

2022 Indiana Commercial & Industrial Portfolio  
EM&V Report  
Volume I of II

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Prepared for:  
Indiana Michigan Power

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# 1. Introduction

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Under contract with the Indiana Michigan Power (I&M), ADM Associates, Inc., (ADM) performed evaluation, measurement, and verification (EM&V) activities that confirmed the energy savings (kWh) and demand reduction (kW) realized through the energy efficiency programs that I&M implemented in Indiana during the during January 2022 through December 2022 (PY2022).

This chapter provides a summary of evaluation findings for the C&I program portfolio and presents information regarding the organization of the report.

## 1.1. Summary of Data Collection

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Table 1-1 summarizes the number of verification sites reviewed for the ex post gross analysis.

*Table 1-1 Number of Sampled Projects*

<i>Program</i>	<i>Number of Sampled Projects</i>
Work Prescriptive	23
Work Custom	20
Public Efficient Streetlighting	Census

Surveys were conducted to collect data on the program's impact on participants' decisions to install efficient equipment, as well as their feedback on the program. Table 1-2 summarizes the survey data collection completed for PY2022.

*Table 1-2 Summary of Survey Data Collection*

<i>Mode</i>	<i>Time Frame</i>	<i>Number of Contacts</i>	<i>Number of Completions</i>
Email	October 2022	131	13
Phone follow up to October email invitation	January 2023	26	3
Email	January 2023	48	1
Total		179	17

## 1.2. Impact Evaluation Findings

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The savings variables presented in this evaluation report are defined in Table 1-3.

*Table 1-3 Savings-Related Terminology*

<i>Variable</i>	<i>Definition</i>
kWh Savings Goal	<i>kWh Savings Goal</i> is the energy savings goal cited in the applicable portfolio plan.
Ex Ante Gross kWh Savings	<i>Ex Ante Gross kWh Savings</i> are the annual energy savings reported by I&M and are typically obtained from I&M's DSM/EE Program Scorecard documents.

<i>Variable</i>	<i>Definition</i>
Gross Audited kWh Savings	<i>Gross Audited kWh Savings</i> are determined by reviewing tracking data presenting for any errors and adjusting <i>Ex Ante Gross kWh Savings</i> accordingly.
Gross Verified kWh Savings	<i>Gross Verified kWh Savings</i> are determined by applying an installation rate to the <i>Gross Audited kWh Savings</i> . <sup>1</sup> The installation rate is defined as the ratio of units that were installed (verified) to the number of units reported (claimed).
Ex Post Gross kWh Savings	<i>Ex Post Gross kWh Savings</i> are the realized annual gross kWh savings reflecting all adjustments made by ADM, without accounting for free ridership or spillover.
Ex Post Net kWh Savings	<i>Ex Post Net kWh Savings</i> are equal to <i>Ex Post Gross kWh Savings</i> , adjusted to account for free ridership and spillover. <sup>2</sup>
Ex Post Net Lifetime kWh Savings	<i>Ex Post Net Lifetime kWh Savings</i> is the <i>Ex Post Net kWh Savings</i> occurring over the course of the applicable measure effective useful life (EUL).
Gross Realization Rate	<i>Gross Realization Rate</i> is equal to <i>Ex Post Gross kWh Savings</i> divided by <i>Ex Ante Gross kWh Savings</i> .
Net-to-Gross Ratio	<i>Net-to-Gross Ratio</i> is equal to <i>Ex Post Net kWh Savings</i> divided by <i>Ex Post Gross kWh Savings</i> .
Free Rider <sup>3</sup>	A <i>free rider</i> is a program participant who would have implemented the program measure or practice in the absence of the program. Free riders can be: 1) total, in which the participant's activity would have completely replicated the program measure; 2) partial, in which the participant's activity would have partially replicated the program measure; or 3) deferred, in which the participant's activity would have completely replicated the program measure, but at a future time than the program's timeframe.  The free ridership estimate are the savings attributable to free riders.

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1 Gross Verified energy impacts will be equal to Gross Audited energy impacts for the Work Prescriptive, Work Custom, and Public Efficient Street Lighting as the in-service rate for these programs is 1.0.

<sup>2</sup> ADM conducted a non-participant spillover study in 2021 to estimate non-participant spillover and concluded that there was not any qualifying non-participant spillover. Spillover savings presented in this report reflect participant spillover.

<sup>3</sup> Northeast Energy Efficiency Partnerships (NEEP) EMV Glossary version 2.1. <https://neep.org/media/4330>



<i>Variable</i>	<i>Definition</i>
Spillover (Participant and Non-Participant) <sup>4</sup>	<i>Spillover</i> effects are reductions in energy consumption and/or demand caused by the presence of an energy efficiency program, beyond the program-related gross savings of the participants and without financial or technical assistance from the program. There can be participant and/or non-participant spillover. <i>Participant spillover</i> is the additional energy savings that occur when a program participant independently installs energy efficiency measures or applies energy saving practices after having participated in the efficiency program because of the program's influence. <i>Non-participant</i> spillover refers to energy savings that occur when a program non-participant installs energy efficiency measures or applies energy saving practices as a result because of a program's influence.

Based on the definitions presented in Table 1-3, Table 1-4 presents a summary of the components of the impact evaluation that are accounted for in savings variables presented in this report.

*Table 1-4 Components of Impact Evaluation Accounted for in Savings Variables*

<i>Category</i>	<i>Tracking Data Review</i>	<i>In-Service Rates</i>	<i>Ex Post Gross Analysis</i>	<i>Net-to-Gross Analysis</i>
Gross Audited	✓			
Gross Verified	✓	✓		
Ex Post Gross	✓	✓	✓	
Ex Post Net	✓	✓	✓	✓

ADM performed EM&V activities for each of the C&I programs offered by I&M during PY2022. Total C&I portfolio ex post gross energy savings are 40,977,758 kWh, while ex post net energy savings are 36,868,964 kWh, as shown in Table 1-5.

*Table 1-5 Summary of Energy Savings – PY2022*

<i>Program Name</i>	<i>Ex Ante Annual kWh Savings</i>	<i>Gross Audited kWh Savings</i>	<i>Gross Verified kWh Savings</i>	<i>Ex Post Annual Gross kWh Savings</i>	<i>Gross Realization Rate</i>	<i>Ex Post Annual Net kWh Savings</i>	<i>Net-to-Gross Ratio</i>	<i>Lifetime Net Ex Post kWh Savings</i>
Work Prescriptive	16,403,055	18,883,903	18,431,394	18,431,394	112%	16,157,685	88%	205,579,377
Work Custom	17,595,760	16,226,554	16,579,879	16,579,879	94%	14,744,794	89%	183,598,535
Public Efficient Street Lighting	5,966,485	5,966,485	5,966,485	5,966,485	100%	5,966,485	100%	113,388,979
C&I Portfolio Totals	39,965,300	41,076,942	40,977,758	40,977,758	103%	36,868,964	90%	502,566,891

Total C&I portfolio ex post gross peak demand savings are 4,847.94 kW, while ex post net peak demand savings are 3,813.59, as shown in Table 1-6.

<sup>4</sup> Ibid.

Table 1-6 Summary of Peak Demand Impacts – PY2022

<i>Program Name</i>	<i>Ex Ante Gross kW Savings</i>	<i>Gross Audited kW Savings</i>	<i>Gross Verified kW Savings</i>	<i>Ex Post Gross kW Savings</i>	<i>Gross Realization Rate</i>	<i>Ex Post Net kW Savings</i>	<i>Net-to-Gross Ratio</i>
Work Prescriptive	1,814.28	2,163.11	2,034.88	2,034.88	112%	1,701.35	84%
Work Custom	2,803.61	2,704.36	2,813.07	2,813.07	100%	2,112.24	75%
Public Efficient Street Lighting	-	-	-	-	N/A	-	N/A
C&I Portfolio Totals	4,617.89	4,867.47	4,847.94	4,847.94	105%	3,813.59	79%

### 1.3. Cost Effectiveness Evaluation Findings

ADM performed the following cost effectiveness tests for the programs: Total Resource Cost (TRC) test, Utility Cost Test, Participant Cost Test (PCT), and Ratepayer Impact Measure (RIM) test. A test score above one signifies that, from the perspective of the test, the program benefits were greater than the program costs. Table 1-7 shows the test results for each program.

Table 1-7 Summary of PY2022 Benefit-Cost Ratios

<i>Program</i>	<i>Program Administrator Cost Test (aka USCRT, or UCT)</i>	<i>Total Resource Cost Test</i>	<i>Ratepayer Impact Measure</i>	<i>Participant Cost Test</i>
Work Prescriptive	2.73	1.81	0.31	5.95
Work Custom	2.22	2.77	0.31	18.39
Public Efficient Streetlighting	0.99	0.76	0.25	2.39
C&I Portfolio Total	1.90	1.59	0.30	5.39

### 1.4. Evaluation Findings and Recommendations

#### 1.4.1. Work Custom and Prescriptive

Based on the results of the analysis, ADM identified the following key findings and recommendations I&M could consider as they implement their efficiency programs for commercial and industrial customers.

**Collaboration and communication between CLEAResult and I&M staff led the program to identify several key measures and incentives that would appeal to the market and encourage participation in the Work programs that led to the program meeting goals.** I&M and CLEAResult staff reported positive communication and collaboration between the two groups that is carrying into 2023. This collaboration led to the encouragement of the market to adopt measure the program had not emphasized in PY2021 such as hotel and cold air weatherization and

compressed air studies. Ultimately, this work led to increased savings for the program and to the program meeting savings goals.

**The program increased outreach staffing and focused on large customers that participated in the programs in the past.** As of late January 2023, three outreach specialists have regular communications with trade allies and key large customers in their respective territories to drive and support energy saving projects. In addition to working with the large customers and active trade allies in their region, these outreach specialists work with key account managers at the utility, chambers of commerce, and similar entities to alert the commercial and industrial entities in the region to the services and incentives offered by I&M. The program also focused on marketing through monthly newsletters to customers and trade allies, maintaining the program website, conducting paid search, providing online advertising, and providing program collateral at conferences, meetings, and similar functions. I&M has entered into a partnership with Allumia, a third-party provider of Efficiency as a Service. As part of this collaboration, I&M will refer its customers to Allumia, who will cover the initial cost of implementing efficiency improvements. Allumia recoups these costs through the customer's energy savings over time.

