EVALUATION OF THE PROGRAM YEAR ELEVEN ENTERGY NEW ORLEANS ENERGY SMART PROGRAMS

SUBMITTED TO: ENTERGY NEW ORLEANS

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ACRONYMS/ABBREVIATIONS

TABLE A-01 ACRONYMS/ABBREVIATIONS

Acronym	Term
AC	Air Conditioner
AOH	Annual operating hours
APS	Advanced Power Strip
AR&R	Appliance Recycling & Replacement
BP	Behavioral Program
BYOT	Bring Your Own Thermostat
C&I	Commercial and Industrial
CEE	Consortium for Energy Efficiency
CF	Coincidence factor
CFL	Compact fluorescent lamp (bulb)
CFM	Cubic feet per minute
CRE	Commercial Real Estate
DI	Direct install
DLC	Direct Load Control
DLC	Design Lights Consortium
EER	Energy efficiency ratio
EFLH	Equivalent full-load hours
EISA	Energy Independence and Security Act
EL	Efficiency loss
EM&V	Evaluation, Measurement, and Verification
ES	ENERGY STAR®
EUL	Estimated Useful Life
GPM	Gallons per minute
HDD	Heating degree days
HID	High intensity discharge
HOU	Hours of Use
HP	Heat pump
HPwES	Home Performance with ENERGY STAR®
HSPF	Heating seasonal performance factor
HVAC	Heating, Ventilation, and Air Conditioning
IEER	Integrated Energy Efficiency Ratio
IEF	Interactive Effects Factor
IPLV	Integrated part load value
IQW	Income Qualified Weatherization
ISR	In-Service Rate
kW	Kilowatt

Acronym	Term
kWh	Kilowatt-hour
LCDR	Large Commercial Demand Response
LCIS	Large Commercial & Industrial Solutions
LCA	Lifecycle Cost Adjustment
LED	Light Emitting Diode
M&V	Measurement and Verification
MFS	Multifamily Solutions
MW	Megawatt
MWh	Megawatt-hour
NC	New Construction
NTG	Net-to-Gross
PCT	Participant Cost Test
PFI	Publicly Funded Institutions
PY	Program Year
QA	Quality Assurance
QC	Quality Control
RCA	Refrigerant charge adjustment
RIM	Ratepayer Impact Measure
RLA	Retail Lighting and Appliances
ROB	Replace on Burnout
RR	Realization Rate
RUL	Remaining Useful Life
SCDR	Small Commercial Demand Response
SCIS	Small Commercial & Industrial Solutions
SEER	Seasonal Energy Efficiency Ratio
SK&E	School Kits and Education
TA	Trade Ally
TRC	Total Resource Cost Test
TRM	Technical Reference Manual
UCT	Utility Cost Test
VFD	Variable Frequency Drive

SAVINGS TYPES

TABLE A-02 SAVINGS TYPES

Savings Types	Definition
Energy Savings (kWh)	The change in energy (kWh) consumption that results directly from program-related actions taken by participants in a program.
Demand Reductions (kW)	The time rate of energy flow. Demand usually refers to electric power measured in kW (equals kWh/h) but can also refer to natural gas, usually as Btu/hr., kBtu/hr., therms/day, etc.
Expected / *Ex ante* Gross	The change in energy consumption and/or peak demand that results directly from program-related actions taken by participants in a program, regardless of why they participated.
Verified / *Ex post* Gross	Latin for "from something done afterward" gross savings. The energy and peak demand savings estimates reported by the evaluators after the gross impact evaluation and associated M&V efforts have been completed.
Net / *Ex post* Net	Verified / *ex post* gross savings multiplied by the net-to-gross (NTG) ratio. Changes in energy use that are attributable to a particular program. These changes may implicitly or explicitly include the effects of free-ridership, spillover, and induced market effects.
Annual Savings	Energy and demand savings expressed on an annual basis, or the amount of energy and/or peak demand a measure or program can be expected to save over the course of a typical year. The TRM provides algorithms and assumptions to calculate annual savings and are based on the sum of the annual savings estimates of installed measures or behavior change.
Lifetime Savings	Energy savings expressed in terms of the total expected savings over the useful life of the measure. Typically calculated by multiplying the annual savings of a measure by its EUL. The TRC Test uses savings from the full lifetime of a measure to calculate the cost-effectiveness of programs.

1 EXECUTIVE SUMMARY

1.1 Overview

This report provides a summary of the evaluation effort of the 2021 ("Program Year 11" or "PY11") Energy Efficiency (EE) and Demand Response (DR) portfolio by Energy New Orleans (ENO). The Energy Smart Programs are administered between January 01, 2021, and December 31, 2021. The evaluation was led by ADM Associates Inc. (herein known as "ADM", or "the Evaluators").

1.2 Evaluation Objectives

The following activities were performed through the PY11 EM&V effort:

- Verify program tracking data and correctly apply the New Orleans Technical Reference Manual Version 4.0 (NO TRM V4.0) to calculate savings and estimate program year 11 (PY11) gross and net energy and demand impacts at the high impact measure, program, and portfolio levels.
- Adjust program-reported gross savings using the results of evaluation research, relying primarily on tracking system and engineering desk reviews, metered data analysis, on-site verification, and equipment metering and achieve a minimum precision of ±10% of the gross realized savings estimate with 90% confidence;
- In consultation with the Advisors, estimate net-to-gross (NTG) values, which was performed following the NO TRM V4.0 and provide complete documentation and transparency of all evaluated savings estimates, and where relevant, compare with TRM calculations, as recommended;
- Provide ongoing technical reviews and guidance to implementers and ENO throughout the evaluation cycle and review tracking system data to assess data captured for new measure offerings following TRM protocols;
- Conduct EM&V research to support possible updates for the next version of the TRM, which may include information on commercial and residential envelope measures, business type lighting hours of use, and persistence of behavioral savings; and
- Complete a full process evaluation of the commercial and industrial (C&I) efficiency programs and no process evaluation of the residential programs and behavioral programs.

1.3 Energy Smart Portfolio Overview

In PY11, the ENO Energy Smart portfolio included the following programs. The table below shows each programs' sector, type and who implemented the program for ENO.

TABLE 1-1 PY11 ENERGY SMART PORTFOLIO OF PROGRAMS

Program Name	Sector	Type	Implementor
Home Performance with ENERGY STAR®	Residential	EE	Franklin
Income Qualified Weatherization	Residential	EE	Franklin
Multifamily Solutions	Residential	EE	Franklin
A/C Solutions	Residential	EE	Franklin
Retail Lighting and Appliances	Residential	EE	Franklin/Green Light
School Kits and Education	Residential	EE	Energy Wise Alliance
Appliance Recycling & Replacement Pilot	Residential	EE	Legacy Professional Services
Behavioral	Residential	Behavioral	Franklin
Rewards	Residential	Behavioral	Franklin
EasyCool - Direct Load Control (DLC)	Residential	DLC/DR	Franklin
EasyCool - Bring Your Own Thermostat	Residential	DLC/DR	Energyhub
Small C&I Solutions	C&I	EE	Aptim
Large C&I Solutions	C&I	EE	Aptim
Publicly Funded Institutions	C&I	EE	Aptim
C&I Construction Solutions	C&I	EE	Aptim
Large C&I Demand Response	C&I	DLC/DR	Honeywell
EasyCool for Business	C&I	DLC/DR	Franklin

In PY11, ENO offered a portfolio of 17 programs; two behavioral, four demand responses (DR) or direct load control (DLC), and eleven energy efficiency programs which provided a comprehensive range of customer options focused on energy efficiency, demand reduction, and educational options.

ENO designed its programs to achieve the following objectives:

- PY11 *ex post* gross energy savings (kWh) goal of 87,511,515 kWh and a demand reduction (kW) target of 19,408 kW;[1]
- Significant energy-savings opportunities for all customers and market segments; and
- Broad ratepayer benefits.

The Evaluators calculated the results for PY11 for each C&I and residential program. Those programs are described below.[2]

- **Home Performance with ENERGY STAR® (HPwES):** This offering will achieve long-term, significantly cost-effective electric savings using local auditors and trade allies who will help residential customers analyze their energy use and identify opportunities to improve efficiency, install low-cost energy-saving measures, and identify and implement more comprehensive home efficiency projects. HPwES will offer three levels of home energy audits.

[1] These goals represent first-year energy and demand savings at the meter.

[2] The program descriptions below align with the ENO Application for Approval of the Implementation Plan for PY10 through PY12 of the Energy Smart Program. Filed December 09, 2019, in Docket UD-17-03.

The Assessment will include a "walk-through" inspection and direct installation of low-cost measures, such as LEDs and water conservation measures. To generate additional savings at the time of the audit, demand response enabled smart thermostats to have been added as a direct install measure.

- **Retail Lighting and Appliances (RLA):** The objective of this offering is to increase the awareness and sales of efficient lighting and appliances to ENO's residential population. The offering will provide customers the opportunity to purchase a variety of discounted products that are ENERGY STAR qualified or better. The two main program activities include (1) retailer recruitment and merchandizing and 2) administration of the incentive process (including program tracking).
- **Multifamily Solutions:** This offering targets multifamily property owners (landlords) and managers, as well as apartment and condo renters. The offering will address these customers' unique needs through a combination of incentives for both direct install and prescriptive measures, and through property owner and tenant education.
- **Income Qualified Weatherization (IQW):** This offering is designed to offer qualifying customers free energy efficiency projects ranging from direct install measures, such as LED bulbs and water savings measures, to demand response enabled smart thermostats and comprehensive envelope measures.
- **A/C Solutions:** This offering will provide residential customers with a more comprehensive set of options to lower the energy consumption and cost associated with keeping their homes cool and comfortable in the summer. Customers with functioning ACs can improve the efficiency of their units with the help of a comprehensive AC tune-up or replacement. The offering will also include DR-enabled smart thermostats. The program will build capacity within the territory's HVAC trade ally network to provide value-added services to its customers.
  These services are eligible to be incentivized because they go above and beyond the standard industry practices and offerings in the marketplace.
- **School Kits and Education (SK&E):** This offering will continue to target middle school students in the New Orleans area. The program will work with local schools to enhance energy efficiency lessons and provide students with energy efficiency kits that they will install in their homes. The School Kit & Education offering will continue to provide the students with kits containing energy efficient items and the students will be able to use these items in their homes and track their energy savings.
- **Appliance Recycling and Replacement (AR&R Pilot):** Starting in PY11, this offering will encourage early recycling of low efficiency appliances, such as refrigerators and freezers, for residential customers. The Pilot will also offer a refrigerator replacement option for income-qualified residential customers. This new offering will go beyond federal recycling requirements using environmentally friendly best practices for recycling all components of each appliance.

- **Behavioral:** The program will work with ENO's new Customer Engagement Platform (CEP) to offer a behavioral program to ENO's residential customers. Through the CEP, residential customers will receive a monthly Home Utility Report that compares them to similar and efficient households, shows their usage over time, provides tips for saving energy, rewards for taking actions and directs them to other program offerings.
- **Rewards:** This offering is designed to drive engagement in the Behavioral program. It includes a dedicated budget that will be leveraged to reward Behavioral program participants with incentives or prizes for participation.
- **EasyCool – Direct Load control (DLC):** This offering is designed to manage peak load capacity for ENO through the utilization of a digital cycling unit (DCU) which will control the operation of air conditioning compressors on conventional residential split systems, package units and heat pumps. DCU controls will be activated on the hottest summer days when many customers are running their air conditioners frequently and on high settings. The DCU receives a radio frequency (RF) paging signal from the utility and cycles the appliance on and off for defined intervals as directed. The program is strictly voluntary and only qualifying property owners can participate.
- **EasyCool – Bring Your Own thermostat (BYOT):** This offering, in which residential customers purchase and install qualifying connected thermostats from device manufacturers on their own, voluntarily enroll those devices in the offering. This offering will leverage EnergyHub's Mercury Distributed Energy Resource Management System ("DERMS"), which enables enrollment, monitoring, and load control of connected devices from the leading thermostat manufacturers and connected-home security providers.

  The BYOT and EasyCool switch program will coordinate marketing activities and DR dispatch of the DLC switch population alongside recruitment and DR dispatch for the program.
- **Small C&I Solutions:** This offering will provide small businesses (100 kW demand or less) and other qualified non-residential customers the opportunity to achieve electricity savings through strategies designed specifically for this sector. This offering will help small business customers analyze facility energy use and identify energy efficiency improvement projects.
- **Large C&I Solutions:** The primary objective of this offering is to provide a solution for larger (greater than 100 kW demand) non-residential customers interested in energy efficiency through a prescriptive or custom approach. The Large C&I offering is designed to generate significant energy savings, as well as a longer-term market penetration by nurturing delivery channels, such as design professionals, distributors, trade allies, and Energy Service Companies (ESCOs).
- **Publicly Funded Institutions (PFI):** This offering is targeted at local publicly funded institutions. The offering will assist end use customers in overcoming barriers that are specific to publicly funded groups. Through hands-on expertise and consulting, the program benchmarks the institution's energy use and identifies a roadmap to success. Customers will be given guidance throughout their engagement with the program.

- **C&I Construction Solutions (C&I NC):** This offering will encourage customers to design and construct higher efficiency facilities than required by building codes or planned designs. This offering will be available to ground-up construction, additions, or expansions, building repurposing and commercial building restorations. The new construction offering will provide incentives for design assistance, prescriptive measures, and custom upgrades tailored to the customer's building operations.
- **Large C&I DR:** This offering will be implemented by Honeywell. The objective of the program is to secure curtailable capacity from large C&I facilities. Honeywell, in coordination with ENO, will recruit, enroll, conduct DR Surveys, and install control equipment at customer sites to provide a turn-key solution for ENO Commercial customers. Specific load control shed measures are tailored to the individual customer facility and their operations.
- **EasyCool for Business:** This offering will provide the opportunity for ENOs' small business customers to assist ENO with its broader load curtailment strategy. Under a BYOT framework, small businesses will be able to participate by installing a qualifying connected thermostat (or enlisting a trade ally for professional installation), and then enrolling in the program through the web based Mercury DERMS platform. Peak demand events will take place on days when heating or cooling needs may strain ENO's generating and transmission capacity. Through Mercury, peak events called by ENO will trigger minor thermostat set-back adjustments among the population of enrolled small businesses.

Through its portfolio, ENO also seeks to provide customers with easy program entry points, flexible options for saving energy and ongoing support for those who want to pursue deeper energy savings (kWh) or demand reduction (kW). The table below shows a list of the programs with their PY11 *ex post* gross goal.

TABLE 1-2 ENERGY SAVINGS (KWH) GOALS AND DEMAND REDUCTION (KW) TARGETS BY PROGRAM

Program	*Ex post* Gross Energy Savings (kWh)	*Ex post* Gross Energy Savings (kWh) Goal	% of kWh Goal	*Ex post* Gross Demand Reductions (kW)	*Ex post* Gross Demand Reductions (kW) Target	% of kW Target
HPwES	4,224,567	4,027,638	105%	619.77	1,228.69	50%
RLA	15,537,114	7,384,715	210%	2,293.12	1,062.27	216%
Multifamily Solutions	1,291,009	1,289,414	100%	354.10	349.05	101%
IQW	3,052,682	1,669,023	183%	2,880.94	575.50	501%
A/C Solutions	975,031	2,388,674	41%	392.82	687.42	57%
SK&E	811,149	681,132	119%	116.58	80.91	144%
AR&R Pilot	67,284	1,481,900	5%	8.59	181.90	5%
Behavioral	4,576,399	21,700,000	21%	750.20	0.00	N/A
Rewards	0	0	N/A	0.00	0.00	N/A
EasyCool - DLC	0	0	N/A	859.78	622.60	138%
EasyCool - BYOT	0	0	N/A	1,295.85	2,871.00	45%
Small C&I Solutions	1,886,054	8,120,295	23%	442.09	1,715.89	26%
Large C&I Solutions	28,625,263	33,169,760	86%	5,283.34	4,833.95	109%
PFI	4,012,002	3,385,031	119%	123.27	445.06	28%
C&I NC	0	2,213,933	0%	0.00	434.89	0%
Large C&I DR	4,029	0	N/A	446.84	3,918.00	11%
EasyCool for Business	0	0	N/A	34.42	400.50	9%
Total	**65,062,584**	**87,511,515**	**74%**	**15,901.70**	**19,407.63**	**82%**

Sums may differ due to rounding.

