Lodging	0	-
	Warehouse	0	-
	Residential	0	-
	Gas station	0	-
	Other – specify:	0	-
	REFUSED	0	-
	DON'T KNOW	0	-

	Response	*(n=15)*	*Percent of Respondents*
Does your organization own or occupy, own and rent to someone else, or rent the facility where the project(s) took place?	Own and occupy	12	80%
	Own and rent to someone else	1	7%
	Rent	2	13%
	REFUSED	0	0%
	DON'T KNOW	0	0%