- **Recommendation 1:** With the availability of additional outreach resources, the program should also focus on reaching mid-size and large customers that have not participated in the program or have not participated in the last few years while reaping the benefits of outreach to past participants. Findings from the non-participant survey completed in PY2021 found that two-thirds of C&I customers were unaware of I&M incentives, suggesting that there is an opportunity to educate the customer on the incentives I&M offers.

**Participant survey findings indicate that contractors are playing important roles in supporting the program.** Contractors and vendors were the most common source of program awareness among survey respondents (35% learned of the program from a trade ally, contractor, vendor, or energy consultant) and contractors assisted a majority of participants with the application.

**Participants reported a positive experience with the program.** Most participants (94%) were satisfied with the program overall and all respondents reported that the application process was somewhat or completely acceptable.

## 1.5. Organization of Report

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ADM prepared two volumes for this report, and they provide information on the impact, process, and cost effectiveness evaluation of the Indiana Michigan Power portfolio of C&I programs implemented in Indiana during the 2022 program year. Volume I is organized as follows:

- Chapter 2: Work Prescriptive
- Chapter 3: Work Custom
- Chapter 4: Public Efficient Streetlighting
- Chapter 5: Cost Effectiveness Evaluation

See report Volume II for chapters that present reports of site-level gross energy impacts, survey instruments and tabulated survey response information.

## 2. Work Prescriptive

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This chapter presents the results of both the impact and process evaluations of the Work Prescriptive Program that Indiana Michigan Power (I&M) offered to its non-residential customers during the period of January 2022 through December 2022.

The objectives of the evaluation were to:

- Establish a pre-approval review procedure;
- Assess gross and net energy (kWh) savings and peak demand (kW) reductions resulting from participation in the program during the program year;
- Document sources of program awareness among participants;
- Assess satisfaction among participating customers; and
- Provide recommendations for program improvement as appropriate.

### 2.1. Program Description

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This program targets non-residential customers eligible for prescriptive measures. These will include commercial, industrial, and institutional customers. For-profit, non-profit, and public agencies (such as schools) are eligible to participate.

Categories of eligible measures for this program include:

- Lighting
- Lighting controls
- HVAC systems
- Variable frequency drives
- Commercial refrigeration equipment
- Commercial kitchen equipment
- Compressed Air – Engineered Nozzle

### 2.2. Data Collection

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#### 2.2.1. Verification of Measures

##### 2.2.1.1. *Sampling Plan*

ADM selected a sample of all 2022 C&I projects for which ADM performed measurement and verification (M&V) and calculated gross realized kWh savings and kW demand reductions.

ADM used a stratified sampling approach to develop the M&V sample. A stratified sampling approach allowed for a given statistical precision and confidence level target to be met with a smaller sample size than would have been allowed by simple random sampling. Strata boundaries

were based on ex ante kWh energy savings. ADM selected a sample with enough sample units to facilitate estimation of program ex post kWh energy savings with 10% statistical precision at a 90% confidence level.

Completed program projects accumulated over the course of the program year, and sample selection occurred at multiple points in time. The timing of sample selection was contingent upon the timing of the completion of projects during the program year.

The table below shows the number of projects, ex ante gross kWh energy savings, and sampling statistics, by stratum, of the program sample.

*Table 2-1 Population Statistics Used for Work Prescriptive Sample Design*

<i>Variable</i>	<i>Stratum 1</i>	<i>Stratum 2</i>	<i>Stratum 3</i>	<i>Stratum 4</i>	<i>Stratum 5</i>	<i>Totals</i>
Strata boundaries (kWh)	> 350000	160000 - 350000	65000 - 160000	19000 - 65000	< 19000	
Number of projects	5	27	43	96	98	269
Total Ex Ante Annual kWh	2,043,825	5,879,230	4,364,563	3,251,409	864,244	16,403,270
Average kWh Savings	408,765	217,749	101,501	33,869	8,819	60,978
Std. dev. of kWh savings	40,950	49,302	30,295	13,281	4,941	138,768
Coefficient of variation	0.1	0.23	0.3	0.39	0.56	
Final design sample	1	7	6	5	4	23

#### *2.2.1.2. Verification Data Collection Procedures*

ADM used remote verifications to collect project-specific data. ADM staff accomplished three major tasks with these communications:

- First, ADM staff verified the implementation status of all measures for which customers received incentives. They verified the correct installation of the energy efficiency measures and that they still functioned properly.
- Second, ADM staff collected additional data, when necessary, needed to analyze the realized energy savings from the installed improvements and measures. ADM collected data in a form prepared specifically for the project in question after an in-house review of the project file.
- Third, ADM interviewed the contact personnel at a facility to obtain additional information on the installed system to complement the data collected from other sources.

#### *2.2.2. Participant Survey*

ADM administered a survey to Work Prescriptive and Work Custom participants to collect data for use in estimating net savings and obtaining feedback about participants' experience with the program. Table 2-2 summarizes the survey data collection efforts. ADM contacted participants by email and a segment of participants with larger projects that did not respond to the October email invitation were contacted by telephone to complete the survey.

*Table 2-2 Summary of Work Prescriptive and Work Custom Data Collection*

<i>Mode</i>	<i>Time Frame</i>	<i>Number of Contacts</i>	<i>Number of Completions</i>
Email	October 2022	131	13
Phone follow-up to October email invitation	January 2023	26	3
Email	January 2023	48	1
Total		179	17

### 2.2.3. Staff Interviews

The evaluation team completed staff interviews with the key staff responsible for managing and implementing the Work programs. Specifically, the interviews covered:

- The program approach to outreach and marketing.
- Any recent changes to measure and incentives.
- The launch of new program offerings like the midstream offering and the efficiency as a service element and the associated partnership with Allumia.
- Feedback from participants and trade allies about their satisfaction with the program.
- Key successes and challenges experience in the last year.

The evaluation team completed two interviews, one with the key I&M staff person responsible for the Work programs, and the second with four CLEAResult staff that worked in management, marketing, reporting, and rebate processing (Table 2-3).

*Table 2-3 Staff Interview Summary*

<i>Interviews</i>	<i>Title</i>	<i>Key Duties</i>
Interview #1	Programs Coordinator at Indiana Michigan Power	Manage all energy efficiency work for I&M including being the primary point of contact for CLEAResult
Interview #2	Marketing Portfolio Manager	Oversee I&M marketing campaigns and demand generation
	Program Director	Oversee CLEAResult work for I&M Residential and Commercial Programs
	Senior Program Manager	Oversee Work Programs including being the key liaison with I&M staff
	Program Analyst	Reporting, forecasting, and rebate processing

## 2.3. Estimation of Ex Post Gross Savings

### 2.3.1. Methodology for Estimating Ex Post Gross Savings

#### 2.3.1.1. *Review of Documentation*

I&M's program implementation contractor provided documentation for the sampled energy efficiency projects undertaken at customer facilities. ADM's 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, ADM reviewed the available documentation (e.g., audit reports, savings calculation work papers, etc.) for each rebated measure, with attention given to the calculation procedures and documentation for savings estimates. Reviewed documents included program forms, reports, billing system data, weather data, and any other potentially useful data. For each application, ADM determined if the following types of information was available for each application:

- 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.

In addition to the above activities, ADM completed a review of program tracking data. The purpose of the review was to assess the sufficiency of the tracking data for supporting program implementation and evaluation. To this end, ADM reviewed the program data to verify tracking of the following fields, that the fields were populated (i.e., the data were not missing), and that the values were reasonable.

- Unique customer identifier, such as customer account number;
- Customer specific project data such as contact name and information, building type;
- Project milestone dates such as application submission date, application approval, incentive payment (where applicable);
- Measure specific information such as:
  - type of measure;
  - specific measure;
  - ex ante measure kWh energy savings and peak kW reductions;
  - measure attributes necessary to estimate measure savings (where applicable);
  - unique measure identifier (e.g., numeric or alpha-numeric code);
  - unit serial number (where applicable);
  - incremental costs / project costs
- Vendor/Contractor business name, contact name and information (where applicable);
- Incentive amounts; and
- Application status.



ADM provided recommendations, specifically regarding tracking measure level information, to the implementation contractor based on this review.

### 2.3.1.2. *Procedures for Estimating Measure-Level Gross Energy Savings*

A breakdown of sampled measures for the Work Prescriptive Program is below in Table 2-4.

*Table 2-4 Breakdown of Sampled Prescriptive Measures*

<i>Measure Category</i>	<i>Ex Ante Annual kWh Savings</i>	<i>Ex Post Annual Gross kWh Savings</i>	<i>Gross Realization Rate</i>
Air Conditioner	10,929	2,138	20%
Exterior Area Lighting Fixture - HID to LED	300,406	374,314	125%
Heat Pump	11,245	2,396	21%
HID-to-LED Retrofit	7,698	6,828	89%
Interior Area Lighting Fixture - HID to LED	326,367	352,611	108%
LED Exit Sign	6,474	11,867	183%
LED MR16 Replacing Incandescent	4,187	11,238	268%
LED Recessed Light Fixture/Lamps	105,537	135,706	129%
LED Tube Relamp	888,047	1,197,759	135%
Lighting Occupancy Sensor	303,105	270,778	89%
Streetlight Fixture	720,543	767,848	107%
VFD Added to HVAC Fans	67,080	64,386	96%
Total	2,751,620	3,197,869	116%

ADM calculated a kWh energy savings gross realization rate and a peak kW reduction gross realization rate for each site in the M&V sample. Sites with relatively high or low gross realization rates were analyzed to determine the reasons for the discrepancy between ex ante and ex post energy savings. The site-level gross impact analysis results for each M&V sample site are presented in Volume II of the report. These reports outline the data sources and analytical approaches employed in the calculation of measure impacts.