1.4 The COVID-19 Pandemic

PY11 primary data collection efforts were restricted due to the COVID-19 pandemic.[3]

The Evaluators were able to perform commercial and industrial (C&I) site visits for PY11 projects/installations; however, the sample was abbreviated and reduced to what was deemed necessary. Additionally, the Evaluators limited field data collection in instances where data was available from the program implementation trade ally's end-use metering or where impacts were analyzable via Option C and Option D analyses.

Residential projects did not receive site visits or participant surveys[4] in PY11. The Evaluators examined past site visit data and estimated measure-level verification rates. However, in support of the PY12 evaluation, the Evaluators will be performing site visits, pending any unexpected rise in cases.

[3] Hurricane Ida, a Category 4 storm that took place in August of 2021, was a secondary driver for restricting site visits. This storm also impacted program performance and introduced an incentive campaign to aid in recovery.

[4] A general population survey is underway, which represents phase one of a residential appliance saturation study (RASS).

1.5 Sections of the Report

This report is structured as shown below:[5]

- Section 1 Executive Summary;
- Section 2 Evaluation Findings;
- Section 3 Evaluation Methodology;
- Section 4 Home Performance with ENERGY STAR (HPwES) Program;
- Section 5 Income-Qualified Weatherization (IQW) Program;
- Section 6 Retail Lighting and Appliances (RLA) Program;
- Section 7 Multifamily Solutions Program;
- Section 8 A/C Solutions Program;
- Section 9 School Kits and Education (SK&E) Program;
- Section 10 Appliance Recycling & Replacement (AR&R) Pilot Program;
- Section 11 Behavioral Program;
- Section 12 EasyCool - Direct Load Control (DLC) Program;
- Section 13 EasyCool - Bring Your Own Thermostat (BYOT) Program;
- Section 14 Small Commercial & Industrial Solutions (Small C&I Solutions) Program;
- Section 15 Large Commercial and Industrial Solutions (Large C&I Solutions) Program;
- Section 16 Publicly Funded Institutions (PFI) Program;
- Section 17 Commercial & Industrial Construction Solutions (C&I NC) Program;
- Section 18 Large Commercial & Industrial Demand Response (Large C&I DR) Program;
- Section 19 EasyCool for Business Program;
- Appendix A – Commercial Site Reports;
- Appendix B – Cost Benefit Testing; and
- Appendix C – Behavioral Program Evaluation Results.

[5] The PY11 EM&V Report does not include individual chapters for Rewards or C&I NC programs due to a lack of program activity. These programs are listed in initial chapters to account for their inclusion in planning documents, incentive spend and the impact on cost effectiveness results. For example, there was a small incentive expenditure in PY11 for the Rewards Pilot ($235), but no savings or verified participation.

2 EVALUATION FINDINGS

The following subsections provide a summary of the portfolio-level findings and any cross-cutting evaluation activities that occurred over the course of the PY11 EM&V effort. Specifically, this includes:

- A summary of EM&V activities and expenditures in PY11;
- A summary of program and portfolio performance in PY11; and
- High-level findings that cut across programs.

2.1 Summary of Evaluation Effort

The table below summarizes the total EM&V expenditures and total program expenditures.

TABLE 2-1 PORTFOLIO EM&V EXPENDITURES

Total PY11 EM&V Expenditures	Total PY11 Program Expenditures	EM&V as % of Expenditures
$750,047	$15,892,097	4.7%

Sums may differ due to rounding.

To facilitate a thorough evaluation, the Evaluators conducted several primary research and data collection activities, including interviews with program and implementer staff, customer surveys, and market actor interviews. The Evaluators conducted participant surveys for programs using the collected self-reported data to inform NTG calculations for those programs. The results of these analyses informed our calculation of NTG values.

The Evaluators followed the NO TRM V4.0 in designing both the focus and level of effort for each process evaluation. For all programs, the Evaluators performed telephone discussions with the primary program staff and the primary implementation staff for most programs.

2.1.1 SUMMARY OF DATA COLLECTION

The Evaluators completed surveys with customers and active trade allies as part of the PY11 evaluation to collect information for use in verifying participation, assessing net savings, assessing the customer experience and satisfaction with programs, and levels of program awareness.

TABLE 2-2 SUMMARY OF PROCESS PRIMARY DATA COLLECTION

Survey Group	Mode	Survey Time Frame	Number of Contacts*	Number of Completions
Small C&I Solutions Participants	Online/Phone	November - January	59	7
Online Marketplace Participants	Online		111	27
Large C&I Solutions Participants	Online/Phone		63	17
Publicly Funded Institutions	Online/Phone		5	2
Small C&I Business Kits (retail)	Online/Phone		175	12
Small C&I Business Kits (office)	Online/Phone		121	5
Small C&I Business Kits (restaurant)	Online/Phone		142	7
Commercial Trade Allies	Online/Phone	November	49	15
Total			**725**	**92**

Staff interviews with program staff provided insight into program management and operations. Interviews were completed with eight ENO and implementation staff.

The table below shows the number of site visits and desk reviews performed. Site visits were performed in the C&I sector in PY11. There were no residential site visits in PY11.

TABLE 2-3 SUMMARY OF IMPACT PRIMARY DATA COLLECTION

Program	Project Desk Reviews	Site Visits	# Surveys	# Staff Interviews	# Trade Ally Interviews
HPwES	Census	No residential site visits due to the COVID-19 pandemic.	No residential participant surveys; RASS in-progress (750#), phase I of II.	0	No trade ally interviews due to limited approach for this sector in PY11
RLA					
Multifamily Solutions					
IQW					
A/C Solutions					
SK&E					
AR&R Pilot					
Behavioral		N/A	0	1	N/A
Rewards					
EasyCool - DLC				0	
EasyCool - BYOT					
Small C&I Solutions	25	2	7	2	11
Large C&I Solutions	48	1	17	2	
PFI	10	0	2	2	
C&I NC	0	0	0	0	0
Large C&I DR	Census	0	0	1	N/A
EasyCool for Business		0	0	0	

The table below outlines the scale of staff interviews in PY11.

TABLE 2-4 SUMMARY OF STAFF INTERVIEWS

Programs	Organization	Interviewed Staff Roles	# Staff Interviewed
Behavioral	Implementation Trade ally	Program Director, Project Manager, Technical Manager, and Director of Operations	4
Portfolio		Lead Energy Engineer	1
C&I Programs	ENO/ Implementation Trade ally	Program Director, Senior Energy Engineer, Energy Efficiency Project Manager, and Program Manager	4
Large C&I DR	Implementation Trade ally	Program Manager, Energy Products Manager	2
Total			**10**

2.1.1.1 Low Response Rates

The number of surveys completed was somewhat small relative to the total number of unique contacts in some cases. For the efficiency kits, the number of surveys completed was small because of a low response rate (i.e., less than 10%). The response rate was low because the contact information we had for the kits was incomplete in many cases or incorrect. For the incentive programs, the primary driver for the small number of surveys completed relative to the size of the population was the timing of project completion. In PY11, the programs were experiencing low participation rates, most likely due to the COVID-19 pandemic, supply shortages and associated economic inputs. After the extensive damage from Hurricane Ida, ENO and their implementers created an incentive bonus to help drive repairs and economic regrowth in the area. Participation in the incentive programs increased significantly after the introduction of the incentive bonus. Because these additional projects were only reflected in the final data and not in previous datasets, that is provided, after data collection activities were complete, these additional participants were not included in our survey or site visit efforts.

The table below outlines survey timing and results. Additionally, information on incentives provided to survey participants.

TABLE 2-5 SURVEY RESPONSE INFORMATION

Program	Mode	Time Frame	Unique Contacts	# Contacted by Email	# Contacted by Phone	# Complete	Incentives Paid ($)
Large C&I Solutions	Online/ Phone	Nov. – Jan.	58	63	24	17	$300
Small C&I Solutions	Online/ Phone	Nov. – Jan.	51	59	20	7	$200
PFI	Online/ Phone	Nov. – Jan.	7	5	0	2	$50
Kits (Retail)	Online/ Phone	Nov. – Jan.	230	175	76	12	$50
Kits (Restaurant)	Online/ Phone	Nov. – Jan.	187	142	64	7	$125
Kits (Office)	Online/ Phone	Nov. – Jan.	172	121	55	5	$75
OLM	Online	Nov. – Jan.	127	111	0	27	$175

2.1.2 IMPACT EVALUATION FINDINGS

ENO's portfolio achieved 74% of planned *ex post* gross energy (kWh) savings and 82% of planned *ex post* gross demand reduction (kW). In addition to verifying the savings reported by ENO, the Evaluators calculated lifetime impacts. As part of this process, in the body of the report we refer to the impacts (energy savings (kWh) or peak demand reduction (kW)) accrued during the program year being evaluated (PY11) as "first year" impacts.

The tables below show the ENO goals, first year *ex ante* gross energy savings (kWh) (66,111,048 kWh) and *ex ante* gross demand reductions (14,191.39 kW), gross realization rates (98% for kWh, 112% for kW), net impacts (54,521,872 kWh and 14,491.14 kW), net-to-gross (NTG) ratios, and *ex post* gross (892,226,929 kWh) and net (731,843,606 kWh) lifetime impacts.[6] The levelized cost of energy savings (kWh) for the PY11 portfolio is $0.027 ($/kWh).

The figure below summarizes energy savings (kWh) for each program in the portfolio in order of size. The Rewards and C&I NC programs are excluded as they did not claim savings in PY11.

[6] Lifetime impacts are the sum of energy savings over the course of the measure's effective useful life (EUL) and the weighted average demand reduction across the lifetime of the measure divided by the EUL (in years).

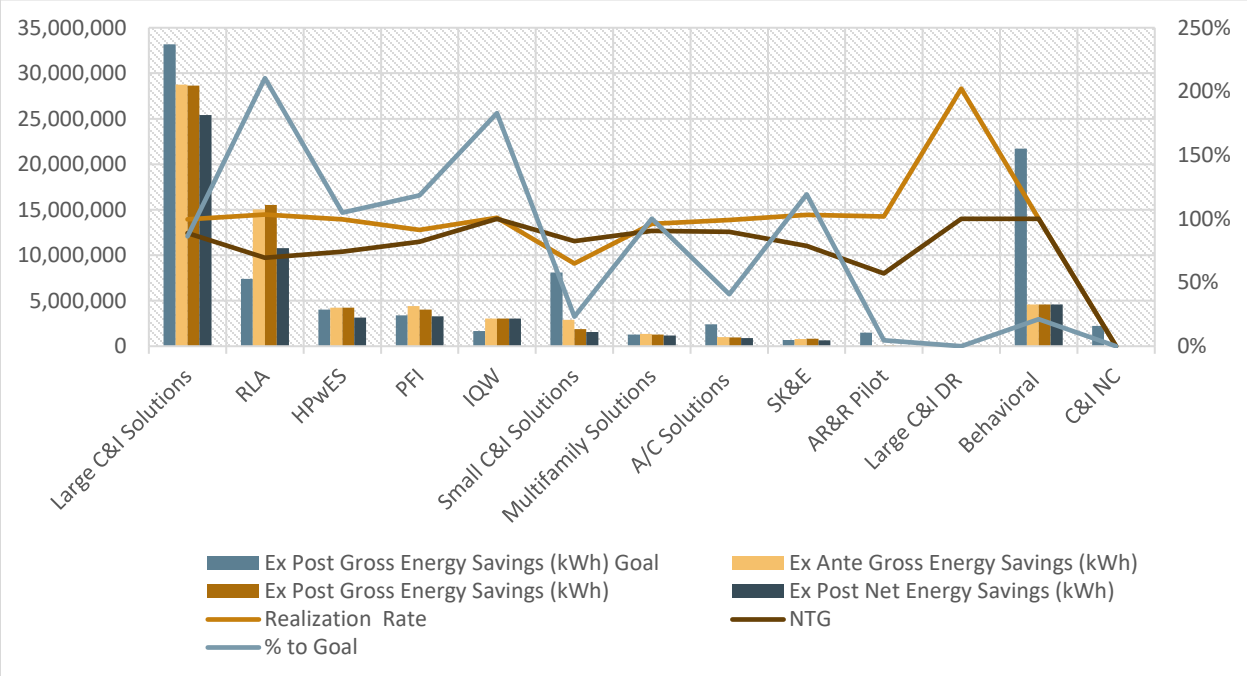


FIGURE 2-1 ENERGY SAVINGS (KWH) SUMMARY BY PROGRAM

TABLE 2-6 PORTFOLIO ENERGY SAVINGS (KWH) RESULTS

Program	*Ex post* Gross Energy Savings (kWh) Goal	*Ex ante* Gross Energy Savings (kWh)	*Ex post* Gross Energy Savings (kWh)	*Ex post* Net Energy Savings (kWh)	RR	NTG	% to Goal
HPwES	4,027,638	4,244,792	4,224,567	3,136,976	100%	74%	105%
RLA	7,384,715	15,021,255	15,537,114	10,775,926	103%	69%	210%
Multifamily Solutions	1,289,414	1,343,807	1,291,009	1,167,364	96%	90%	100%
IQW	1,669,023	3,026,233	3,052,682	3,052,682	101%	100%	183%
A/C Solutions	2,388,674	984,427	975,031	876,553	99%	90%	41%
SK&E	681,132	786,200	811,149	637,991	103%	79%	119%
AR&R Pilot	1,481,900	66,080	67,284	38,406	102%	57%	5%
Behavioral	21,700,000	21,700,000	4,576,399	4,576,399	21%	100%	21%
Rewards	0	0	0	0	N/A	N/A	N/A
EasyCool - DLC	0	0	0	0	N/A	N/A	N/A
EasyCool - BYOT	0	0	0	0	N/A	N/A	N/A
Small C&I Solutions	8,120,295	2,909,328	1,886,054	1,555,227	65%	82%	23%
Large C&I Solutions	33,169,760	28,750,741	28,625,263	25,408,556	100%	89%	86%
PFI	3,385,031	4,399,794	4,012,002	3,291,763	91%	82%	119%
C&I NC	2,213,933	0	0	0	N/A	N/A	0%
Large C&I DR	0	1,993	4,029	4,029	202%	100%	N/A
EasyCool for Business	0	0	0	0	N/A	N/A	N/A
Total	**87,511,515**	**83,234,649**	**65,062,584**	**54,521,872**	**78%**	**84%**	**74%**

Sums may differ due to rounding.

TABLE 2-7 PORTFOLIO DEMAND REDUCTIONS (KW) RESULTS

Program	*Ex post* Gross Demand Reductions (kW) Target	*Ex ante* Gross Demand Reductions (kW)	*Ex post* Gross Demand Reductions (kW)	*Ex post* Net Demand Reductions (kW)	RR	NTG	% to Target
HPwES	1,228.69	630.57	619.77	564.73	98%	91%	50%
RLA	1,062.27	2,195.91	2,293.12	1,569.25	104%	68%	216%
Multifamily Solutions	349.05	359.25	354.10	320.59	99%	91%	101%
IQW	575.50	2,837.99	2,880.94	2,880.94	102%	100%	501%
A/C Solutions	687.42	396.34	392.82	353.15	99%	90%	57%
SK&E	80.91	111.96	116.58	91.69	104%	79%	144%
AR&R Pilot	181.90	2.48	8.59	4.90	346%	57%	5%
Behavioral	0.00	0.00	750.20	750.20	N/A	100%	N/A
Rewards	0.00	0.00	0.00	0.00	N/A	N/A	N/A
EasyCool - DLC	622.60	0.00	859.78	859.78	N/A	100%	138%
EasyCool - BYOT	2,871.00	0.00	1,295.85	1,295.85	N/A	100%	45%
Small C&I Solutions	1,715.89	635.07	442.09	379.63	70%	86%	26%
Large C&I Solutions	4,833.95	6,427.87	5,283.34	4,817.22	82%	91%	109%
PFI	445.06	134.83	123.27	121.95	91%	99%	28%
C&I NC	434.89	0.00	0.00	0.00	N/A	N/A	0%
Large C&I DR	3,918.00	459.11	446.84	446.84	97%	100%	11%
EasyCool for Business	400.50	0.00	34.42	34.42	N/A	100%	9%
Total	**19,407.63**	**14,191.39**	**15,901.70**	**14,491.14**	**112%**	**91%**	**82%**

Sums may differ due to rounding.

TABLE 2-8 PORTFOLIO LIFETIME ENERGY SAVINGS (KWH) RESULTS

Program	*Ex post* Gross Energy Savings (kWh)	*Ex post* Net Energy Savings (kWh)	EUL	*Ex post* Gross Lifetime Energy Savings (kWh)	*Ex post* Net Lifetime Energy Savings (kWh)
HPwES	4,224,567	3,136,976	18	75,167,146	55,090,291
RLA	15,537,114	10,775,926	17	270,161,643	182,078,794
Multifamily Solutions	1,291,009	1,167,364	17	21,801,984	19,675,129
IQW	3,052,682	3,052,682	17	51,618,168	51,618,168
A/C Solutions	975,031	876,553	12	11,309,097	10,166,878
SK&E	811,149	637,991	14	11,653,422	9,165,735
AR&R Pilot	67,284	38,406	17	1,137,214	648,945
Behavioral	4,576,399	4,576,399	1	4,576,399	4,576,399
Rewards	0	0	N/A	0	0
EasyCool - DLC	0	0	N/A	0	0
EasyCool - BYOT	0	0	N/A	0	0
Small C&I Solutions	1,886,054	1,555,227	12	23,298,155	19,820,053
Large C&I Solutions	28,625,263	25,408,556	13	380,923,763	344,725,092
PFI	4,012,002	3,291,763	10	40,575,909	34,274,092
C&I NC	0	0	N/A	0	0
Large C&I DR	4,029	4,029	1	4,029	4,029
EasyCool for Business	0	0	N/A	0	0
Total	**65,062,584**	**54,521,872**	**14**	**892,226,929**	**731,843,606**

Sums may differ due to rounding.

The contribution to portfolio energy savings (kWh) and demand reduction (kW) by program is summarized in the figure below.

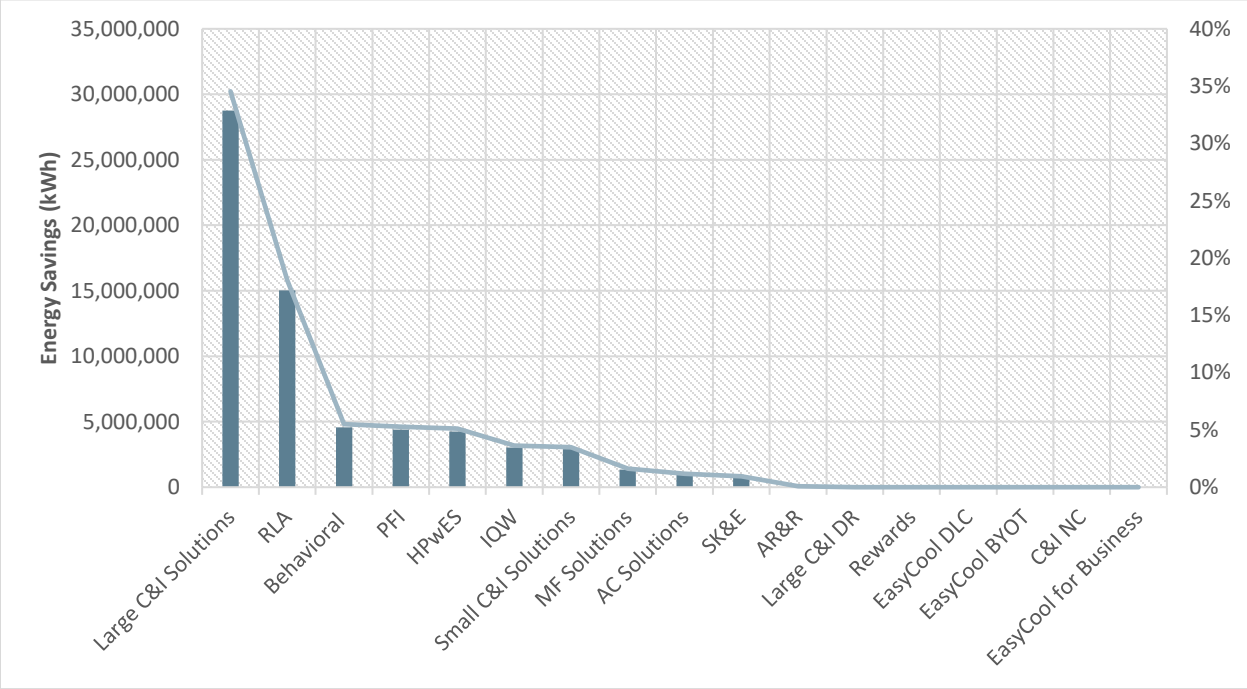


FIGURE 2-2 CONTRIBUTION TO *EX ANTE* KWH SAVING BY PROGRAM

The figures below represent the contribution of *ex ante* gross energy savings (kWh), by end use and sector, in the PY11 portfolio. Figure 2-2 summarizes the contributions to the C&I sector and Figure 2-3 summarizes the contributions to the residential sector.

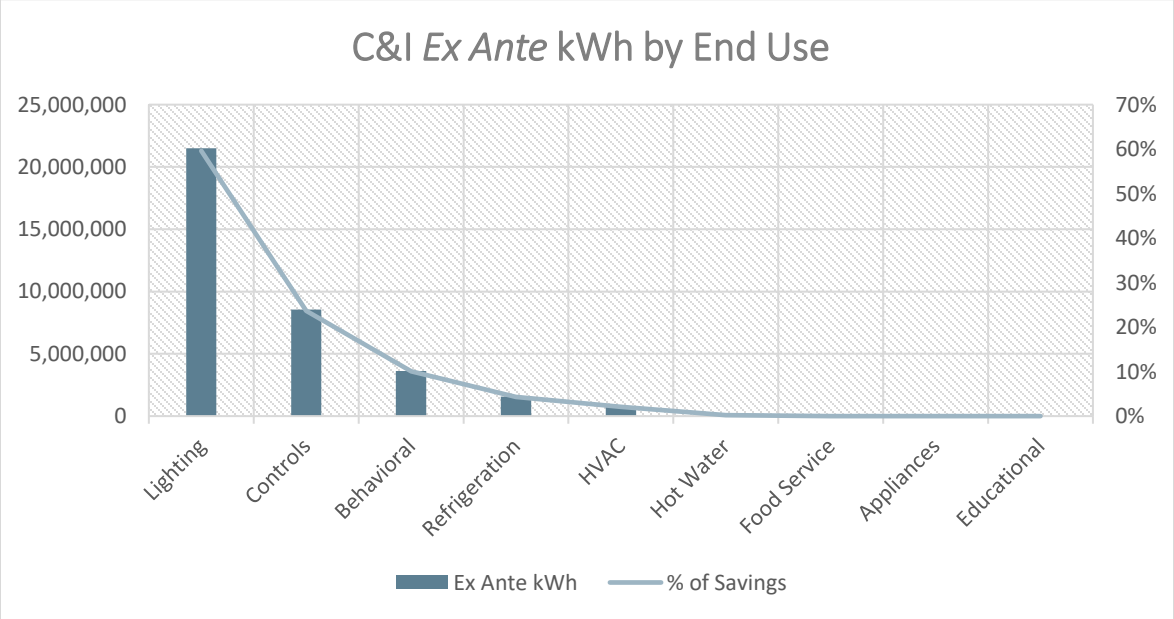


FIGURE 2-3 C&I *EX ANTE* KWH BY END USE

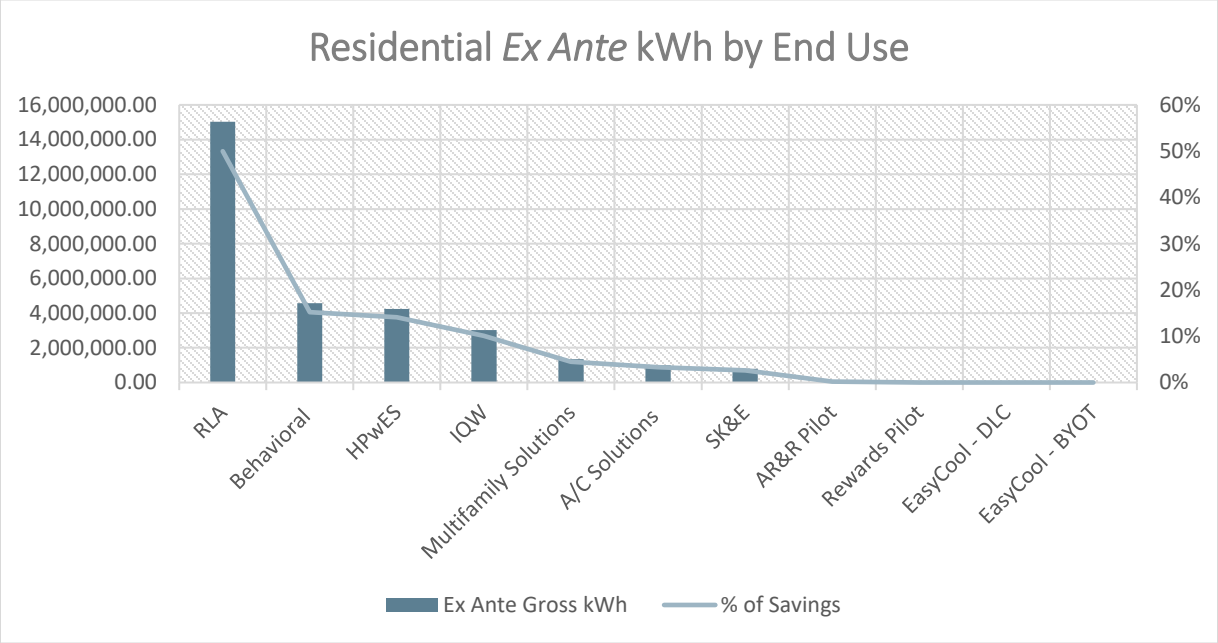


FIGURE 2-4 RESIDENTIAL *EX ANTE* BY END USE

Each bar in the figure below shows the contributions to *ex ante* gross energy savings (kWh) for each measure in the commercial sector. Custom LED projects (39%), customer control projects (22%), prescriptive LED projects (18%) and retrocommissioning projects (10%) were the high impact measures (HIMs) for the commercial sector, and equal to 89% of C&I *ex ante* energy savings (kWh).

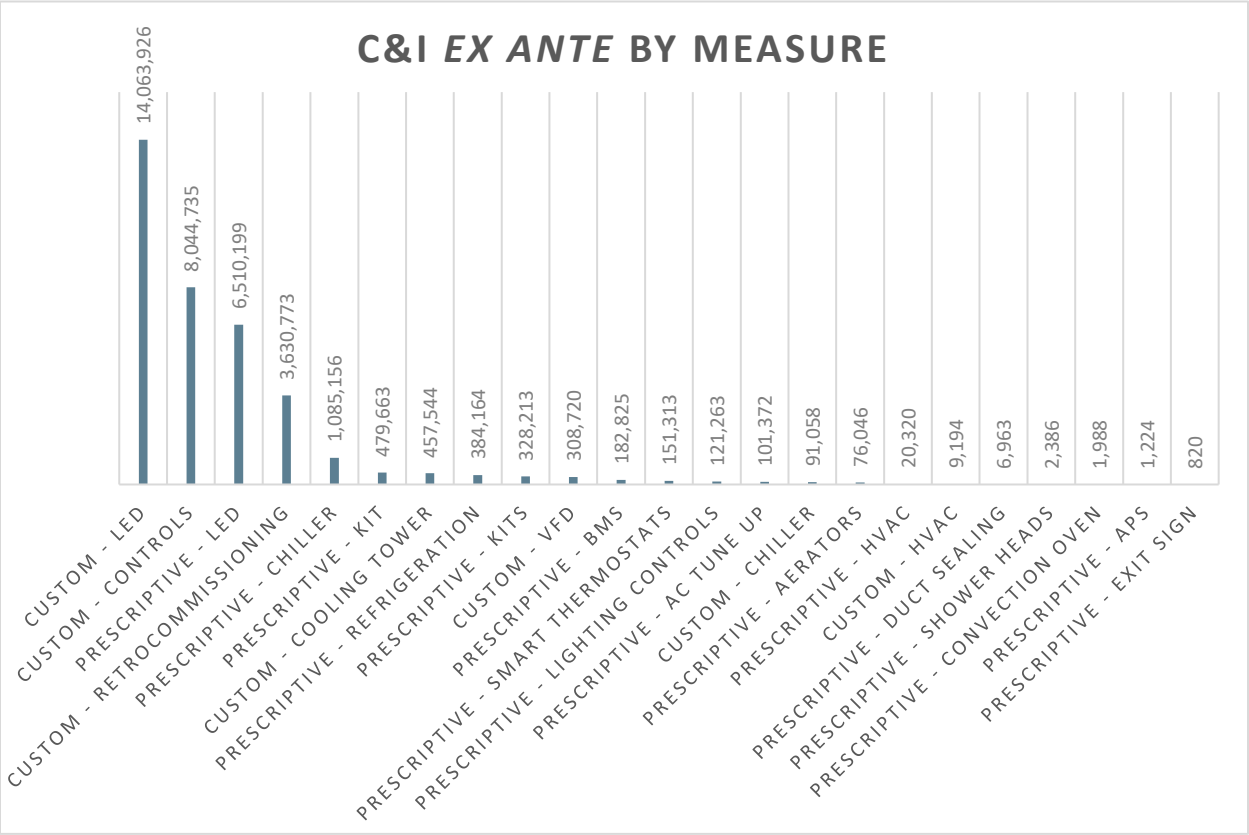


FIGURE 2-5 C&I *EX ANTE* KWH BY MEASURE

Each bar in the figure below shows the contributions to *ex ante* gross energy savings (kWh) for each measure in the residential sector. LEDs (55%), Behavioral (15%), Duct Sealing (10%), and smart thermostats (7%) are the HIMs in the residential sector, and equal to 88% of residential *ex ante* energy savings (kWh).