### 2.3.2. Results of Ex Post Gross Savings Estimations

The kWh gross realization rate is the ratio of sampled measure ex post gross kWh energy savings to sampled measure ex ante kWh energy savings. The kW gross realization rate is the ratio of sampled measure ex post gross kW demand savings to sampled measure ex ante kW demand savings. Since a stratified sampling approach was employed for this program, stratum-level kWh and kW gross realization rates were developed for each sampling stratum.

Program-level gross ex post gross kWh energy savings are calculated as follows:

- The ex-ante kWh energy savings of non-sampled measures are factored by the applicable stratum-level kWh gross realization rates to calculate ex post gross kWh energy savings for non-sampled measures.
- The ex post gross kWh energy savings of all sampled measures and all non-sampled measures are summed.

Program-level gross ex post gross kW demand savings are calculated as follows:

- The ex-ante kW demand savings of non-sampled measures are factored by the applicable stratum-level kW gross realization rates to calculate ex post gross kW savings for non-sampled measures.
- The ex post gross kW demand savings of all sampled measures and all non-sampled measures are summed.

### 2.3.2.1. *Ex Post Gross kWh Savings*

Table 2-5 displays the ex ante and ex post gross kWh savings of the Work Prescriptive Program including gross realization rates for sampled projects.

*Table 2-5 Work Prescriptive Project-Level Ex Ante and Ex Post kWh Savings*

<i>Stratum</i>	<i>Project Number</i>	<i>Measure</i>	<i>Ex Ante kWh Savings</i>	<i>Gross Ex Post kWh Savings</i>	<i>Project Gross Realization Rate</i>
1	120	LED lighting	377,667	808,050	214%
2	114	LED lighting and occupancy sensor	304,536	39,356	13%
2	103	Streetlighting	253,735	293,247	116%
2	109	LED lighting	214,724	356,414	166%
2	104	Streetlighting	198,396	207,192	104%
2	105	Streetlighting	183,265	190,845	104%
2	121	LED lighting	181,652	277,845	153%
2	110	LED lighting	165,542	151,444	91%
3	115	LED lighting and occupancy sensor	150,349	142,410	95%
3	116	LED lighting, exit signs, and occupancy sensor	133,074	149,814	113%
3	117	LED lighting	93,982	99,395	106%
3	102	Streetlighting	85,147	76,564	90%
3	101	VFD, Heat pump	78,325	66,782	85%
3	100	LED lighting	67,092	82,659	123%
4	122	LED lighting	62,052	33,159	53%
4	106	LED lighting and occupancy sensor	59,085	81,976	139%
4	118	Occupancy sensor	54,900	52,612	96%
4	108	LED lighting	37,485	54,443	145%
4	107	LED lighting	25,384	23,646	93%

<i>Stratum</i>	<i>Project Number</i>	<i>Measure</i>	<i>Ex Ante kWh Savings</i>	<i>Gross Ex Post kWh Savings</i>	<i>Project Gross Realization Rate</i>
5	119	Air conditioner and LED exit signs	12,589	3,798	30%
5	113	LED lighting and occupancy sensor	5,610	2,831	50%
5	112	LED lighting	5,454	2,718	50%
5	111	LED lighting	1,572	669	43%
All Non-Sample Projects			13,651,435	15,233,525	112%
Total			16,403,055	18,431,394	112%

Fifteen of the 23 sampled prescriptive projects had a realization rate that was lower than 90% or higher than 110%.

- Projects 100, 103, 106, 108, 109, 116, 120 & 121 had high realization rates (123%, 116%, 139%, 145%, 166%, 113%, 214% & 153%, respectively). The difference between the ex ante and the ex post savings was due to the ex ante analysis applying a deemed per fixture/lamp kWh savings value that was multiplied by the quantity of measures to estimate the project savings, whereas the ex post analysis used project-specific information (wattages, hours of use for the space, and appropriate heating and cooling interactive factors).
- Projects 111, 112, & 113 had low realization rates (43%, 50% & 50%, respectively) for lighting measures. The ex ante deemed savings per unit values may have been derived with hours of use greater than the ex post analysis, which verified 2,500 annual operating hours. The application form for lighting projects also includes a second savings estimate, labeled “Annual kWh Reduction”, with a result that was similar to the ex post savings, as hours of use were included in the supplemental calculation.
- In Project 114, there was a double-counting issue with the installed lighting due to the disaggregation of the installed measures into the Prescriptive or Custom programs. The as-built lighting survey was referenced by separate Excel spreadsheet pivot tables. Specifically, when the installed measures were grouped into the Custom program, the ex ante savings were based on the pivot table that referenced the “existing fixture.” On the other hand, when the installed measures were grouped into the Prescriptive program, the ex ante savings were based on the pivot table that referenced the unique field for “efficient fixture.” The ex post method retained the 1:1 retrofits in the prescriptive savings, and the measures with a quantity changes in the custom savings.
- Project 122 had a low realization rate (53%) for lighting measures. The ex ante deemed savings per unit values may have been derived with hours of use greater than the ex post analysis, which verified 2,340 annual operating hours. A second reason was that the same deemed savings estimate was applied to 105W and 155W efficient lamps, which resulted in realization rates of 87% and 51%, respectively.

Two prescriptive heat pump projects also had low realization rates.

- Projects 101 and 119 had realization rates of 85% and 30%, respectively. Both projects involved heat pump measures, when air conditioning units with a gas heat source were installed. The ex post savings analysis only counted cooling savings from the units. Because both projects were new construction projects, the ex post analysis referenced federal appliance standards for the baseline efficiency.

Table 2-6 presents the ex post annual gross kWh savings for the Work Prescriptive Program from January 2022 through December 2022.

*Table 2-6 Ex Post Annual Gross kWh*

<i>Ex Ante Gross kWh Savings</i>	<i>Gross Audited kWh Savings</i>	<i>Gross Verified kWh Savings</i>	<i>Ex Post Gross kWh Savings</i>	<i>Gross Realization Rate</i>
16,403,055	18,883,903	18,431,394	18,431,394	112%

#### 2.3.2.2. *Ex Post Gross kW Reductions*

Table 2-7 presents the ex post peak kW reduction for the Work Prescriptive Program from January 2022 through December 2022.

*Table 2-7 Ex Post Peak kW Reduction*

<i>Ex Ante Gross kW Savings</i>	<i>Gross Audited kW Savings</i>	<i>Gross Verified kW Savings</i>	<i>Ex Post Gross kW Savings</i>	<i>Gross Realization Rate</i>
1,814.28	2,163.11	2,034.88	2,034.88	112%

## 2.4. Estimation of Ex Post Net Savings

### 2.4.1. Methodology for Estimating Ex Post Net Savings

The net savings analysis was used to determine what part of the gross energy savings achieved by program participants could be attributed to the effects of the program. The net savings attributed to program participants are the gross savings less free ridership, plus spillover.

#### 2.4.1.1. *Methodology for Estimating Free Ridership*

A survey of program participants that asked them about role of the program in their decision to implement the energy efficiency measures informed the net-to-gross analysis.

ADM considered three factors to determine what percentage of savings may be attributable 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; and
- A firm's previous experience with a measure installed under the program.

For each of these factors, ADM applied rules to develop binary variables indicating whether a participant's behavior shows free ridership. These rules make use of answers to questions on the decision maker survey questionnaire.

The first factor requires determining if a participant's intention was to install an energy efficiency measure even without the program. The answers to a combination of several questions are used with a set of rules to determine whether a participant's behavior indicates likely free ridership. Two binary variables 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 answers "yes" to the following two questions: "Did you have plans to install the measure before participating in the program?" and "Would you completed the [MEASURE] project even if you had not participated in the program?"
- The respondent answers "definitely would have installed" to the following question: "If the financial incentive from the [PROGRAM] had not been available, how likely is it that you would have installed [MEASURE] anyway?"
- The respondent answers "did not affect timing of purchase and installation" to the following question: "How did the availability of information and financial incentives through the [PROGRAM] affect the timing of your purchase and installation of [MEASURE]?"
- The respondent answers "no, the program did not affect level of efficiency that we chose for equipment" in response to the following question: "Did you purchase and install the [MEASURE] earlier 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 answers "yes" to the following two questions: "Did you have plans to install the [MEASURE] before participating in the program?" and "Would you have completed the [MEASURE] project even if you had not participated in the program?"

- Either the respondent answers "definitely would have installed" or "probably would have installed" to the following question: "If the financial incentive from the [PROGRAM] had not been available, how likely is it that you would have installed [MEASURE] anyway?"
- Either the respondent answers "did not affect timing of purchase and installation" to the question: "Did you purchase and install the [MEASURE] earlier than you otherwise would have without the program?" or the respondent indicates 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 answers “no, the program did not affect level of efficiency that we chose for equipment” in response to the following question: “Did you choose equipment that was more energy efficient than you would have chosen because of the program?”

The second factor requires determining if a customer reports that a recommendation from a Program representative or 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 answers “very important” to the following question: “How important was previous experience with the [Program Name] in making your decision to install [Equipment/Measure]?”
- The respondent answers “yes” to the following question: “Did a representative of the [Program Name] recommend that you install [Equipment/Measure]?”

The third factor requires determining if a participant in the program indicates that he or she had previously installed an energy efficiency measure like the 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 answers “yes” to the following question: “Before participating in the [Program Name], had you installed any equipment or measure similar to [Rebated Equipment/Measure] at your facility?”
- The respondent answers “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 [Program Name]?”

The four sets of rules just described are used to construct four different indicator variables that address free ridership behavior. For each customer, a free ridership value is assigned based on the combination of variables. With the four indicator variables, there are 12 applicable combinations for assigning free ridership scores for each respondent, depending on the combination of answers to the questions creating the indicator variables. Table 2-8 shows these values.

Table 2-8 Free Ridership Scoring

<i>Indicator Variables</i>				<i>Free Ridership Score</i>
<i>Had Plans and Intentions to Install Measure without the Program? (Definition 1)</i>	<i>Had Plans and Intentions to Install Measure without the Program? (Definition 2)</i>	<i>The Program had influence on Decision to Install Measure?</i>	<i>Had Previous Experience with Measure?</i>	
Y	Y	Y	Y	100%
Y	Y	N	Y	100%
Y	Y	N	N	100%
Y	Y	Y	N	67%
N	Y	N	Y	67%
N	Y	Y	Y	33%
N	Y	N	N	33%
N	N	N	Y	33%
N	Y	Y	N	0%
N	N	Y	Y	0%
N	N	Y	N	0%
N	N	N	N	0%

The free ridership assessment also included questions on the participants' financial ability to pay for the measures. These questions were used to assess the consistency of the responses to the questions used to score free ridership.

Responses are considered inconsistent if the respondent indicates that they were not financially able to install the equipment, but state that they have plans to install the equipment and would have installed it without the program incentive. There were no cases where respondents reported this and that they could not have afforded the measure without program support.

#### 2.4.1.2. *Methodology for Estimating Spillover*

Program participants could implement additional energy saving measures without receiving a program incentive because they participated in the program. The energy savings resulting from these additional measures constitute program participant spillover effects.

To assess participant spillover savings, survey respondents are asked whether or not they implemented any additional energy saving measures for which they did not receive a program incentive. Respondents are also asked to provide information on the measures implemented for use in estimating the associated energy savings.

To determine if the savings from the reported measures were attributable to the program, survey respondents were asked questions about the degree to which their experience with the program influenced them to implement the measures and the likelihood of implementing the measures in the absence of the program. Specifically, respondents were asked the following questions:



- SO1: How important was your experience with the [PROGRAM\_NAME] in your decision to install this lighting equipment?
- SO2: If you had NOT participated in the [PROGRAM\_NAME], how likely is it that your organization would still have installed this lighting equipment?

ADM calculated the spillover score using Equation 2-1.

*Equation 2-1*

$$Spillover = Average(SO1, 10 - SO2)$$

Savings from measures associated with a spillover score greater than 7 were considered attributable to the program.

All survey response data were systematically reviewed by a researcher who was familiar with the portfolio. As part of this review, the researcher could determine whether the available information justifies modifying the spillover score calculated in accordance with the algorithm outlined below. The spillover score calculated in accordance with the algorithm outlined above could be revised in instances in which there were significant apparent inconsistencies between responses provided by the decision maker or in cases in which the responses were apparently invalidated by other information regarding the measure(s). Additionally, responses may be dropped in cases where respondents do not report sufficient information to estimate the savings associated with the measure implemented.

#### 2.4.2. Results of Ex Post Net Savings Estimation

Because a limited number of responses (n = 17) were obtained from PY2022 participants, ADM used the survey responses for PY2021 and PY2022 and weighted them based on the ex post kWh savings to calculate the average free ridership rate applicable to the aggregate PY2021 and PY2022 ex post savings.

To estimate the free ridership rate applicable to PY2022 survey-nonrespondents, ADM adjusted the combined PY2021/PY2022 free ridership rate. This adjustment involved taking into account the reported free ridership rate from PY2021 and the free ridership rate from PY2022 survey respondents. This adjustment was necessary to develop an estimate of the free ridership applicable to PY2022 non-survey respondents, while ensuring that the weighted average free ridership rate is applied, in the aggregate, to the PY2021 and PY2022 ex post savings.

Table 2-9 summarizes the net ex post kWh savings and the net ex post kW demand reduction of the Work Prescriptive Program.



*Table 2-9 Ex Post Net kWh and kW Savings*

<i>Category</i>	<i>kWh</i>	<i>kW</i>
Ex Ante Gross Savings	16,403,055	1,814.28
Gross Audited Savings	18,883,903	2,163.11
Gross Verified Savings	18,431,394	2,034.88
Ex Post Gross Savings	18,431,394	2,034.88
Gross Realization Rate	112%	112%
Ex Post Free Ridership	2,273,709	333.52
Ex Post Non-Participant Spillover	-	-
Ex Post Participant Spillover	-	-
Ex Post Net Savings	16,157,685	1,701.35
Net-to-Gross Ratio	88%	84%
Ex Post Net Lifetime Savings	205,579,377	n/a

## 2.5. Process Evaluation

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ADM completed a process evaluation of the PY2022 program. The following research activities informed the process evaluation.

- Interviews and discussions with program staff.
- Review of program documents and tracking data.
- Interviews with participating program trade allies.
- A survey of program participants.
- A survey of I&M customers that did not participate in the program.

### 2.5.1. Process Evaluation Findings

ADM interviewed program staff and completed a survey of program participants. The interviews with program staff provided information on how the program was implemented in 2022, changes made since 2021, and key successes and challenges. Surveys provided feedback from customers on their perspective of program processes.

#### 2.5.1.1. *Program Team Perspective*

##### 2.5.1.1.1. *Outreach and Marketing*

**The Work programs rely on outreach specialists that work directly with customers and trade allies to drive energy saving projects to the program.** As of late January 2023, two outreach specialists have regular communications with trade allies and key large customers in their respective territories to drive and support energy saving projects. In addition to working with the large customers and active trade allies in their region, these outreach specialists work with key account managers at the utility, chambers of commerce, and similar entities to alert the commercial and industrial entities in the region to the services and incentives offered by I&M.

**The program provides marketing efforts that complement the outreach specialists' efforts.** The Work programs generate demand by providing monthly newsletters to customers and trade allies, maintaining the program website, conducting paid search, providing online advertising, and providing program collateral at conferences, meetings, and similar functions. Staff reported they emphasize marketing efforts at times when there are program changes such as when the program provides bonus incentives or is trying to encourage the adoption of specific measures.

**The program relies partially on large customers repeatedly using the Work programs for projects so keeping these customers informed of program changes and opportunities is important to continue to gather savings.** Staff reported that several large industrial customers in the region got involved with the program by doing a lighting project at one site and then doing follow-up projects at other sites in the region. According to staff, after the program began emphasizing compressed air incentives, several companies have recently begun doing compressed air projects across multiple sites in the region. And, because the compressed air studies and work need to be done annually, these sites will likely need to be reminded of the compressed air opportunities for years to come, thus also providing an opening for the program to promote other savings opportunities.

**The program has emphasized reaching large energy users in recent years to concentrate on the large savings opportunities but has recently begun to promote program offerings to smaller users.** The program does reach out to chambers of commerce and economic development commissions to promote program offerings to small commercial customers but there has not been a concerted effort to reach these organizations in the same way as the large energy users because of the savings opportunities available at large organizations. However, the program recently brought in an outreach specialist to focus on “mom-and-pop shops” with offerings like exterior lighting incentives, an incentive most likely to appeal to many of these smaller organizations. Additionally, in 2023, there will be an emphasis on rolling out a small business direct install offering that has already attracted interest from trade allies wanting to participate.

**In the last year and into 2023, the program has emphasized recruiting compressed air trade allies.** Staff reported identifying significant opportunities for energy savings coming from compressed air leak detection in 2021 and early 2022. To gather savings from that work, the program looked to boost their numbers of trade allies doing this type of work in 2022. According to staff, the program was successful in recruiting these allies as they were able to meet energy savings goals in large part due to the uptick in these types of projects in 2022.

#### *2.5.1.1.2. Program Changes to Measures and Incentives*

**Some trade allies in neighboring utility areas and states have become more active in I&M territory due to a change in incentives.** Staff reported that a large trade ally that completes many energy saving projects in a neighboring utility area has begun to work more in I&M territory, in part due to the increase in incentives offered by I&M. Additionally, another trade ally that has been active in Michigan with the program, has recently become more active in Indiana in part because of the increase in incentives offered in Indiana.

#### 2.5.1.1.3. *New Work Program Offerings*

**The energy efficiency as a service program (EESP) element has not seen notable participation in 2022, mostly because of how new the service is.** Staff reported that the EESP service, provided through a partnership with Allumia, started in November 2022 and customers are now learning about the service. I&M launched this service to help large energy users find creative ways to finance energy saving capital projects.

#### 2.5.1.1.4. *Feedback from the Market*

**Trade allies and participants tell program staff they are largely satisfied with the services offered.** According to staff, trade allies and participants report that the participation process is relatively easy and when they have questions they know they can work with an outreach specialist that will assist them. As discussed in Section 2.2.2, survey responses collected for the evaluation effort indicate a high rate of program satisfaction.

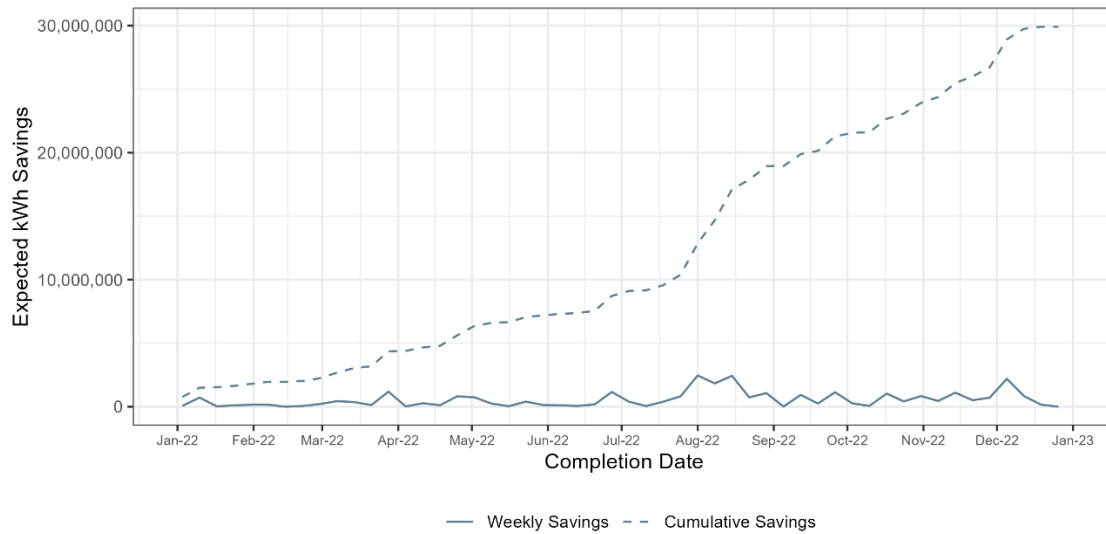
**Participants reported to staff that they appreciate the non-energy benefits of their project.** Specifically, participants told staff they appreciate the safety improvements provided by their new lighting and the reduced maintenance costs associated with upgraded equipment.