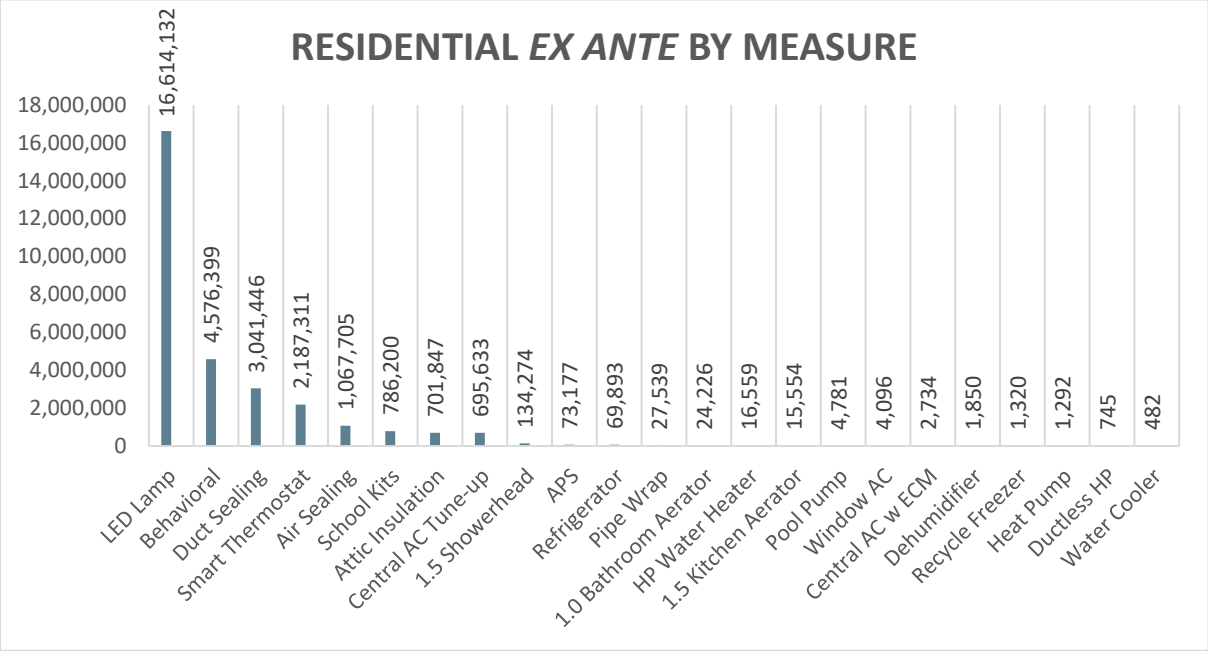


FIGURE 2-6 RESIDENTIAL *EX ANTE* BY MEASURE

A summary of participation, net participant contributions, and gross incentive spend by program can be found in the table below.

TABLE 2-9 PARTICIPATION AND INCENTIVE SPEND BY PROGRAM

Program	Count of Measures	Gross Incentive Expenditures ($)
HPwES	17,902	$573,983
RLA	10,193	$1,346,043
Multifamily Solutions	2,102	$244,100
IQW	4,502	$1,328,540
A/C Solutions	1,167	$215,852
SK&E	37	$93,065
AR&R Pilot	150	$82,500
Behavioral	95,655	$0
Rewards	0	$235
EasyCool - DLC	1,370	$54,965
EasyCool - BYOT	2,078	$126,985
Small C&I Solutions	1,542	$364,303
Large C&I Solutions	417	$2,707,147
PFI	35	$339,483
C&I NC	0	$0
Large C&I DR	6	$25,178
EasyCool for Business	71	$4,140
Total	**137,227**	**$7,506,518**

Sums may differ due to rounding.

The PY11 budgets and actual spend are summarized in the table below.

TABLE 2-10 BUDGETS AND ACTUAL SPEND SUMMARY

Program	Budgeted Expenditures	Actual Expenditures	Spending (% of Budget)	Energy Savings (% of Goal)	Levelized ($ per kWh)
HPwES	$1,522,446	$943,075	62%	105%	$0.019
RLA	$1,401,765	$1,678,457	120%	210%	$0.010
Multifamily Solutions	$527,144	$498,513	95%	100%	$0.034
IQW	$1,318,370	$2,033,465	154%	183%	$0.066
A/C Solutions	$651,891	$426,703	65%	41%	$0.058
SK&E	$498,733	$530,363	106%	119%	$0.052
AR&R Pilot	$323,125	$246,805	76%	5%	$0.259
Behavioral	$263,600	$280,344	106%	21%	$0.061
Rewards	$150,000	$236	0%	N/A	$0.000
EasyCool - DLC	$304,394	$317,889	104%	N/A	$0.000
EasyCool - BYOT	$281,928	$291,089	103%	N/A	$0.000
Small C&I Solutions	$1,935,605	$1,204,993	62%	23%	$0.073
Large C&I Solutions	$6,357,478	$5,580,734	88%	86%	$0.024
PFI	$909,712	$897,702	99%	119%	$0.033
C&I NC	$722,527	$347,652	48%	0%	$0.000
Large C&I DR	$907,894	$537,003	59%	N/A	$132.943
EasyCool for Business	$84,152	$77,075	92%	N/A	$0.000
Total	**$18,160,764**	**$15,892,097**	**88%**	**74%**	**$0.027**

Sums may differ due to rounding.

2.1.3 PROCESS EVALUATION FINDINGS

There were very limited residential process evaluation activities in PY11. Primary activities included staff interviews. The Evaluators focused on the C&I sector in PY11, see those findings and recommendations below. Each program chapter may have additional findings and recommendations, which are predominantly impact-related.

2.1.3.1 Small C&I Solutions Findings and Recommendations

Program Management and Delivery Key Findings and Recommendations

- **Key Finding 1: Small Business Solutions had significant challenges in PY11.** The challenges of the pandemic and Hurricane Ida have most severely impacted ENO's Small C&I Solutions offering. Program staff indicated they struggle to engage small businesses within the service territory. Staff noted that more time and effort need to be invested in this line of work in the coming program year.
    - ***Recommendation 1: Provide financing opportunities.*** *Almost all articles and reports on small business centered energy efficiency programs underscore the financial barriers small business face when deciding whether or not to upgrade to efficient equipment. Offering financing opportunities like loans, fixed monthly costs, time of use, and higher rebates make equipment upgrades more financially feasible and tenable to small businesses that may not have the upfront capital to invest in upgrades.*

- **Key Finding 2: Small business kits and the online marketplace benefitted from marketing outreach.** ENO staff brought on external marketing and outreach teams to help promote the program. Common marketing tactics included door-to-door visits, bill inserts, digital and social media marketing, ENO-sponsored trade ally trainings, as well as television, radio, and newspaper ads. Additionally, program staff introduced a "summer bonus" which involved a 25% increase in the incentive amount for various measures.
    - ***Recommendation 2: Conduct a Small Business Needs Assessment.*** *Program staff could meet with small businesses and determine their specific equipment upgrade needs and energy usage and provide personalized recommendations. The utility can take the needs assessment a step further by also offering an energy coaching program that assists small businesses through every step of the process.*
- **Key Finding 3: Online marketplace engagement is low.** The online marketplace ("Energy Smart Small Business Store") experienced some challenges throughout the program year. Not only was the launched delayed, but program staff indicated they struggle to increase site traffic and engagement. Getting customers to visit the website remains a challenge. ENO's marketing team promotes the site through various avenues, including bill inserts, TV interviews, and other advertisements. Program staff also highlighted Black Friday and Cyber Monday campaigns, as well as enhanced marketing plans for early 2022. Program staff believe the online marketplace has a lot of potential and hope engagement will increase over time as the website becomes more ubiquitous among customers.
    - ***Recommendation 3: Increase marketing of the availability of the online marketplace.*** *Program staff should explore additional channels to market the online marketplace to small businesses.*

Online Marketplace Participant Survey Key Findings and Recommendations

- **Key Finding 4: The online marketplace may have influenced customers to receive energy efficient products and customers were generally satisfied with their experience.** More than half of survey respondents learned about the online marketplace through an informational brochure or newsletter. Many survey respondents did not have plans to purchase a smart thermostat prior to learning they could receive a free model or discount through the online marketplace. About half of customers surveyed did not have plans to purchase LED lighting, and about two-thirds did not have plans to purchase low-flow sink aerators and none had plans to purchase low-flow showerheads. Generally, customers were satisfied with the Energy Smart Business Store and with the energy efficient products they received.

Small Business Kits Key Findings and Recommendations

- **Key Finding 5: Participants appear to not install all items offered in the kits.** The top measure currently installed by all types of businesses are the LED light bulbs. According to most respondents, they were not using many of the energy efficiency measures offered in the kits or had not heard of these measures before receiving them. Before receiving the kits, some respondents stated they have previously engaged with other Energy Smart offerings.

Hurricane Ida and COVID-19 pandemic impacts Key Findings and Recommendations

- **Key Finding 6: To some degree, almost all respondents were impacted by the pandemic**. Issues like labor shortages and supply chain issues affected all the survey respondents. Restaurant and retail kit recipients indicated they were significantly affected by Hurricane Ida during 2021. Not many respondents knew about the offer of ENO's Hurricane Ida Recovery Funds. Despite the challenges faced due to hurricane season, most survey respondents stated that the storm did not affect their participation in ENOs' C&I programs.

Census Data Key Findings and Recommendations

- **Key Finding 7: Professional and technical services, service industry, and health care are the most common businesses in Orleans Parish**. In 2018, there were 9,481 business operating in Orleans Parish employing 177,577 people. The top five business types in Orleans Parish include professional/scientific/technical services (17%), accommodation and food services (16%), retail (14%), health care and social assistance (10%), and other services (10%). Many employees in Orleans Parish work in accommodations and food services, followed by health care and education.
- **Key Finding 8: Over half of Orleans Parish business are considered microbusinesses.** Ninety-three percent of businesses in Orleans Parish have less than 50 employees, with more than half of businesses in the Orleans Parish employing five employees or less. Among microbusinesses many people are employed in professional, scientific, and technical services compared to small-to-large businesses where many people are employed in accommodations and food services.
- **Key Finding 9: The pandemic had an overall negative impact on small businesses in New Orleans.** In April 2020, 44% of small businesses in New Orleans indicated that the pandemic had a large negative effect and an additional 39% indicated it had a moderate negative effect. This trend changed in the summer of 2020, with more respondents saying the pandemic had a moderate negative impact rather than large negative effect.

2.1.3.2 Large C&I Solutions Findings and Recommendations

Program Management and Delivery Key Findings and Recommendations

- **Key Finding 1: There were not changes to program design or types of measures offered.** Aside from some additional refrigeration measures, the prescriptive measures offered have remained the same. Rather than significantly expand the measures offered, program staff focused their efforts on novel marketing tactics, such as door-to-door distribution of kits and the online marketplace, for the existing measures. Program staff continue to expand non-lighting projects.
- **Key Finding 2: Increased marketing and outreach efforts in PY11.** In response to low participation rates and the various challenges of PY11, ENO staff brought on external marketing and outreach teams to help promote the program. Common marketing tactics included door-door visits, bill inserts, digital and social media marketing, ENO-sponsored trade ally trainings, as well as television, radio, and newspaper ads.

Additionally, program staff introduced a "summer bonus" which involved a 25% increase in the incentive amount for various measures. Although program staff acknowledge that they likely will not meet their goals, it is "due to external factors. It is not from a lack of creativity or effort" regarding outreach.

- ***Recommendation: Explore offering bonuses earlier in the year to spur project completions.*** *To increase project completions earlier in the year, program staff could explore unique opportunities to offer various bonuses earlier in the year and throughout the year.*

Participant Survey Findings and Recommendations

- **Key Finding 3: Trade allies were a key component to participants' experience with the Energy Smart Large C&I Solutions offering.** Trade allies or other trade allies were how most participants learned about Large C&I Solutions. Other common sources of awareness included from an Energy Smart representative or through a program event or presentation. Most large business customers reported working with a trade ally through the entire project (e.g., design through installation). Many respondents reported that a trade ally who had previously worked with installed the equipment for their project. More than half of the survey participants stated it was an easy decision when their trade ally first approached them about participating in the offering. Additionally, many survey respondents were satisfied with the trade allies' explanation of the program rules and processes, the trade ally they worked with, the proposal they received, and the technical assistance they received.
- **Key Finding 4: Large C&I Solutions participants were mostly satisfied with application process, the offering, and ENO**. Most participants agreed that the overall application process was smooth and agreed that the time it took to approve the application was acceptable. All survey respondents were very satisfied with the offering. Large business customers who participated in the program were satisfied with the amount of time it took to complete the project, the time between the audit and installation, and the steps to complete the project. Most respondents were satisfied with ENO as their electric service provider. Furthermore, many respondents agreed that they would recommend the program to others.

Trade Ally Interview Findings and Recommendations

- **Key Finding 5: The trade allies indicated they were satisfied with the Energy Smart Large C&I Solutions Offering overall.** Most respondents stated they were either somewhat or completely satisfied with the offering. Many expressed their satisfaction with communication between program staff, incentive amount, and the range of offering-qualifying equipment.
  - ***Recommendation: Continue to engage trade allies and provide opportunities to gather their feedback****. Large C&I customers were generally satisfied with the trade ally they worked with throughout the project. This finding suggests that trade allies are integral to the success of the Energy Smart commercial offerings. Program staff should continue to engage the trade allies and create new connections.*

- **Key Finding 6: Most trade allies expressed challenges promoting certain measure to customers.** Over half of the interviewed trade allies indicated there are measures in which the incentive amounts are too low to encourage adoption among the clients they serve. Some of the trade allies provided suggestions for improving the commercial offerings. These recommendations included adding measures to the list of qualifying equipment, expanding prescriptive lighting, and removing pre-approval to help projects complete quickly.
    - ***Recommendation: Explore ways to incorporate suggestions from trade allies.*** *Program staff could create a systematic way to collect suggestions from trade allies and explore the feasibility of the recommendations. While not all suggestions may be feasible to incorporate immediately, trade allies are most familiar with market dynamics and may be able to provide real-time assessments of barriers to participation and opportunities to improve the offering.*
- **Key Finding 7: Most of the trade allies found the training conducted by ENO or APTIM to be practical.** Most interviewed trade allies received training from ENO or APTIM. All respondents indicated that ENO offered an adequate amount of training opportunities in 2021. Sixty percent of trade allies who attended a training found it somewhat or extremely useful. Most surveyed trade allies (55%) prefer email for providing them information about program changes or updates, followed by 27% who indicated phone calls, 9% who said presentation, and another 9% who stated in-person visits.
    - ***Recommendation: Continue to offer adequate and up to date trainings to trade allies.*** *Program staff have been successfully offering training to trade allies and should continue to look for new training topics. Offering multiple modes of training (in-person, online/webinar, self-paced prepared education) to accommodate trade allies' preferences. When possible, incorporate training evaluations to ensure that training is adequate and appropriate.*

Midstream Literature Review Key Findings and Recommendations

- **Key Finding 8: Midstream programs focus outreach and engagement up the supply chain at the distributor level**. Programs target midstream market actors – distributors and trade allies. Midstream program designs typically involve a cooperative agreement or memorandum of understanding with wholesale distributors to provide discounts on energy efficient equipment.
- **Key Finding 9: Incentive structure and design should be easy for distributors to understand**. The incentives should also be sufficient to drive sales while remaining reasonable relative to the level of energy savings that the equipment can provide. Additionally, incentives should be provided to increase sales relative to the distributors baseline sales of the equipment to mitigate free-ridership risk.