#### 2.5.1.1.5. *Successes and Challenges in 2022*

Staff noted these successes in 2022:

- **Communication and collaboration between the implementation staff and the I&M staff was effective in 2023.** Specifically, when problems, issues, or opportunities arose throughout the year, each party made the other aware of the issue and they worked collaboratively to address it. For example, the teams started seeing savings coming in from the compressed air projects and they are now working together on building upon those opportunities by looking into the possibility and cost effectiveness of offering compressor upgrades.
- **CLEAResult reviewed the list of available incentives in the first half of 2022 looking for opportunities to encourage the adoption of certain measures in the market.** Compressed air studies, engineered nozzles, and hotel weatherization, were all measures that appeared to be underutilized in the region, so the program staff worked to encourage the adoption of these measures and found many savings projects.
- **The program reached its savings goals.** The program managed to meet goals even though it got a slow start to the program year and booked most of its projects from Q2 to Q4 2022. Figure 2-1 displays the accumulation of savings during the course of the year. Approximately, two-thirds of the savings came from projects completed after July.

Figure 2-1 Weekly and Cumulative Ex Ante Savings



### 2.5.1.2. Participant Survey Findings

**Contractors and vendors are playing important roles in supporting the program.** Contractors and vendors were the most common source of program awareness. Thirty-five percent of respondents learned of the program from a trade ally, contractor, vendor, or energy consultant (see Figure 2-2). Additionally, as shown in Figure 2-3, vendors and contractors assisted a majority of participants with the application. Fifty-three percent of participants reported that a contractor they had worked with before installed the equipment, 18% that it was installed by a contractor recommended to them, and 12% that it was a contractor they learned about through the program.

Figure 2-2 Initial Source of Program Awareness

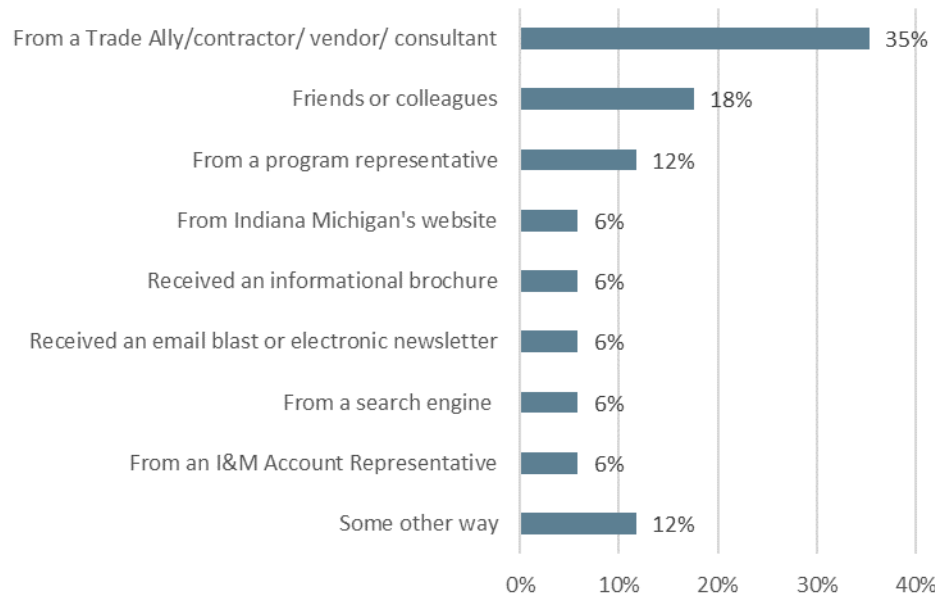
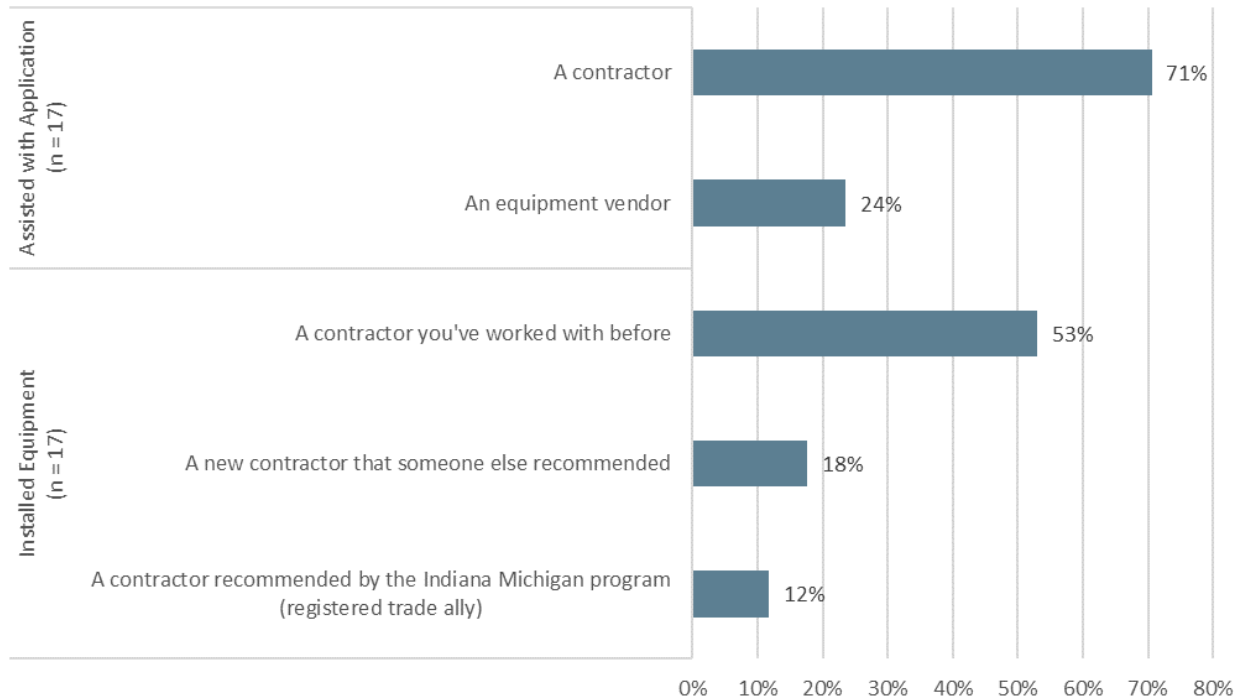


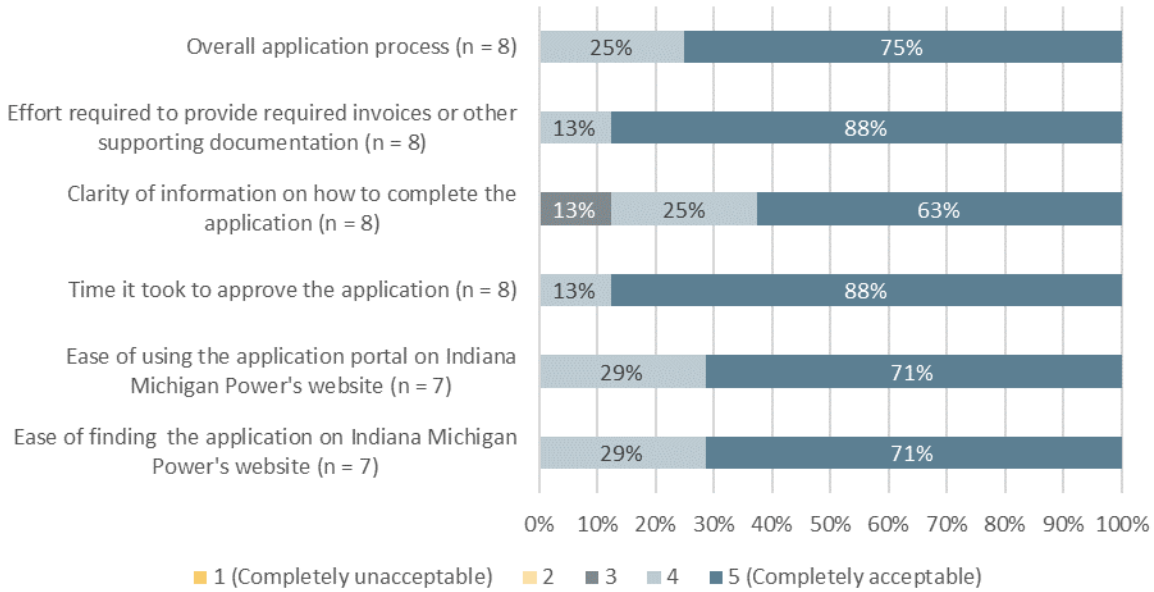
Figure 2-3 Application Assistance and Equipment Installation



**Respondents found the application process to be acceptable.** All respondents reported that the application process was somewhat or completely acceptable and none of the rated aspects of the

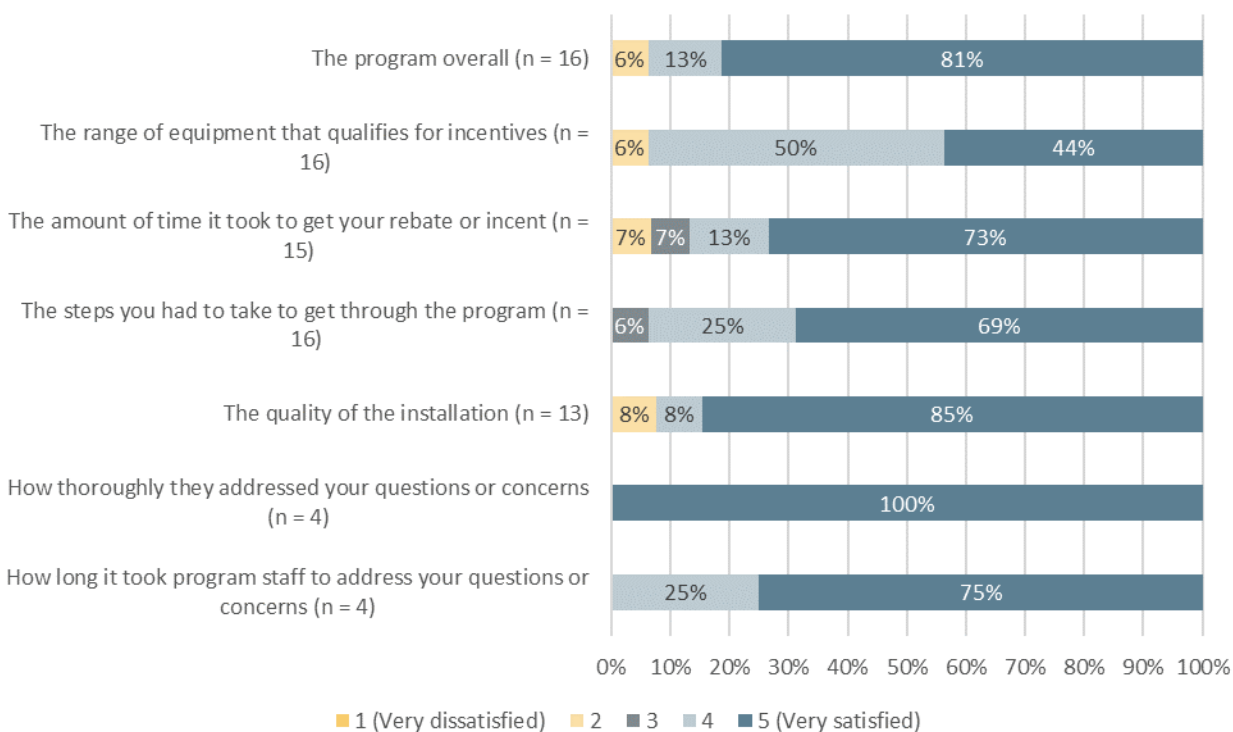
application process were rated as unacceptable by any respondents. All but one respondent reported that they had a clear sense of who to go through for assistance with the application.

*Figure 2-4 Acceptability of the Application Process*



**Most participants (94%) were satisfied with the program overall.** One respondent did indicate that they were somewhat dissatisfied with the program overall, the range of qualifying equipment, the time it took to get the rebate, and the quality of installation.

Figure 2-5 Program Satisfaction



## 2.6. Findings and Recommendations

Based on the results of the analysis, ADM identified several key conclusions and recommendations I&M could consider as they implement their efficiency programs for commercial and industrial customers.

**Collaboration and communication between CLEAResult and I&M staff led the program to identify several key measures and incentives that would appeal to the market and encourage participation in the Work programs that led to the program meeting goals.** I&M and CLEAResult staff reported positive communication and collaboration between the two groups that is carrying into 2023. This collaboration led to the encouragement of the market to adopt measure the program had not emphasized in PY2021 such as hotel and cold air weatherization and compressed air studies. Ultimately, this work led to increased savings for the program and to the program meeting savings goals.

**The program increased outreach staffing and focused on large customers that participated in the programs in the past.** As of late January 2023, three outreach specialists have regular communications with trade allies and key large customers in their respective territories to drive and support energy saving projects. In addition to working with the large customers and active trade allies in their region, these outreach specialists work with key account managers at the utility, chambers of commerce, and similar entities to alert the commercial and industrial entities in the region to the services and incentives offered by I&M. The program also focused on marketing

through monthly newsletters to customers and trade allies, maintaining the program website, conducting paid search, providing online advertising, and providing program collateral at conferences, meetings, and similar functions. I&M has entered into a partnership with Allumia, a third-party provider of Efficiency as a Service. As part of this collaboration, I&M will refer its customers to Allumia, who will cover the initial cost of implementing efficiency improvements. Allumia recoups these costs through the customer's energy savings over time.

- **Recommendation 1:** With the availability of additional outreach resources, the program should also focus on reaching mid-size and large customers that have not participated in the program or have not participated in the last few years while reaping the benefits of outreach to past participants. Findings from the non-participant survey completed in PY2021 found that two-thirds of C&I customers were unaware of I&M incentives, suggesting that there is an opportunity to educate the customer on the incentives I&M offers.

**Participant survey findings indicate that contractors are playing important roles in supporting the program.** Contractors and vendors were the most common source of program awareness among survey respondents (35% learned of the program from a trade ally, contractor, vendor, or energy consultant) and contractors assisted a majority of participants with the application.

**Participants reported a positive experience with the program.** Most participants (94%) were satisfied with the program overall and all respondents reported that the application process was somewhat or completely acceptable.



### 3. Work Custom

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This chapter presents the results of both the impact and process evaluations of the Work Custom Program that Indiana Michigan Power (I&M) offered to its non-residential customers from January 2022 through December 2022.

The objectives of the evaluation are to:

- Establish a pre-approval review procedure;
- Assess gross and net energy (kWh) savings and peak demand (kW) reductions resulting from participation in the program during the program year;
- Assess satisfaction among participating customers; and
- Provide recommendations for program improvement as appropriate.

#### 3.1. Program Description

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The Work Custom Program targets commercial and industrial accounts and provides incentives to implement efficiency measures not covered by the prescriptive program. The program provides an incentive of \$0.05 per kWh saved for lighting measures, and \$0.06 per kWh saved for non-lighting measures. The program measures include non-prescriptive lighting and HVAC, and refrigeration measures, compressed air measures, industrial process improvements, and retro-commissioning.

#### 3.2. Data Collection

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##### 3.2.1. Verification of Measures

##### 3.2.1.1. *Sampling Plan*

The sampling approach was combined for all C&I programs in 2022. The approach is described in Section 2.2.1.1 of this document on page 7.

The table below shows the number of projects, ex ante gross kWh energy savings, and sampling statistics, by stratum, of the program sample.

*Table 3-1 Population Statistics Used for Work Custom Sample Design*

<i>Variable</i>	<i>Stratum 1</i>	<i>Stratum 2</i>	<i>Stratum 3</i>	<i>Stratum 4</i>	<i>Stratum 5</i>	<i>Totals</i>
Strata boundaries (kWh)	> 600000	330000 – 600000	130000 – 330000	20000 – 130000	< 20000	
Number of projects	5	11	24	54	58	152
Total Ex Ante Annual kWh	4,387,827	4,850,478	5,166,337	2,691,015	522,741	17,618,398
Average kWh Savings	877,565	440,953	215,264	49,834	9,013	115,911
Std. dev. Of kWh savings	265,985	85,149	61,757	26,142	5,228	444,260
Coefficient of variation	0.3	0.19	0.29	0.52	0.58	
Final design sample	5	3	4	6	2	20

### 3.2.1.2. *Verification Data Collection Procedure*

The data collection procedure for the Work Custom Program was the same as the approach described in Section 2.2 of this document on page 8.

### 3.2.2. Participant Survey

The survey data collection for the Work Custom Program is described in Section 2.5.1.2 of this document on page 22.

### 3.2.3. Staff Interviews

The staff interviews completed for the Work Custom Program is described in Section 2.5.1.1 of this document on page 19.

## 3.3. Estimation of Ex Post Gross Savings

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### 3.3.1. Methodology for Estimating Ex Post Gross Savings

#### 3.3.1.1. *Review of Documentation*

The process for reviewing program documentation for the Work Custom Program was the same as the approach described in Section 2.3.1.1 of this document on page 9.

#### 3.3.1.2. *Procedures for Estimating Measure-Level Gross Energy Savings*

A breakdown of sampled measures for the Work Custom Program is below in Table 3-2.

*Table 3-2 Breakdown of Sampled Custom Measures*

<i>Measure Category</i>	<i>Ex Ante Annual kWh Savings</i>	<i>Ex Post Annual Gross kWh Savings</i>	<i>Gross Realization Rate</i>
Cold Air Weatherization	1,572,594	733,075	47%
Compressed Air Leak Audit and Repair	34,001	34,001	100%
LED Upgrade	4,952,992	4,949,195	100%
New Construction Lighting	612,219	484,247	79%
Total	7,171,806	6,200,518	86%

During PY2022, Work Custom participants completed 72 compressed air leak projects. Of these projects, 43 were below the upper energy savings boundary for stratum 5 (20,000 kWh) and only two projects (both of which were lighting) were sampled from this stratum to meet the precision requirements. The sampled compressed air project fell into stratum 4. The remaining compressed air projects were not part of the random sample.

The sampled compressed air project realization rate was 100%. In its analysis, ADM verified the completion of the project, the hours of operation, and the energy profile and operation of the on-

site air compressor. ADM referenced the UE Systems Compressed Gas Flow Rate Curves to calculate the air loss rate at each leak based on the ultrasonic decibel (dB) reading at each leak. The approach ADM used was the same as the approach used in the ex ante savings analysis.

ADM calculated a kWh energy savings gross realization rate and a peak kW reduction gross realization rate for each site in the M&V sample. Sites with relatively high or low gross realization rates were analyzed to determine the reasons for the discrepancy between ex ante and ex post energy savings. The site-level gross impact analysis results for each M&V sample site are presented in Volume II of the report. These reports outline the data sources and analytical approaches employed in the calculation of measure impacts.

### 3.3.2. Results of Ex Post Gross Savings Estimation

The kWh gross realization rate is the ratio of sampled measure ex post gross kWh energy savings to sampled measure ex ante kWh energy savings. The kW gross realization rate is the ratio of sampled measure ex post gross kW demand savings to sampled measure ex ante kW demand savings. Since a stratified sampling approach was employed for this program, stratum-level kWh and kW gross realization rates were developed for each sampling stratum.