  One approach is to provide a flat per-unit incentive structure that allows for distributors to anticipate payments. Incentive payments should be timely to keep distributor engaged and satisfied with the program. Additional stipends to offset costs of administering the program, providing training, and marketing the measures can be used to increase distributor buy-in. Allow distributors flexibility in how they utilize the incentives.

- **Key Finding 10: Common measures offered among midstream programs are lighting, HVAC equipment, kitchen equipment, and refrigeration equipment.** Commercial midstream HVAC offerings commonly included in offerings include split systems, ductless, and packaged rooftop units. Less common incentive offers for HVAC components included high-performance circulator pumps, economizer controls, and VFDs. Midstream incentive offerings targeting kitchen and refrigeration equipment can be an opportunity to engage with small business customers seeking to upgrade equipment with high efficiency options. Common measures incented include combination ovens, convection ovens, fryers, griddles, pre-rinse sprayers, hot holding cabinets, ice machines, commercial dishwashers, steam cookers, and refrigerators/freezers.
- **Key Finding 11: There are several advantages and disadvantages to implementing a midstream commercial program.** Midstream programs have the potential to provide several advantages over traditional downstream programs: 1) they can increase stocking of energy efficient equipment; 2) they can reduce transaction costs for customers and program staff; 3) they can increase educational opportunities for end-users and purchasers; and 4) they can strengthen ties between program administrators and market actors. Despite the potential benefits of a well-implemented midstream program, there are some factors to consider when designing an offering. Things to consider during the design phase: incentives may not generate additional sales of energy efficient equipment, program setup costs may be prohibitive, data limitations and net-to-gross, and lack of customer contact opportunities.
    - ***Recommendation: Investigate the possibility of designing and implementing a commercial midstream pilot program.*** *Program staff could start by conducting outreach with distributors and other market actors to assess the readiness of implementing a midstream program. Staff could explore a pilot program with limited measures targeting hard to reach businesses (e.g., kitchen equipment for restaurants).*

Hurricane Ida and COVID-19 Pandemic Key Findings and Recommendations

- **Key Finding 12: A significant proportion of large business customers surveyed reported being impacted by Hurricane Ida.** Most respondents stated that the hurricane did not affect their ability to participate in the Energy Smart program. About a quarter experienced increase in material cost, business cost, supply chain issues, and labor supply issues.

  Key Finding 13: The program remained adaptable in response to uncontrollable, outside forces. Both the ongoing COVID-19 pandemic, Hurricane Ida, and supply chain issues have resulted in unforeseen obstacles for program delivery. Although the Energy Smart Commercial programs are unlikely to reach the energy savings goal this year, program staff continue to demonstrate nimbleness and flexibility in their efforts to engage commercial and industrial customers. Staff note that they have been able to interact with customers in person and virtually, based on customer preference. Program staff provided higher incentives towards the end of the year than in years past and were more flexible regarding timelines and payments. Staff also talked about their strategy of targeting customers with high bills early in the year to jump start engagement. Overall, the pandemic and hurricane have taught staff that they need to always be thinking of innovative ways to adapt and increase participation.

- **Key Finding 14: Hurricane Ida Recovery Fund was a successful addition to Energy Smart C&I programs.** All program staff commented on the success of the Hurricane Ida Recovery Fund. Implemented in less than three weeks, the Ida Recovery Fund provided special funds for commercial customers impacted by the hurricane. C&I customers had to demonstrate damage to equipment that would be eligible for the funds (e.g., HVAC, chillers, refrigeration, lighting). Targeting customers that were hit particularly hard by the storm, the initiative received 80 applications, with 26 projects being funded: these projects represent over a million dollars' worth of incentives and 4.7 million kWh savings.
- **Key Finding 15: Most trade allies were impacted by COVID-19 pandemic.** Forty-five percent of trade allies stated they were greatly impacted by COVID-19 pandemic in PY11. Some trade allies indicated they lost staff, ran into challenges with face-to-face outreach with clients, business slowed down, supply chain issues, experienced increased cost of materials, and had financial concerns. More than half of survey respondents indicated their organization was provided COVID-19 pandemic related trainings or materials through Energy Smart. Trade allies indicated the types of materials they received included monthly emails and pamphlets with COVID-19 pandemic protocols.
- **Key Finding 16: More than half of large business customers surveyed reported that Hurricane Ida had a very significant impact on their operations.** Over a quarter of respondents reported applying for ENOs' Hurricane Ida Recovery Funds. Twenty-one percent did not know the fund existed. Some large C&I customers reported experiencing an increase in the cost of materials, labor supply issues, increase in cost of doing business, and supply chain issues during PY11.
    - ***Recommendation: Remain adaptable to outside forces that significantly impact participation and engagement in the Energy Smart offerings.*** *Program staff, large commercial customers, and trade allies all noted that both COVID-19 pandemic and Hurricane Ida impacted their operations in PY11. Program staff will need to remain flexible to be able to adjust program to meet the needs of businesses (e.g., Hurricane Ida Recovery Funds).*

2.1.3.3 Publicly Funded Institutions Findings and Recommendations

Publicly Funded Institutions Key Findings and Recommendations

- **Key Finding 1: PFI participants were satisfied with the Energy Smart program**. Both PFI participants agreed that the application process, interactions with program staff, the improvements made, and the turnaround time to complete the projects was satisfactory. The two respondents were somewhat satisfied with ENO as their electricity service provider. Finally, both respondents intend to initiate another energy efficiency improvement in the next 12 months and recommend the Energy Smart program to others.

- **Key Finding 2: Educational settings were common for PFI survey respondents**. One project was completed at a college facility, and the other was at a K-12 school. PFI participants learned of the offering through a program representative or through a trade ally.
  Although both customers received calculation and application assistance, one indicated they received a facility assessment from an Energy Smart program representative. Without the recommendation from a program representative, one of the participants would not have made the upgrades.
- **Key Finding 3: Trade allies were very involved with the PFI customers' projects**. Both survey respondents worked with their trade ally through the entire project (e.g., design to installation). One participant hired a trade ally they worked with previously to install the equipment, and the other hired a trade ally registered with the Energy Smart program. According to the participants, the trade ally could answer most of their questions. Finally, they indicated they would recommend the trade ally to others.
- **Key Finding 4: Hurricane Ida significantly impacted participants' operations**. According to participants, the storm increased the cost of materials and doing business as well as experienced labor and supply chain issues for both respondents. Fortunately, both participants stated that despite the storm, Hurricane Ida did not affect their ability to partake in ENO's commercial energy efficiency programs. One participant did apply for the ENO's Hurricane Ida Recovery Funds, while the other respondent stated they were unaware of the funds.
- **Key Finding 5: The Evaluators reviewed the best practices for implementing energy efficiency programs designed for publicly funded institutions (PFIs).** The Evaluators identified critical aspects of program design, delivery, end-use offerings, incentive levels, and marketing approaches used by the program staff. In general, eligible measures for PFIs range from lighting to upgrading heating and cooling systems. Incentives also vary by price on kWh, providing discount by total cost, or offering on-bill financing services. Finally, most successful PFI programs implement an integrative approach that includes all groups impacted by the upgrades and produces the most energy savings long-term by making changes that positively affect future improvements/upgrades.

2.1.3.4 Large C&I Demand Response Findings and Recommendations

Large C&I Demand Response Key Findings and Recommendations

- **Key Finding 1: The Large Demand Response program launched in 2020 and, thus, is still new.** As a new program, the program is still getting its feet off the ground and enrolling participants. Staff often work with ENO's other C&I programs to enroll new customers once they have received upgraded equipment through the various other programs.

- ***Recommendation: Continue to build relationships with other C&I programs.*** *The program should continue to build off its partnership with ENO's other C&I programs as a means of recruiting interested customers in the demand response program. Staff noted that buildings with more updated equipment perform better in this program and thus participants who recently received updated equipment through the C&I program are prime candidates.*

- **Key Finding 2: Although the approach to each project is uniform, projects themselves vary based on customer.** As a demand response program, this program allows for flexibility and diversity across project plans. Demand curves and usage forecasts are based on each buildings equipment size and existing usage patterns. Staff have developed a system of surveying potential buildings and calculation predictions based on survey results.
- **Key Finding 3: Participants are given ample warning ahead of an event.** Participants are warned of an upcoming event about 24 hours in advance via a notification. Typically, events last about 2-3 hours and occur in the middle of heat waves or other predictable events.
- **Key Finding 4: In response to concerns about comfort during events, staff recommend participants "pre-cool".** Program staff encourage customers to plan for events and practice pre-cooling prior to an event. Staff underscored that this program is not an energy saving program but rather a load shifting, demand reductions program.

2.1.4 COST-EFFECTIVENESS EVALUATION FINDINGS

See Appendix B: Cost-Effectiveness Analysis of this report for additional information on the approach.

2.1.4.1 Results by Program

The results of the cost effectiveness analysis are in the table below.

TABLE 2-11 COST TEST RESULTS BY PROGRAM

Program	TRC	UCT	RIM	PCT	SCT
HPwES	2.02	1.79	0.39	6.73	2.79
RLA	4.03	3.26	0.42	10.21	5.55
Multifamily Solutions	1.39	1.38	0.40	5.16	1.94
IQW	1.64	1.66	0.64	2.93	2.41
A/C Solutions	0.90	0.94	0.34	3.60	1.16
SK&E	0.65	0.52	0.24	9.15	0.82
AR&R Pilot	0.09	0.08	0.07	2.39	0.12
Behavioral	0.47	0.47	0.19	0.00	0.47
Rewards	0.00	0.00	0.00	1.00	0.00
EasyCool - DLC	0.00	0.00	0.00	0.00	0.00
EasyCool - BYOT	0.00	0.00	0.00	0.00	0.00
Small C&I Solutions	0.57	0.55	0.26	3.28	0.72
Large C&I Solutions	1.99	2.03	0.39	6.97	2.56
PFI	1.03	1.06	0.28	6.05	1.26
C&I NC	0.00	0.00	0.00	0.00	0.00
Large C&I DR	0.00	0.00	0.00	0.00	0.00
EasyCool for Business	0.00	0.00	0.00	0.00	0.00
Total	**1.64**	**1.57**	**0.39**	**6.33**	**2.19**

2.1.4.2 Avoided Replacement Costs

In PY11, the Evaluators included an adjustment to incremental costs accounting for the avoided replacement costs (ARC) associated with LED lamps.

TABLE 2-12 AVOIDED REPLACEMENT COST SUMMARY BY PROGRAM

Program	*Ex post* Gross ARCs ($)	*Ex post* Net ARCs ($)	NPV of ARCs ($)
HPwES	$168,481	$111,984	$111,984
RLA	$364,434	$259,399	$259,399
Multifamily Solutions	$11,806	$10,615	$10,615
IQW	$61,176	$61,176	$61,176
A/C Solutions	$0	$0	$0
SK&E	$75,345	$59,261	$59,261
AR&R Pilot	$0	$0	$0
Behavioral	$0	$0	$0
Rewards	$0	$0	$0
EasyCool - DLC	$0	$0	$0
EasyCool - BYOT	$0	$0	$0
Small C&I Solutions	$98,891	$97,894	$97,894
Large C&I Solutions	$1,299,799	$1,282,318	$1,282,318
PFI	$67,735	$67,535	$67,535
C&I NC	$0	$0	$0
Large C&I DR	$0	$0	$0
EasyCool for Business	$0	$0	$0
Total	**$2,147,667**	**$1,950,181**	**$1,950,181**

Sums may differ due to rounding.

The method used in the evaluation is described in Section 3.4.1.3.

3 EVALUATION METHODOLOGY

3.1 Introduction

This section details general evaluation methodologies by program-type as well as data collection methods applied to this evaluation and methods and activities used in the PY11 evaluation. This section will present full descriptions of gross savings estimation; net savings estimation; sampling methodologies; process evaluation methodologies; and data collection procedures.

3.2 Glossary of Terminology

As a first step to detailing the evaluation methodologies, the Evaluators have provided a glossary of terms to follow:

Baseline: Conditions, including energy consumption, which would have occurred without implementation of the subject energy efficiency activity. Baseline conditions are sometimes referred to as "business-as-usual" conditions.

Deemed Savings: An estimate of an energy savings or demand savings outcome (gross savings) for a single unit of an installed energy efficiency measure. This estimate (a) has been developed from data sources and analytical methods that are widely accepted for the measure and purpose and (b) is applicable to the situation being evaluated (e.g., assuming 284 kWh savings for a low-flow showerhead)

Effective useful life (EUL): Sometimes referred to as measure life and often used to describe persistence. EUL is an estimate of the duration of savings from a measure.

Evaluation: The performance of a range of assessment studies and activities aimed at determining the effects of a program (and/or portfolio) and understanding or documenting program performance, program or program-related markets, program induced changes in energy efficiency markets, levels of demand or energy savings, or program cost-effectiveness.

Evaluation, Measurement and Verification (EM&V): Catch-all term for evaluation activities at the measure, project, program and/or portfolio level; can include impact, process, market and/or planning activities. EM&V is distinguishable from Measurement and Verification (M&V) defined below.

***Ex ante* Gross (Expected) Savings:** Forecasted savings used for program and portfolio planning purposes (from the Latin for "beforehand").

***Ex post* Gross (Verified) Savings:** Savings estimates reported by the Evaluators after the energy impact evaluation has been completed (From the Latin for "from something done afterward").

***Ex post* Net (Net) Savings:** Savings estimates reported by the Evaluators after the net-to-gross adjustments have been applied to *ex post* gross savings.

Impact Evaluation: Determination of the program-specific, directly, or indirectly induced changes (e.g., energy and/or demand usage) attributable to an energy efficiency program.

International Performance Measurement and Verification Protocol (IPMVP): A guidance document with a framework and definitions describing the four M&V approaches; a product of the Energy Valuation Organization (www.evo-world.org).

Measure: Installation of a single piece of equipment, subsystem or system, or single modification of equipment, subsystem, system, or operation at an end-use energy consumer facility, for the purpose of reducing energy and/or demand (and, hence, energy and/or demand costs) at a comparable level of service.

Measurement and Verification (M&V): A subset of program impact evaluation that is associated with the documentation of energy savings at individual sites or project, using one or more methods that can involve measurements, engineering calculations, statistical analyses, and/or computer simulation modeling. M&V approaches are defined in the International Performance Measurement and Verification Protocol (IPMVP - available at www.evoworld.org).

Portfolio: Collection of all programs conducted by an organization. In the case of ENO, portfolio includes electric energy efficiency and demand response programs that address different customer segments. Portfolio can also be used to refer to a collection of similar programs addressing the market. In this sense of the definition, ENO has an electric portfolio with programs addressing the various customer segments.

Process Evaluation: A systematic assessment of an energy efficiency program or program component for the purposes of documenting operations at the time of the examination and identifying and recommending improvements to increase the program's efficiency or effectiveness for acquiring energy resources while maintaining high levels of participant satisfaction.

Program or offering: An activity, strategy or course of action undertaken by an implementer. Each program or offering is defined by a unique combination of program strategy, participation pathway, market segment, marketing approach and energy efficiency measure(s) included. Examples are a program to install energy-efficient lighting in commercial buildings and residential weatherization program.