Program-level gross ex post gross kWh energy savings are calculated as follows:

- The ex-ante kWh energy savings of non-sampled measures are factored by the applicable stratum-level kWh gross realization rates to calculate ex post gross kWh energy savings for non-sampled measures.
- The ex post gross kWh energy savings of all sampled measures and all non-sampled measures are summed.

Program-level gross ex post gross kW demand savings are calculated as follows:

- The ex-ante kW demand savings of non-sampled measures are factored by the applicable stratum-level kW gross realization rates to calculate ex post gross kW savings for non-sampled measures.
- The ex post gross kW demand savings of all sampled measures and all non-sampled measures are summed.

#### 3.3.2.1. *Ex Post Gross kWh Savings*

Table 3-3 displays the ex ante and ex post gross kWh savings of the Work Custom Program including gross realization rates for sampled projects.

*Table 3-3 Work Custom Project-Level Ex Ante and Ex Post kWh Savings*

<i>Stratum</i>	<i>Project Number</i>	<i>Measure</i>	<i>Ex Ante kWh Savings</i>	<i>Gross Ex Post kWh Savings</i>	<i>Project Gross Realization Rate</i>
1	216	LED Upgrade	1,312,492	1,312,492	100%
1	211	LED Upgrade	884,884	884,938	100%

<i>Stratum</i>	<i>Project Number</i>	<i>Measure</i>	<i>Ex Ante kWh Savings</i>	<i>Gross Ex Post kWh Savings</i>	<i>Project Gross Realization Rate</i>
1	213	Cold air weatherization	844,243	410,260	49%
1	207	Cold air weatherization	728,352	322,815	44%
1	218	New Construction Lighting	612,219	484,247	79%
2	204	LED Upgrade	504,092	504,092	100%
2	214	LED Upgrade	470,079	472,865	101%
2	203	LED Upgrade	397,939	403,800	101%
3	201	LED Upgrade	316,728	243,230	77%
3	215	LED Upgrade	291,741	294,904	101%
3	212	LED Upgrade	283,108	343,009	121%
3	210	LED Upgrade	148,846	146,248	98%
4	217	LED Upgrade	84,021	83,068	99%
4	208	LED Upgrade	80,158	73,840	92%
4	219	LED Upgrade	65,654	65,224	99%
4	209	LED Upgrade	49,087	54,325	111%
4	205	LED Upgrade	42,666	46,762	110%
4	202	Compressed air leak audit and repair	34,001	34,001	100%
5	206	LED Upgrade	16,333	15,403	94%
5	200	LED Upgrade	5,164	4,995	97%
All Non-Sample Projects			10,423,955	10,379,361	100%
Total			17,595,760	16,579,879	94%

The realization rate for two of the 20 sample sites was greater than 110%. The factors that resulted in the realization rates were idiosyncratic to the project and are summarized below.

- Project 209 had a higher realization rate for lighting. The ex post savings included the heating cooling interactive effects from the reduced lighting load in the savings calculation for the air conditioned, gas heated manufacturing facility.
- Project 212 had a higher realization rate for lighting. The ex ante savings listed an hours of use value that differed from the ex post hours of use developed through the verification activities.

Four of the 20 samples site had realization rate lower than 90%.

- Projects 207 and 213 for cold storage weatherization applied deemed savings per gap width that were based on infiltration directly from outdoor air to cold storage space, whereas the ex post analysis applied the same savings methodology, but accounting for the warehouse loading dock buffer zone installed location and site operating schedule.

- Project 218 savings calculation for new construction lighting power density applied a code-based allowed wattage to an area that was not illuminated by the installed lighting.
- Project 201 savings calculation for HVAC scheduling applied the reduced operating hours without time of day information, whereas the ex post 8,760 bin analysis considered the time of day.

*Table 3-4 Ex Post Annual Gross kWh*

<i>Ex Ante Gross kWh Savings</i>	<i>Gross Audited kWh Savings</i>	<i>Gross Verified kWh Savings</i>	<i>Ex Post Gross kWh Savings</i>	<i>Gross Realization Rate</i>
17,595,760	16,226,554	16,579,879	16,579,879	94%

### 3.3.2.2. *Ex Post Gross kW Reductions*

Table 3-5 presents the ex post peak kW reduction for the Work Custom Program during the period January 2022 through December 2022.

*Table 3-5 Ex Post Peak kW*

<i>Ex Ante Gross kW Savings</i>	<i>Gross Audited kW Savings</i>	<i>Gross Verified kW Savings</i>	<i>Ex Post Gross kW Savings</i>	<i>Gross Realization Rate</i>
2,803.61	2,704.36	2,813.07	2,813.07	100%

## 3.4. Estimation of Ex Post Net Savings

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### 3.4.1. Methodology for Estimating Ex Post Net Savings

The procedure for the estimation of program-level kWh energy savings and program-level kW demand reductions was the same as the approach described in Section 2.4.1 of this document on page 14.

### 3.4.2. Results of Ex Post Net Savings Estimation

Table 3-6 summarizes the net ex post kWh savings and the net ex post kW demand reduction of the Work Custom Program.

*Table 3-6 Ex Post Net kWh and kW Savings*

<i>Category</i>	<i>kWh</i>	<i>kW</i>
Ex Ante Gross Savings	17,595,760	2,803.61
Gross Audited Savings	16,226,554	2,704.36
Gross Verified Savings	16,579,879	2,813.07
Ex Post Gross Savings	16,579,879	2,813.07
Gross Realization Rate	94%	100%
Ex Post Free Ridership	1,835,085	700.83
Ex Post Non-Participant Spillover	-	-
Ex Post Participant Spillover	-	-
Ex Post Net Savings	14,744,794	2,112.24
Net-to-Gross Ratio	89%	75%
Ex Post Net Lifetime Savings	183,598,535	n/a

### 3.5. Process Evaluation

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Methods and findings related to the process evaluation of the Work Custom Program are presented in the Work Prescriptive Chapter in Section 2.5 on page 19.

### 3.6. Findings and Recommendations

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Applicable conclusions and recommendations are presented in Section 2.6 on page 25.

## 4. Public Efficient Streetlighting

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This chapter presents the results of the impact evaluation of the Public Efficient Streetlighting Program that Indiana Michigan Power (I&M) offered to its local government customers from January 2022 through December 2022.

The objectives of the evaluation are to:

- Assess gross and net energy (kWh) savings and peak demand (kW) reductions that resulted from participation in the program during the program year; and
- Provide recommendations for program improvement as appropriate.

### 4.1. Program Description

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To be eligible to participate in the Public Efficient Street Lighting Program, an eligible customer must convert I&M-owned street lighting systems to more efficient LED street lighting. The Program is targeted at local governments and will seek to convert street lighting to LED technology.

The incentive strategy for the program is to apply 100% of the difference between the cost of a LED streetlight and a baseline high pressure sodium equivalent streetlight. Rebates are calculated based on this cost differential and will offset I&M's capital cost of conversion (material and labor) of the LED streetlight fixture to the high-pressure sodium streetlight fixture. As LED streetlight conversions occur, where LED streetlights are placed in-service, I&M will use the rebate from the Public Efficient Street Lighting Program to offset the capital cost of conversion booked in I&M electric plant in-service streetlight accounts.

The program requires pre-approval for any street lighting projects before purchasing and installing equipment. Once applications are approved, they are sent to I&M for approval as the last step in the implementation process.

### 4.2. Data Collection

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#### 4.2.1. Verification of Measures

ADM completed a desk review of the Public Efficient Street Lighting Program for the completed projects. For the desk review, ADM reviewed the ex ante savings estimate and applied the correct baseline wattage for the fixtures, and the regional hours of use.

### 4.3. Estimation of Ex Post Gross Savings

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The procedure for the estimation of program-level gross kWh energy savings and gross kW demand reductions for the Public Efficient Street Lighting Program.

#### 4.3.1. Methodology for Estimating Ex Post Gross Savings

##### 4.3.1.1. *Review of Documentation*

The process for reviewing program M&V and due diligence procedures for the Public Efficient Street Lighting Program is the same as the approach described in Section 2.3.1.1 of this document on page 9.

##### 4.3.1.2. *Procedures for Estimating Measure-Level Gross Energy Savings*

Annual energy savings for each sampled streetlight is determined by the following formula:

$$\text{Annual Energy Savings} = \text{kWh}_{\text{baseline}} - \text{kWh}_{\text{after}}$$

The input values for this formula are determined through the following steps:

- Location-specific dusk to dawn hours (3,934).
- Factoring the dusk to dawn hours by the baseline and post-installation demand to calculate the kWh energy consumption.

#### 4.3.2. Results of Ex Post Gross Savings Estimation

##### 4.3.2.1. *Ex Post Gross kWh Savings*

The ex post annual gross kWh savings for the Public Efficient Street Lighting Program during the period January 2022 through December 2022 are presented in Table 4-1.

*Table 4-1 Ex Post Annual Gross kWh*

<i>Ex Ante Gross kWh Savings</i>	<i>Gross Audited kWh Savings</i>	<i>Gross Verified kWh Savings</i>	<i>Ex Post Gross kWh Savings</i>	<i>Gross Realization Rate</i>
5,966,485	5,966,485	5,966,485	5,966,485	100%

##### 4.3.2.2. *Ex Post Gross kW Reductions*

There are no peak kW reductions associated with the streetlighting retrofits.

#### 4.4. Estimation of Ex Post Net Savings

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##### 4.4.1. Methodology for Estimating Ex Post Net Energy Savings

The lighting replaced under the streetlighting program is owned and maintained by I&M and municipalities. Consequently, ADM assigned a net-to-gross ratio of 1.0 to the program.

##### 4.4.2. Results of Ex Post Net Savings Estimation

Table 4-2 summarizes the net ex post kWh savings and the net ex post kW demand reduction of the Public Efficient Street Lighting Program.



*Table 4-2 Ex Post Net kWh and kW Savings*

<i>Category</i>	<i>kWh</i>	<i>kW</i>
Ex Ante Gross Savings	5,966,485	-
Gross Audited Savings	5,966,485	-
Gross Verified Savings	5,966,485	-
Ex Post Gross Savings	5,966,485	-
Gross Realization Rate	100%	n/a
Ex Post Free Ridership	0	-
Ex Post Non-Participant Spillover	0	-
Ex Post Participant Spillover	0	-
Ex Post Net Savings	5,966,485	-
Net-to-Gross Ratio	100%	n/a
Ex Post Net Lifetime Savings	113,388,979	n/a

## 5. Cost Effectiveness Evaluation

The following cost effectiveness tests were performed for each program: Total Resource Cost (TRC) test, Utility Cost Test (UCT), Participant Cost Test (PCT), and Ratepayer Impact Measure (RIM) test. A score above one signifies that, from the perspective of the test, the program benefits were greater than the program costs. The benefits and costs associated with each test are defined in Table 5-1.

*Table 5-1 Summary of Benefits and Costs Included in each Cost Effectiveness Test*

Variable	Definition	PCT		UCT		RIM		TRC	
		Benefit	Cost	Benefit	Cost	Benefit	Cost	Benefit	Cost
Incentives	Incentives paid to customers.	✓			✓		✓		
Program Installation Costs	Installation costs paid by program.				✓		✓		✓
Bill Savings /Lost Revenue	Reduction in electricity costs faced by customers as a result of implementation of program measures. Equal to revenue lost to the utility.	✓					✓		
Avoided Energy Costs	Energy-related costs avoided by utility.			✓		✓		✓	
Avoided Capacity Costs	Capacity-related costs avoided by utility, including T&D.			✓		✓		✓	
Incremental Costs	Incremental costs associated with measure implementation, as compared with what would have been done in absence of program.		✓						✓
Program Overhead Costs	Program costs other than incentive or installation costs.				✓		✓		✓

### 5.1. PY2022 Cost Effectiveness Evaluation

Table 5-2 through Table 5-4 summarize key financial benefit and cost inputs for the various tests along as well as the test results for each commercial and industrial program during PY2022.

Table 5-2 Work Prescriptive Program Cost Test Inputs and Results

Variable	PCT		UCT		RIM		TRC	
	Benefit	Cost	Benefit	Cost	Benefit	Cost	Benefit	Cost
Incentives	\$ 834,861			\$ 834,861		\$ 834,861		
Program Installation Costs				\$ -		\$ -		\$ -
Bill Savings (NPV)	\$ 9,413,880							
Lost Revenue (NPV)						\$ 13,376,298		
Avoided Energy Costs (NPV)			\$ 4,394,660		\$ 4,394,660		\$ 4,394,660	
Avoided Capacity Costs (NPV)			\$ 332,077		\$ 332,077		\$ 332,077	
Avoided T&D Costs (NPV)			\$ -		\$ -		\$ -	
Incremental Costs		\$ 1,721,163						\$ 1,721,163
Program Overhead Costs				\$ 894,861		\$ 894,861		\$ 894,861
Total Benefits	\$	10,248,740	\$	4,726,738	\$	4,726,738	\$	4,726,738
Total Costs	\$	1,721,163	\$	1,729,722	\$	15,106,020	\$	2,616,024
Test Score		5.95		2.73		0.31		1.81

Table 5-3 Work Custom Program Cost Test Inputs and Results

Variable	PCT		UCT		RIM		TRC	
	Benefit	Cost	Benefit	Cost	Benefit	Cost	Benefit	Cost
Incentives	\$ 907,021			\$ 907,021		\$ 907,021		
Program Installation Costs				\$ -		\$ -		\$ -
Bill Savings (NPV)	\$ 8,649,437							
Lost Revenue (NPV)						\$ 12,127,886		
Avoided Energy Costs (NPV)			\$ 3,963,447		\$ 3,963,447		\$ 3,963,447	
Avoided Capacity Costs (NPV)			\$ 408,023		\$ 408,023		\$ 408,023	
Avoided T&D Costs (NPV)			\$ -		\$ -		\$ -	
Incremental Costs		\$ 519,705						\$ 519,705
Program Overhead Costs				\$ 1,058,042		\$ 1,058,042		\$ 1,058,042
Total Benefits	\$	9,556,458	\$	4,371,471	\$	4,371,471	\$	4,371,471
Total Costs	\$	519,705	\$	1,965,062	\$	14,092,948	\$	1,577,747
Test Score		18.39		2.22		0.31		2.77

Table 5-4 Public Efficient Streetlighting Program Cost Test Inputs and Results

Variable	PCT		UCT		RIM		TRC	
	Benefit	Cost	Benefit	Cost	Benefit	Cost	Benefit	Cost
Incentives	\$ 1,918,102			\$ 1,918,102		\$ 1,918,102		
Program Installation Costs				\$ -		\$ -		\$ -
Bill Savings (NPV)	\$ 4,242,621							
Lost Revenue (NPV)						\$ 6,620,456		
Avoided Energy Costs (NPV)			\$ 2,235,455		\$ 2,235,455		\$ 2,235,455	
Avoided Capacity Costs (NPV)			\$ -		\$ -		\$ -	
Avoided T&D Costs (NPV)			\$ -		\$ -		\$ -	
Incremental Costs		\$ 2,580,129						\$ 2,580,129
Program Overhead Costs				\$ 342,360		\$ 342,360		\$ 342,360
Total Benefits	\$	6,160,723	\$	2,235,455	\$	2,235,455	\$	2,235,455
Total Costs	\$	2,580,129	\$	2,260,462	\$	8,880,918	\$	2,922,489
Test Score		2.39		0.99		0.25		0.76

## 5.2. PY2021 – PY2022 Cost Effectiveness Evaluation

Cost effectiveness of programs across PY2021 and PY2012 was also evaluated. The test results for each program are presented in Table 5-5.

Table 5-5 Summary of PY2021 - PY2022 Benefit-Cost Ratios

Program	Program Administrator Cost Test (aka USCRT, or UCT)	Total Resource Cost Test	Ratepayer Impact Measure	Participant Cost Test
Work Prescriptive	2.16	1.46	0.31	5.26
Work Custom	1.65	1.90	0.30	12.05
Public Efficient Streetlighting	1.23	0.83	0.26	2.40
C&I Portfolio Total	1.72	1.43	0.30	5.39

Table 5-6 through Table 5-8 summarize key financial benefit and cost inputs for the various tests along as well as the test results for each commercial and industrial program during PY2021 – PY2022.

Table 5-6 PY2021 - PY2022 Work Prescriptive Program Cost Test Inputs and Results

Variable	PCT		UCT		RIM		TRC	
	Benefit	Cost	Benefit	Cost	Benefit	Cost	Benefit	Cost
Incentives	\$ 1,528,255			\$ 1,528,255		\$ 1,528,255		
Program Installation Costs				\$ -		\$ -		\$ -
Bill Savings (NPV)	\$ 15,445,842							
Lost Revenue (NPV)						\$ 21,614,863		
Avoided Energy Costs (NPV)			\$ 6,997,490		\$ 6,997,490		\$ 6,997,490	
Avoided Capacity Costs (NPV)			\$ 679,336		\$ 679,336		\$ 679,336	
Avoided T&D Costs (NPV)			\$ -		\$ -		\$ -	
Incremental Costs		\$ 3,229,533						\$ 3,229,533
Program Overhead Costs				\$ 2,022,413		\$ 2,022,413		\$ 2,022,413
Total Benefits	\$ 16,974,097		\$ 7,676,826		\$ 7,676,826		\$ 7,676,826	
Total Costs	\$ 3,229,533		\$ 3,550,669		\$ 25,165,531		\$ 5,251,946	
Test Score	5.26		2.16		0.31		1.46	

Table 5-7 PY2021 - PY2022 Work Custom Program Cost Test Inputs and Results

Variable	PCT		UCT		RIM		TRC	
	Benefit	Cost	Benefit	Cost	Benefit	Cost	Benefit	Cost
Incentives	\$ 2,192,345			\$ 2,192,345		\$ 2,192,345		
Program Installation Costs				\$ -		\$ -		\$ -
Bill Savings (NPV)	\$ 16,434,070							
Lost Revenue (NPV)						\$ 22,467,144		
Avoided Energy Costs (NPV)			\$ 7,441,020		\$ 7,441,020		\$ 7,441,020	
Avoided Capacity Costs (NPV)			\$ 840,930		\$ 840,930		\$ 840,930	
Avoided T&D Costs (NPV)			\$ -		\$ -		\$ -	
Incremental Costs		\$ 1,545,237						\$ 1,545,237
Program Overhead Costs				\$ 2,814,666		\$ 2,814,666		\$ 2,814,666
Total Benefits	\$ 18,626,414		\$ 8,281,950		\$ 8,281,950		\$ 8,281,950	
Total Costs	\$ 1,545,237		\$ 5,007,010		\$ 27,474,154		\$ 4,359,903	
Test Score	12.05		1.65		0.30		1.90	

Table 5-8 PY2021 - PY2022 Public Efficient Streetlighting Program Cost Test Inputs and Results

Variable	PCT		UCT		RIM		TRC	
	Benefit	Cost	Benefit	Cost	Benefit	Cost	Benefit	Cost
Incentives	\$ 2,083,946			\$ 2,083,946		\$ 2,083,946		
Program Installation Costs				\$ -		\$ -		\$ -
Bill Savings (NPV)	\$ 5,829,529							
Lost Revenue (NPV)						\$ 9,091,842		
Avoided Energy Costs (NPV)			\$ 3,049,085		\$ 3,049,085		\$ 3,049,085	
Avoided Capacity Costs (NPV)			\$ -		\$ -		\$ -	
Avoided T&D Costs (NPV)			\$ -		\$ -		\$ -	
Incremental Costs		\$ 3,304,141						\$ 3,304,141
Program Overhead Costs				\$ 391,514		\$ 391,514		\$ 391,514
Total Benefits	\$ 7,913,475		\$ 3,049,085		\$ 3,049,085		\$ 3,049,085	
Total Costs	\$ 3,304,141		\$ 2,475,460		\$ 11,567,303		\$ 3,695,655	
Test Score	2.40		1.23		0.26		0.83	