Project: An activity or course of action involving one or multiple energy efficiency measures at a single facility or site.

Realization Rate: Ratio of *Ex post* Gross Savings / *Ex ante* Gross Savings (e.g., if the Evaluators verify 268 kWh per showerhead, Gross Realization Rate = 268/274= 99% realization rate)

Rigor: The level of expected confidence and precision. The higher the level of rigor, the more confident one is that the results of the evaluation are both accurate and precise, i.e., reliable.

Technical Reference Manual: A prepared resource document that contains (ex-ante) savings estimates, assumptions, sources for those assumptions, guidelines, and relevant supporting documentation for the ENO electricity energy efficiency prescriptive measures which is populated and vetted by the implementers and Evaluators.

Uncertainty: The range or interval of doubt surrounding a measured or calculated value within which the true value is expected to fall within some degree of confidence.

Verification: An assessment that the program or project has been implemented per the program design. An assessment that the program or project has been implemented per the program design. For example, the objectives of measure installation verification are to confirm (a) the installation rate, (b) that the installation meets reasonable quality standards, and (c) that the measures are operating correctly and have the potential to generate the predicted savings.

3.3 Overview of Methodology

3.3.1 SAMPLING

Programs are evaluated on one of three bases:

- Census of all participants.
- Simple Random Sample; and
- Stratified Random Sample

3.3.1.1 Census

A census of participant data was used for selecting programs where such review is feasible. All program measures were evaluated. Programs that received analysis of a census of participants include: HPwES, IQW, A/C Solutions, RLA and SK&E.

3.3.1.2 Simple Random Sampling

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

$$CV = \frac{Standard\ Deviation_x}{Mean_x}$$

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

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

Where:

1.645 = Z Score for 90% confidence interval in a normal distribution
CV = Coefficient of Variation
RP = Required Precision, 10% in this evaluation

3.3.1.3 Stratified Sampling

For the ENO Small C&I and Large C&I programs, Simple Random Sampling is not an effective sampling methodology as the CV values observed in business programs are typically very high because the distributions of savings are generally positively skewed. Often, a relatively small number of projects account for a high percentage of the estimated savings for the program.

To address this situation, the evaluators use a sample design for selecting projects for the M&V sample that takes such skewness into account. With this approach, the evaluators select a number of sites with large savings for the sample with certainty and take a random sample of the remaining sites. To further improve the precision, non-certainty sites are selected for the sample through systematic random sampling. That is, a random sample of sites remaining after the certainty sites have been selected is selected by ordering them according to the magnitude of their savings and using systematic random sampling. Sampling systematically from a list that is ordered according to the magnitude of savings ensures that any sample selected will have some units with high savings, some with moderate savings, and some with low savings. Samples cannot result that have concentrations of sites with atypically high savings or atypically low savings. As a result of this methodology, the required sample for Small C&I and Large C&I were reduced to the following strata.

TABLE 3-1 STRATIFIED SAMPLING SUMMARY

Program	Strata	Sites Sampled
Small Commercial Solutions	4	25
Large Commercial and Industrial	4, plus 1 certainty	48
Publicly Funded Institutions	4	10

3.3.2 GROSS IMPACT CALCULATIONS

The general approach for calculation of verified energy savings (kWh) and demand reductions (kW) was to use the NO TRM V4.0. Further detail can be found in each program chapter for relevant measures.

The gross impact evaluation effort included the following:

- **Desk Reviews:** The Evaluators utilized the NO TRM V4.0 values in assessing *ex post* gross energy savings (kWh) and demand reductions (kW). In addition to the TRM, the Evaluators also examined Excel workbooks and supplemental documentation used by implementation staff to assess savings by measure. The workbook utilizes TRM savings algorithms with Trade ally inputs to calculate savings based on the measure and input parameters. The Evaluators verified the factor tables for each measure to ensure the values were appropriate.
- **Data Tracking Review:** Project data from the implementers was reviewed to ensure that tracking systems followed the TRM.
- **Site Visits:** Site visits were conducted on an as needed basis, where sites with higher uncertainties in project documentation were selected for on-site verification.
- **Survey Analysis:** Where applicable, results from participant survey results were utilized to determine in-service-rates (ISRs).

3.3.3 NET IMPACT CALCULATIONS

Table 3-2 summarizes the net savings approach used for each program.

TABLE 3-2 SUMMARY OF NET SAVINGS APPROACHES

Program	Self-Report Surveys	Literature Review	Billing Analysis/ Price Response Modeling	Deemed Value
Home Performance with ENERGY STAR	✓			
Home Performance with ENERGY STAR (Kits)	✓			
Income Qualified Weatherization (IQW)				✓
Multifamily Solutions	✓			✓
Residential Lighting and Appliances			✓	✓
A/C Solutions				✓
School Kits and Education				✓
Behavioral			✓	
DLC and DR Programs			✓	
Small C&I Solutions	✓			
Large C&I Solutions	✓			
Publicly Funded Institutions	✓			

3.4 Impact Evaluation

3.4.1 GROSS IMPACT

The Evaluators approach to savings analysis depends largely on the types of measures installed.

In the following subsections gross savings calculation methodologies are detailed by measure category, as is appropriate.

3.4.1.1 New Orleans TRM V4.0

Whenever possible, deemed savings values and algorithms from the New Orleans Technical Reference Manual version 4.0 (herein referred to as the "New Orleans TRM" or simply, "NO TRM V4.0") were used to determine verified *ex post* gross energy (kWh) and demand (kW) impacts. Care was taken to assure any assumptions were reasonable and current, and that there were no errors in the algorithms. For each measure in the program, total *ex post* gross energy (kWh) and demand (kW) savings were determined as a product of the number of measures verified as qualifying for an incentive and the deemed savings per measure.

3.4.1.2 Energy Savings (kWh) Calculations

For the PY11 evaluation, the Evaluators utilized the NO TRM V4.0 to conduct the evaluation of the Energy Smart programs.

The approaches are as follows below.

- **Deemed Savings:** The deemed savings approach includes any analysis based upon the TRM or current ENO work papers. This approach involves using stipulated savings for energy efficiency measures for which average savings values are well known and documented. When applying deemed savings values, our verification efforts include verifying measure installations through on-site inspection or telephone surveys. The effort may involve using one savings value for all installations of a particular measure (for example, a residential refrigerator) or a site-specific analysis that uses partially deemed unit energy savings algorithms (such as assessing the savings from deemed commercial lighting retrofits). In the latter case, some inputs into the savings calculation are site specific (for example, lighting hours of use).
- **Billing Data Analysis:** Billing data analysis may be applied where there is a large, relatively homogenous pool of participant customers implementing similar energy efficiency measures. Billing analysis may be particularly effective when a program installs a number of measures in individual homes, which affect similar end uses and therefore have interactive effects. Such analysis typically involves regression modeling of participants and a non-participant control group. Examining bills of these two groups before and after participation has occurred. Analysis based on comparison of energy use in a participant and non-participant control group is applicable for the Behavioral Program and could possibly be expanded to weatherization programs.
- **Site-Specific Custom:** This refers to any program where savings must be calculated on a per-site basis using primary data collected on-site or facility bills for a unique, premise-level analysis (as opposed to the large-scale, whole-program analysis detailed under the “Billing Data Analysis” bullet). This includes the C&I programs in the Energy Smart portfolio for which custom protocols would need to be applied (e.g., IPMVP).

The table below summarizes the approaches that were be applied to the ENO programs.

TABLE 3-3 SAVINGS ESTIMATION APPROACHES FOR ENERGY SMART PROGRAMS

Sector	Program	Approach to Savings Estimation
Residential	HPwES	Deemed Savings
	IQW	Deemed Savings
	MF Solutions	Deemed Savings
	A/C Solutions	Deemed Savings
	RLA	Deemed Savings
	SK&E	Deemed Savings
	EasyCool BYOT	Whole Program Billing Analysis
	EasyCool DLC	Whole Program Billing Analysis
	Behavioral	Whole Program Billing Analysis
	AR&R Pilot	Deemed Savings
C&I	Small C&I Solutions	Deemed Savings
	Large C&I Solutions	Deemed Savings/Site-Specific Custom
	PFI	Deemed Savings/Site-Specific Custom
	C&I NC	Site-Specific Custom/Site-Specific Custom
	Large C&I DR	Deemed 50% of nomination due to missing data
	EasyCool for Business	Whole Program Billing Analysis

3.4.1.3 Avoided Replacement Costs

Avoided replacement costs associated with energy efficiency measures were derived from the AR TRM Version 8.2: Protocol L3: Non-Energy Benefits of Avoided and Deferred Equipment Replacement Costs. The Evaluator utilizes the following two protocols to calculate avoided replacement costs for Replacement on Burnout (ROB) measures:

- ROB 1 – baseline and efficient measures that have different useful lifetimes under static baselines over the lifetime of the measures; and
- ROB 2 - baseline and efficient measures that have different useful lifetimes under changing baselines over the lifetime of the measures.

The avoided replacement costs are summarized mathematically as:

$$Avoided\ Replacement\ Cost = NPV(RDR, ML, RLCC_t)$$

$$NPV = Net\ Present\ Value\ function = \sum_{t=1}^{ML} \frac{RLCC_t}{(1+RDR)^t}$$

Where:

RDR = Real Discount Rate

ML = Program Measure Life (EUL)

$RLCC_t$ = Real Levelized Carrying Charge in year t (annualized baseline installed cost at RDR)

The following equation defines the ARCs for ROB 1, under the assumption of different EULs for baseline and efficient measures and static baselines:

$$Avoided\ Replacement\ Cost = -PV(RDR, ML - EUL_B, RLCC_B)/(1 + RDR)^{EUL_B}$$

Where:

RDR = Real Discount Rate

ML = Program Measure Life (EUL)

EUL_B = Baseline Equipment Life

$RLCC_B$ = -PMT (RDR, EUL_B, Baseline Installed Cost)

The following equations define the ARC for ROB 2, under the assumption of different EULs for baseline and efficient measures and changing baselines:

$$Avoided\ Replacement\ Cost = ARC\ (Tier\ 1) + ARC\ (Tier\ 2)$$
$$ARC\ (Tier\ 1) = -PV(RDR, NY - EUL_{T1}, RLCC_{T1})/(1 + RDR)^{EUL_{T1}}$$
$$ARC\ (Tier\ 2) = -PV(RDR, ML - NY, RLCC_{T2})/(1 + RDR)^{NY}$$

Where:

RDR = Real Discount Rate

ML = Program Measure Life (EUL)

EUL_{T1} = Baseline Equipment Life (Tier 1)

$RLCC_{T1}$ = -PMT (RDR, EUL_{T1}, Baseline Installed Cost (Tier 1))

EUL_{T2} = Baseline Equipment Life (Tier 2)

$RLCC_{T2}$ = -PMT (RDR, EUL_{T2}, Baseline Installed Cost (Tier 2))

NY = Number of years of Tier 1 installation

3.4.1.3.1 *Residential Lighting*

Table 3-4 provides ARCs for programs with residential LED lighting by LED type. A RDR of 4.89% was utilized for all measures. Installed costs for LEDs, Halogens, and CFLs were obtained from the Illinois TRM V7.0[7]. Under ROB 2, the length of the Tier 1 baseline is assumed to be 2 years for PY2021.

TABLE 3-4 AVOIDED REPLACEMENT COSTS FOR RESIDENTIAL LED LIGHTING

LED Type	Installed Cost (LED)	Tier I Installed Cost (Halogen)	Tier II Installed Cost (CFL)	LED EUL	Tier 1 EUL (e.g., Halogen)	Tier II EUL (CFL)	ARC
Omni-directional	$3.11	$1.25	$2.17	17	2	7	$3.59
Decorative	$3.40	$1.25	$2.17	20	2	7	$4.00
Directional	$5.18	$1.25	$2.17	20	2	7	$4.00

[7] Page 501 "LED Bulb Assumptions".

3.4.1.3.2 *Commercial Lighting*

Table 3-5 provides ARCs for programs with commercial LED lighting by LED type. A RDR of 3.15% was utilized for all measures. Installed costs for LEDs, Halogens, and CFLs were obtained from the Illinois TRM V7.0[8].

TABLE 3-5 AVOIDED REPLACEMENT COSTS FOR COMMERCIAL LED LIGHTING

LED Type	Installed Cost (LED)	Installed Cost (Baseline)	LED EUL	Baseline EUL	ARC
Screw-in Bulb	$2.70	$1.25	4	2	$1.17
Fixture (Troffers)	$115.97	$18.50	15	9	$9.76
Fixture (High Bay)	$149.59	$112.88	15	6	$134.41
Fixture (Recess)	$30.75	$8.86	15	2	$45.94
Fixture (Exterior)	$183.68	$65.50	15	4	$143.34
Fixture (Interior)	$39.00	$9.71	15	2	$50.35
Linear Tube	$7.63	$6.17	15	9	$3.25

The tables below show each measure by program by sector. If ARC was estimated for that measure it is indicated in the applicable column.

TABLE 3-6 PY11 ARC BY C&I MEASURE

Program	Measure	ARCs ($)
Large C&I Solutions	Custom - LED	✓
Large C&I Solutions	Prescriptive - LED	✓
Large C&I Solutions	Prescriptive - Screw-Based LED	✓
PFI	Prescriptive - LED	✓
PFI	Custom - LED	✓
PFI	Prescriptive - Screw-Based LED	✓
Small C&I Solutions	Custom - LED	✓
Small C&I Solutions	Prescriptive - LED	✓
Small C&I Solutions	Prescriptive - Screw-Based LED	✓
Small C&I Solutions	OLM Screw Based LED	✓
Small C&I Solutions	OLM LED	✓

[8] Page 501 "LED Bulb Assumptions". In cases where a range of lumens are provided, the average cost is used.

TABLE 3-7 PY11 ARC BY RESIDENTIAL MEASURE

Program	Measure	ARCs ($)
HPwES	Outdoor LED Lamp (Specialty)	✓
HPwES	LED 15W A-Type - KIT	✓
HPwES	LED 9W A-Type - KIT	✓
HPwES	Outdoor LED Lamp (Standard)	✓
HPwES	Indoor LED Lamp (Standard)	✓
HPwES	Indoor LED Lamp (Specialty)	✓
HPwES	LED 9W A-Type - LTN KIT	✓
HPwES	LED 15W A-Type - LTN KIT	✓
HPwES	LED 15W PAR38 - LTN KIT	✓
IQW	Outdoor LED Lamp (Specialty)	✓
IQW	Outdoor LED Lamp (Standard)	✓
IQW	Indoor LED Lamp (Specialty)	✓
IQW	Indoor LED Lamp (Standard)	✓
Multifamily Solutions	Indoor LED Lamp (Specialty)	✓
Multifamily Solutions	Outdoor LED Lamp (Specialty)	✓
Multifamily Solutions	Indoor LED Lamp (Standard)	✓
RLA	Giveaway LED 9W A19	✓
RLA	Outdoor LED Lamp (Specialty)	✓
RLA	Indoor LED Lamp (Specialty)	✓
RLA	Indoor LED Lamp (Standard)	✓
SK&E	School Kits	✓

ARC estimates are found in each of the program chapters within this report.

3.4.1.4 Deviations from the New Orleans TRM V4.0

There were no diversions from the NO TRM V4.0.

3.4.1.5 Tracking System Review

The impact evaluation began with a review of program tracking data. The tracking data included a separate row for each measure installed. Every premise in the program had a unique incentive identifier, so each premise had multiple rows to reflect the different measures completed.

3.4.1.6 Site Visits

Due to the COVID-19 pandemic and the implementation of the RASS[9], the Evaluators were unable to perform site visits for projects in PY11 for the residential programs. As a result, the Evaluators have applied the results of previous years' site visits.

In PY11, the evaluators reserved on-site verification for C&I projects where the available documentation did not provide enough information to verify the estimated savings. The projects where there was not enough information to verify savings with a desk review were selected for a site visit.

The Evaluators hope to resume site visits in PY12.

3.4.2 NET IMPACT

This section discusses the approaches used to estimate net savings for Energy Smart portfolio.

3.4.2.1 Participant Surveys

This section discusses the approaches used to estimate net savings for Energy Smart portfolio. The table below summarizes the net savings approach used for each program.

TABLE 3-8 SUMMARY OF NET SAVINGS APPROACHES

Program	Self-Report Surveys	Literature Review	Billing Analysis/ Price Response Modeling	Deemed Value
Home Performance with ENERGY STAR				✓
Home Performance with ENERGY STAR (Kits)				✓
Income Qualified Weatherization (IQW)				✓
Multifamily Solutions				✓
Residential Lighting and Appliances			✓	✓
A/C Solutions				✓
School Kits and Education				✓
Behavioral			✓	
EasyCool Direct Load Control			✓	
Small Commercial Solutions	✓			
Large Commercial and Industrial Solutions	✓			
Publicly Funded Institutions	✓			

3.4.2.2 Literature Review

A literature review was performed to estimate the net-to-gross ratio for Appliance Recycling and Replacement Pilot.

[9] In lieu of a residential site visits, the Evaluators are conducting a Residential Appliance Saturation Study (RASS). The study has been broken up into two phases, a survey in PY11 and site visits in PY12. The results are not complete and are not included in the report. The study will support planning efforts.

3.4.2.3 Demand Response Programs

The net-to-gross is 100% for the demand response programs because the timing of the peak events that produce the demand reductions is at the discretion of the utility. The impact approach for each is as follows: EasyCool DLC: Deemed per-ton kW from metering; EasyCool BYOT: Deemed per-ton kW from metering; Large C&I DR: Assigned 50% of the nomination when sites had missing meter data; and EasyCool for Business: Deemed per-ton kW from metering.

3.4.2.4 Non-Low Income Residential Energy Efficiency Programs

Net-to-gross ratios were applied from the PY9 evaluations to estimate the net savings for the following programs: Home Performance with ENERGY STAR (including kits); Multifamily Solutions; Residential Lighting and Appliances; A/C Solutions; and School Kits and Education.

3.4.2.5 Deemed Values for Low Income Program

A net-to-gross ratio of 1.0 was applied to estimate the net savings of the Income Qualified Weatherization Program.

3.4.2.6 Self-Report Methodology for C&I Energy Efficiency Programs

Participant survey responses were used to estimate the net energy impacts for the Small C&I, Large C&I, and PFI offerings. There were no C&I NC projects in PY11. The methodology used is described in detail below.

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 energy efficient [Measure/Equipment] at the location without the financial incentive from the Program?" Customers that answer "No" to this question are asked to confirm that they would not have allocated funds to the project without the incentive. If a customer confirms that they would not have allocated the funds if the incentives were not available, the 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 were:

- 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, rules were applied to develop binary variables indicating whether or not a participant's behavior showed free-ridership.

The first factor requires 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 (Definition 1):

- The respondent answers "yes" to the following two questions: "Did you have plans to install energy efficient [Measure/Equipment] at the location before deciding to participate in the program?" and "Would you have gone ahead with this planned project if you had not received the rebate through the program?"
- The respondent answers "definitely would have installed" to the following question: "If the rebates from the program had not been available, how likely is it that you would have installed energy efficient [Measure/Equipment] at the location anyway?"
- The respondent answers "no, program did not affect timing of purchase and installation" to the following question: "Did you purchase and install energy efficient [Measure/Equipment] earlier than you otherwise would have without the program?"
- The respondent answers "no, program did not affect level of efficiency chosen for equipment" in response to the following question: "Did you choose equipment that was more energy efficient than you would have chosen had you not participated in the program?"

The second, less restrictive criteria indicating customer plans and intentions that likely signify free-ridership are as follows (Definition 2):

- The respondent answers "yes" to the following two questions: "Did you have plans to install energy efficient [Measure/Equipment] at the location before participating in the program?" and "Would you have gone ahead with this planned installation 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 rebates from the program had not been available, how likely is it that you would have installed energy efficient [Measure/Equipment] at the location anyway?"
- Either the respondent answers "no, program did not affect timing of purchase and installation" to the following question: "Did you purchase and install energy efficient [Measure/Equipment] 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, program did not affect level of efficiency chosen for equipment" in response to the following question: "Did you choose equipment that was more energy efficient than you would have chosen had you not participated in the program?"

The second factor requires determining if a customer reported that a recommendation from a 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 answers "very important" to the following question: "How important was previous experience with the program in making your decision to install energy efficient [Measure/Equipment] at the location?"
- The respondent answers "probably would not have" or "definitely would not have" to the following question: "If the program representative had not recommended [Measure/Equipment], how likely is it that you would have installed it anyway?"

The third factor requires determining if a participant in the program indicates 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 answers "yes" to the following question: "Before participating in the Program, had you installed any equipment or measure similar to energy efficient [Measure/Equipment] at the location?"
- The respondent answers "yes" to the following question: "Has your organization purchased any significant energy efficient equipment in the last three years at the location?" and answered "yes" to the question: "Did you install any of that equipment without applying for a financial incentive through an energy efficiency program?"

The four sets of rules described above 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 are 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 shows these values.

TABLE 3-9 FREE-RIDERSHIP SCORES FOR COMBINATIONS OF INDICATOR VARIABLE RESPONSES

Indicator Variables				Free-ridership Score
Had Plans and Intentions to Install Measure without 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?	
Y	N/A	Y	Y	100%
Y	N/A	N	N	100%

Indicator Variables				Free-ridership Score
Had Plans and Intentions to Install Measure without Program? (Definition 1)	Had Plans and Intentions to Install Measure without Program? (Definition 2)	Program had influence on Decision to Install Measure?	Had Previous Experience with Measure?	
Y	N/A	N	Y	67%
Y	N/A	Y	N	67%
N	Y	N	Y	67%
N	N	N	Y	33%
N	Y	N	N	33%
N	Y	Y	N	0%
N	N	N	N	0%
N	N	Y	N	0%
N	N	Y	Y	0%

3.4.2.6.1 *Participant Spillover Assessment*

Program participants may implement additional energy saving measures without receiving a program incentive because of their participation in the program. The energy savings resulting from these additional measures constitute program participant spillover effects.

To assess participant spillover savings, survey respondents were asked whether or not they implemented any additional energy saving measures for which they did not receive a program incentive. Respondents that indicated that they did install additional measures were asked two questions to assess whether or not the savings are attributable to the program. Specifically, respondents were asked:

"How important was your experience with the <PROGRAM> in your decision to implement this Measure, using a scale of 0 to 10, where 0 is not at all important and 10 is extremely important?"

"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?"

The energy savings associated with the measure are considered attributable to the program if the average of the rating for the first question, and 10 – the rating for the second question, is greater than seven, the savings are counted as attributable to the program.

3.4.2.7 Self-Report Methodology for Small Business Kits

Information collected through a survey of a sample of program participants was used for the net-to-gross analysis. Businesses that received an energy efficiency kit responded to questions about each of the measures provided through the kit to assess the likelihood that they would have installed the measures in the absence the program. The respondents were asked questions on the following topics.

- If they had previously installed the kit item before receiving it for free.
- If they had plans to purchase the kit item before receiving it for free.

- How likely they would have been to purchase the items in the next 12 months if they had not received them for free.

Kit recipients who indicated that they did not have plans or had not previously installed the kit items were determined to not be free-riders. For all other respondents, free-ridership was based on the respondent's likelihood that they would have installed the kit item in the next 12 months. Specifically, the rate likelihood was scored as follows:

- Very likely: 1
- Somewhat likely: .75
- Neither particularly likely or unlikely: .5
- Somewhat unlikely: .25
- Very unlikely: 0

3.4.2.8 Self-Report Methodology for Online Marketplace

Information collected through a survey of a sample of program participants was used for the net-to-gross analysis for the online marketplace measures. The approach taken for each of the measure types is presented below.

3.4.2.8.1 *Smart Thermostats*

The criteria indicating customer had plans and intentions that likely signify free-ridership are as follows:

- FR1: "Did you plan to purchase smart thermostats before learning you could get a [free/discounted] smart thermostat from the Energy Smart Business Store?"
- FR2: [IF YES] "Just to be clear, did you have plans to purchase a smart thermostat as opposed to a programmable or non-programmable thermostat?"

If respondent answered "no" to FR1 or "yes" to FR1 and then "yes" to FR2, they were not considered to have plans or intentions.

Participants were asked about the direct influence of the program on their decision to purchase the measures. Specifically, participants were asked:

- FR3: "How likely is that you would have purchased the same smart thermostat(s) in the next 12 months if you had not received a [free/discounted] thermostat from the Energy Smart Business Store?"

A program influence score was developed based on this response in the following manner:

Program Influence = FR3 / 10

Respondents who were found to not have plans or the financial ability to purchase the measures were deemed to not be free-riders. If respondent had plans, their free-ridership score equals their program influence score.

3.4.2.8.2 *LED Light Bulbs*

The criteria indicating customer had plans and intentions that likely signify free-ridership are as follows:

- FR1: Did you have any LED light bulbs installed at your organization before learning about the discount from the Energy Smart Small Business Store?
- FR2: Prior to receiving LED light bulb(s) from the Energy Smart Business Store, had your organization purchased any LED bulbs within the last three years?
- FR3: Before learning about the Energy Smart Business Store discounts, did you have plans to purchase LED light bulb(s) for your organization?

If respondent answered “no” to FR1, “no” to FR2 or “no” to FR3, they were not considered to have plans or intentions.

Participants were asked about the direct influence of the program on their decision to purchase the measures. Specifically, participants were asked:

- FR4: If you had not received the discount through the Energy Smart Small Business Store, how many LED light bulb(s)would you have purchased within the next 12 months?
- FR5: How likely would you have been to purchase [Field-LED_Quant] LED light bulb(s) within the next 12 months, if you did not receive the discounted bulbs?

A program influence score was developed based on this response in the following manner: Program Influence = FR5 / 10

Respondents who were found to not have plans to purchase the measures were deemed to not be free-riders. If respondent had plans, their free-ridership score equals their program influence score.

3.4.2.8.3 *LED Exit Sign Retrofit Kits*

The criteria indicating customer had plans and intentions that likely signify free-ridership are as follows:

- FRI: Did you have any LED exit sign(s) installed at your organization before learning about the discount from the Energy Smart Small Business Store?
- FR2: Did you plan to purchase LED exit sign(s) before learning about the discount from the Energy Smart Small Business Store?

If respondent answered “no” to FR1 or “no” to FR2, they were not considered to have plans or intentions.

Participants were asked about the direct influence of the program on their decision to purchase the measures. Specifically, participants were asked:

- FR3: How likely would you have been to purchase [Field-Exit_Quant] LED exit sign(s) within the next 12 months, if you did not receive the discount from the Energy Smart Small Business Store?

A program influence score was developed based on this response in the following manner:

Program Influence = FR3 / 10

Respondents who were found to not have plans to purchase the measures were deemed to not be free-riders. If respondent had plans, their free-ridership score equals their program influence score.

3.4.2.8.4 *High Efficiency Showerheads*

The criteria indicating customer had plans and intentions that likely signify free-ridership are as follows:

- FR1: Did you have any low-flow showerheads installed at your organization before learning about the discount from the Energy Smart Small Business Store?
- FR2: Had you heard of low-flow showerhead before you purchased from the Energy Smart Small Business Store
- FR3: Did you plan to purchase low-flow showerheads before learning about the discount from the Energy Smart Small Business Store?

If respondent answered “no” to FR1, “no” to FR2 or “no” to FR3, they were not considered to have plans or intentions.

Participants were asked about the direct influence of the program on their decision to purchase the measures. Specifically, participants were asked:

- FR4: "How many low-flow showerheads do you think you would have purchased in the next 12 months if you had not received a discount through the Energy Smart business store?”
- FR5: "How likely would you have been to purchase [Field-Shower Quant] low-flow showerheads within the next 12 months, if you did not receive the discount from the Energy Smart Small Business Store?

A program influence score was developed based on this response in the following manner:

Program Influence = FR5 / 10

Respondents who were found to not have plans to purchase the measures were deemed to not be free-riders. If respondent had plans, their free-ridership score equals their program influence score.

3.4.2.8.5 *High Efficiency Aerators*

The criteria indicating customer had plans and intentions that likely signify free-ridership are as follows:

- FR1: Did you have any low-flow sink aerators installed at your organization before learning about the discount from the Energy Smart Small Business Store?
- FR2: Had you heard of low-flow sink aerators before you purchased from the Energy Smart Small Business Store
- FR3: Did you plan to purchase low-flow aerators before learning about the discount from the Energy Smart Small Business Store?

If respondent answered “no” to FR1, “no” to FR2 or “no” to FR3, they were not considered to have plans or intentions.

Participants were asked about the direct influence of the program on their decision to purchase the measures. Specifically, participants were asked:

- FR4: "How many low-flow aerators do you think you would have purchased in the next 12 months if you had not received a discount through the Energy Smart business store?"
- FR5: "How likely would you have been to purchase [Field-Shower Quant] low-flow aerators within the next 12 months, if you did not receive the discount from the Energy Smart Small Business Store?

A program influence score was developed based on this response in the following manner:

Program Influence = FR5 / 10

Respondents who were found to not have plans to purchase the measures were deemed to not be free-riders. If respondent had plans, their free-ridership score equals their program influence score.

3.4.2.8.6 *Advanced Power Strips*

The criteria indicating customer had plans and intentions that likely signify free-ridership are as follows:

- FR1: Were you using any Tier 1 Advanced Power Strips at your organization before you received one from ENO?
- FR2: Had you heard of Tier 1 Advanced Power Strips before learning about the discount from the Energy Smart Small Business Store?
- FR3: Did you have plans to purchase Tier 1 Advanced Power Strips before you learned about the discount from the Energy Smart Small Business Store?
- FR4: Just to be clear, did you have plans to purchase a Tier 1 Advanced Power Strips that manages energy use instead of a standard power strip that does not manage energy use?

If respondent answered “no” to FR1, “no” to FR2 or “no” to FR3, they were not considered to have plans or intentions. If respondent answered “yes to FR3 and then “no” to FR4, they were not considered to have plans or intentions.

Participants were asked about the direct influence of the program on their decision to purchase the measures. Specifically, participants were asked:

- FR5: How likely is that you would have purchased [Field-APS_Quant] Tier 1 Advanced Power Strip(s) in the next 12 months if you had not received a discount from the Energy Smart Business Store?

A program influence score was developed based on this response in the following manner:

Program Influence = FR5 / 10

Respondents who were found to not have plans to purchase the measures were deemed to not be free-riders. If respondent had plans, their free-ridership score equals their program influence score.

3.4.2.9 Billing Analysis

This section describes the impact evaluation activities for programs which required billing analysis to verify net energy savings. This methodology is presented in the UMP Chapter 17 Residential Behavior Protocol.[10] This methodology was employed for behavioral programs.

3.4.2.9.1 *Data Preparation and Cleaning*

The Evaluators prepared monthly billing data through a series of cleaning steps. First, an average daily usage value was calculated by dividing the monthly usage by the number of billed days in a month. Additionally, data was filtered using the following criteria:

- Customer months that had less than 10 billed days or greater than 90 billed days were excluded from analysis—months that meet these criteria have overlapping bills and are unreliable for analysis.
- Months that were present after a customer's move out date were also excluded from analysis.
- Customer months in which average daily usage exceeded 200 kWh were excluded from analysis.
- Pre-treatment data was limited to the 12 months prior to the treatment start date for each experimental cohort.
- Customers without at least 9 of the 12 months of pre-period data, as well as at least 9 of the 12 months of post-period data was removed from the analysis.

The data provided to the Evaluators was in the form of bi-monthly billing data. However, after calendarization, the data was essentially converted to monthly resolution. For the remainder of the report, the Evaluators will reference the billing data as having monthly intervals.

The Evaluators identified high outliers at the threshold of average daily kWh usage over 200 kWh per day. This level of consumption is unrealistic for residential households and can reasonably be categorized as the result of a reading error rather than a valid reading from a high user. The Evaluators aimed to remove error reading rather than remove high and low users, as these subgroups contribute real behaviors to the average savings estimate.

3.4.2.9.2 *Validity Testing*

For reliable estimation of savings effects, it is ideal to have a randomized control trial (RCT). In this experimental design, a group of eligible customers are randomly assigned to treatment or control groups. To confirm counterfactual groups, remain valid, cohorts are tested for statistically significant differences in usage between the treatment and control groups for each of the 12 pre-period months. This is conducted with t-tests. In cases where the comparison between treatment average daily energy consumption and control average daily consumption displays p-values less than 0.05, the null hypothesis that the groups are equivalent is rejected and therefore the group demonstrates a difference in behaviors between treatment and control group. Due to natural attrition and due to changes in program

[10] Stewart, J., & Todd, A. (2015, January). The uniform methods project: Methods for determining energy efficiency savings for specific measures (Chapter 17: Residential Behavior Protocol). National Renewable Energy Laboratory. https://www.energy.gov/sites/prod/files/2015/02/f19/UMPChapter17-residential-behavior.pdf

implementation, there is a possibility of the groups ceasing to be a statistical match. Validity testing was completed to determine if propensity score matching is required to create an ad-hoc, quasi-experimental control group for any of the cohorts.

3.4.2.9.3 *Propensity Score Matching*

Regression model analyses are unable to be run on cohorts in which a statistically comparable control group is not defined. Therefore, to analyze cohorts that have non-equivalent counterfactual groups, a post-hoc control group is required to be created. The Evaluators created a statistically similar control group using propensity score matching (PSM), a method that allows the Evaluators to find the most similar household based on the customers' billed consumption trends in the pre-period and verified with statistical difference testing. The Evaluators conducted propensity score matching for each cohort in which a valid counterfactual group was not defined or validated.

A propensity score is a metric that summarizes several dimensions of household characteristics into a single metric that can be used to group similar households. To create a post-hoc control group, the Evaluators compiled billing data of all control participants from all waves to compare against treatment households via quasi-experimental methods. This allowed the Evaluators to select from a large group of similar households that have not received home energy reports. With this information, the Evaluators matched the treatment group to a similar control group via seasonal pre-period usage. After matching, a t-test was conducted for each month in the pre-period to help determine the success of PSM.

After creating a PSM control group, the cohort undergoes the same regression modeling as the remaining statistically valid cohorts. The regression specifications and details are summarized in the next section.

3.4.2.9.4 *Linear Regression Modeling*

After validating control groups were a sufficient match for each cohort, the Evaluators employed a post-program regression model to evaluate verified savings for the impact evaluation for each cohort.

3.4.2.9.5 *Post-Program Regression Modeling*

The post-program regression (PPR) model combines both cross-sectional and time series data in a panel dataset. This model uses only the post-program data, with lagged energy use for the same calendar month of the pre-program period acting as a control for any small systematic differences between the participant and control customers. In particular, energy use in calendar month t of the post-program period is framed as a function of both the participant variable and energy use in the same calendar month of the pre-program period. The underlying logic is that systematic differences between participants and controls will be reflected in differences in their past energy use, which is highly correlated with their current energy use. The version we estimate includes monthly fixed effects and interacts these monthly fixed effects with the pre-program energy use variable. These interaction terms allow pre-program usage to have a different effect on post-program usage in each calendar month.

The model specification is as follows:

EQUATION 3-1 POST-PROGRAM REGRESSION (PPR) MODEL SPECIFICATION

$$ADC_{it} = \alpha_0 + \beta_1(Treatment)_i + \beta_2\ (PreUsage)_i + \beta_3(Month)_t + \beta_4(Month \times PreUsage)_{it} + \varepsilon_{it}$$

Where,

i = the ith household
t = the first, second, third, etc. month of the post-treatment period
ADC_{it} = Average daily usage for reading t for household i during the post-treatment period
$Treatment_i$ = Dummy variable indicating whether household i was in the treatment or control group
$Month_t$ = Dummy variable indicating month-year of month t
$PreUsage_i$ = Average daily usage across household i's available pre-treatment billing reads
ε_{it} = Customer-level random error
α_0= The model intercept for home i
β_{1-4} = Coefficients determined via regression

The coefficient β_1 represents the average change in consumption between the pre-period and post-period for the treatment group.

In this specification, savings are calculated by:

EQUATION 3-2 MONTHLY SAVINGS ESTIMATE

$$Savings = \sum Treatment\ Coeff \times Number\ of\ recipients\ in\ month\ i \times Number\ of\ days\ in\ month\ i$$

3.4.2.9.6 *Remove Double Counted Savings*

Participants in both the treatment and control groups participate in other Energy Smart residential energy efficiency programs. The Behavioral Program reports may also increase the customer's propensity to participate in other programs. This additional participation is known as uplift. The reports sent to customers includes information about other Energy Smart incentives and programs, which may lead to customers adopting more energy efficient upgrades for their home.

When a household participates in an efficiency program because of this encouragement, the utility might count their savings twice: once in the regression-based estimate of behavioral program savings and again in the estimate of savings for the other energy efficiency program. Although uplift rarely displays a statistically significant difference between the treatment and control groups, the UMP recommends removing uplift from each group at the household level.

The double counted savings, whether positive or negative, are subtracted from the wave's savings estimates from the regression analysis to get total verified savings. The approach for removal of double counted savings will differ based on whether the other program is a downstream program. The following sections detail our proposed methodology for downstream programs.

Downstream programs traditionally track installed measures at the customer level. ENO delivered customer-level tracking data for other programs offered to residential customers. The Evaluators evaluated these programs and used the verified savings from each program to use towards downstream

double counting for the Behavioral Program. The residential Energy Smart programs included in the double counting analysis are the Heating, Cooling, and Home Comfort Program, the Income-Eligible Multi-Family Program, and the Smart Thermostats Program.

The Evaluators corrected for cross-program participation that occurred after treatment began to the extent that the treatment group participated at a higher rate than the control group. The Evaluators estimated and subtracted savings from program uplift from the total program portfolio savings for each program year. The double count savings were calculated on a per-household level for each treatment group in each cohort as described below.

Equation 3-3 Double Count Specification

$$Double\ Counting = \left(\frac{OP\ kWh}{Household_{Treatment}} - \frac{OP\ kWh}{Household_{Control}}\right) \times \#\ Accounts_{Treatment}$$

Where,

$\frac{OP\ kWh}{Household_{Treatment}}$ = Other program kWh per household in the treatment group

$\frac{OP\ kWh}{Household_{Control}}$ = Other program kWh per household in the control group

$\#\ Accounts_{Treatment}$ = Total accounts in the treatment group

To estimate double counted program savings from downstream program uplift, the Evaluators:

1. Matched the Behavioral Program treatment and control group customers to the utility energy efficiency program tracking data by customer ID or address;
2. Calculated the savings per treatment group subject from efficiency uplift as the difference between treatment and control groups in average efficiency program savings per subject
3. Multiplied that difference by the number of subjects who are in the treatment group

The Evaluators summarized and removed program uplift for each wave and treatment status for each of the other residential program offerings.

3.4.2.9.7 *Demand Reductions*

The relationship between annual usage savings and peak demand savings has not been defined for HURs. Program savings rely on monthly meter reading data provided by AI. At this time, smart meter data (hourly usage data) are not yet available for the majority of ENO residential customers. Thus, the resolution of billing data provided for analysis is unsuitable for the direct evaluation of peak demand savings. It can be assumed that total monthly usage can be attributed to the usage of other residential components (e.g., HVAC, lighting, etc.) and that any reduction in usage is proportional to the overall usage of these components. Load factors are available for these components at an hourly resolution;

thus, the Evaluators have developed a model for predicting coincident peak demand savings from component load factors from the gross energy savings calculated using the methodology defined below.

3.4.2.9.8 *Normalize kWh Usage*

To increase the generalizability of the model, the Evaluators will first normalize the kWh savings value predicted by the impact evaluation regression model into a percent savings value by dividing each month's savings by the total annual savings, as represented below.

EQUATION 3-4 MONTHLY SAVINGS NORMALIZATION CALCULATION

$$\%\ savings\frac{month}{year} = {kWh\ savings_m}\Big/{kWh\ savings_y}$$

Where,

M = Value for given program month m.

Y = Value for given program year y.

3.4.2.9.9 *Monthly Load Factors*

The model assumes a linear relationship between the component variables and the percent savings calculated above. Because load shape information is available for residential components at an hourly resolution, the Evaluators can estimate the relationship between component load and percent savings to estimate total demand savings. To make sure that the model is interpretable, hourly load factors must be converted to monthly load factors. The Evaluators sourced hourly load data from the U.S. Department of Energy Open Data Catalog of residential hourly load profiles. The database contains hourly load profiles for all TMY3 locations in the United States. The specific location chosen for this evaluation was the New Orleans International Airport.

3.4.2.9.10 *Simple Regression*

To determine the relationship between the percent savings and the component load factors, the Evaluators ran a simple linear regression. Because the model is used to predict savings from known variables, we hold the intercept constant at 0 to ensure that the majority of the variability will be explained by the component load factors. The following equation displays an example regression equation used to predict percent savings attributable to a higher resolution time period.

EQUATION 3-5 PERCENT SAVINGS PREDICTION

$$\%\ savings\frac{month}{year} = \beta_1 lf_{Total\ kWh}$$

Where,

Lf = Load factor for each component variable of interest

Total kWh = All end-uses combined

The regression coefficients for the above regression equation represent the relationship of each of the component variables to percent savings. Because both independent and dependent variables are

calculated in units of months, the numerator of the regression weights are time invariant and can be used to estimate the percentage of savings across any unit of time of interest in a year.

3.4.2.9.11 *Demand Calculation*

Coincidence peak load was estimated for the total electric load by summing the total electric load over peak hours as defined by the TRM—non-weekend and non-holiday days between 4:00 p.m. and 5:00 p.m. for the months of June through August. The following equation illustrates the calculation for calculating the peak load factor.

EQUATION 3-6 PEAK LOAD FACTOR CALCULATION

$$Peak\ load\ factor_x = \sum_{i=1}^{n} Hourly\ load\ factor_x$$

Where,

X = Component variable of interest (Total electric load)

I = First peak hour for the entire annual peak period

N = Last peak hour for the entire annual peak period

This will generate the percent of annual savings that took place in the total peak period. The equation below demonstrates this calculation.

EQUATION 3-7 PERCENT SAVINGS ATTRIBUTABLE TO PEAK PERIOD

$$\%\ savings\frac{peak}{year} = \beta_x \cdot Peak\ load\ factor_x$$

Multiplying this value by the total annual savings will then generate the kWh savings that took place during the peak period, as illustrated below.

EQUATION 3-8 ENERGY SAVINGS DURING PEAK PERIOD

$$Peak\ kWh\ savings = Total\ kWh\ savings\ \cdot \%\ savings\frac{peak}{year}$$

Dividing this value by the total number of peak hours will generate coincident peak demand savings in units of kW, as illustrated below.

EQUATION 3-9 PEAK DEMAND SAVINGS

$$Peak\ kW\ savings = \frac{Peak\ kWh\ savings}{Anual\ Peak\ Period} \cdot \frac{Annual\ Peak\ Period}{Number\ of\ peak\ hours}$$

As with gross usage savings, the Evaluators anticipates that some participants in the treatment group will also participate in other ENO programs. The adjusted savings per month is an input for the demand savings estimation with this method. The Evaluators adjust the savings per month by weighing the HVAC measures by degree day.

3.5 Process Evaluation

3.5.1 APPROACH

The Evaluator's general approach to process evaluation begins with a review of the tests for timing and appropriateness of process evaluation. In this review, the Evaluators determined what aspects of the program warrant a process evaluation.

In general, process evaluations assess organizational and procedural aspects of programs to provide feedback on features of programs that are functioning well and contribute recommendations when areas of improvement are identified. These evaluations are based on criteria that justify conducting a process evaluation. Table provides details on those criteria that should be met prior to proceeding with a process evaluation.

TABLE 3-10 GENERAL OVERVIEW OF PROCESS EVALUATION GUIDANCE

Process Evaluation Guidance
Process evaluation required if: ▪ Program is new. ▪ No process evaluation has been undertaken during current funding cycle.
Process evaluation potentially needed if: ▪ Program impacts are lower than expected. ▪ Goals (both informational and educational) are not being achieved. ▪ Rates of participation are lower/slower than expected. ▪ Program's operational system is slow to get up and running. ▪ Cost effectiveness of the program is less than expected. ▪ Participants (both customers and market actors) report problems/low rates of satisfaction with program.

A process evaluation is a culmination of information from a variety of sources, including program staff, trade allies, and program participants (collectively referred to as market actors). To increase the validity of the findings, the Evaluators gathered data from multiple sources and then "triangulated" the data to compare it across multiple groups. This methodology increases the overall validity of the findings.

It should also address a variety of issues, including:

- Help program designers and managers structure programs to achieve cost-effective savings while maintaining high levels of customer satisfaction;
- Determine program awareness levels to refine marketing strategies and reduce barriers to program participation;
- Provide recommendations for changing the program's structure, management, administration, design, delivery, operations, or target;
- Test for use of best practices and determine what best practices should be incorporated; and
- Gather data from a variety of sources to minimize bias in the findings.

TABLE 3-11 KEY RESEARCHABLE ISSUES BY PROCESS TASK

Process Evaluation Activity						
	Subtask 1	Subtask 2	Subtask 3: Interviews & Surveys		Subtask 4: Surveys	
Key Researchable Issues	Materials Review	Database Review	Staff	3rd Party	Part. Trade Ally	Part. Customer
Program Effectiveness	✓		✓	✓	✓	✓
Tracking Systems		✓	✓	✓		
Rebate Application Processing		✓	✓	✓		
Trade ally Reporting/ Tracking		✓	✓	✓	✓	
Overall Program Satisfaction					✓	✓
Satisfaction with Trade allies			✓	✓		✓
Satisfaction with Utility					✓	✓
Satisfaction with Implementer			✓		✓	
Market Effects	✓		✓	✓	✓	✓
Changes in Stocking Practices			✓	✓	✓	
Barriers to Participation			✓	✓	✓	✓
Awareness Levels					✓	✓
Reasons for Participation					✓	✓
Reasons for Non-Participation					✓	

The process evaluation for PY11 consists of a multiple step process that is outlined in the following section.

3.5.2 REVIEW OF PROGRAM MATERIALS

The Evaluators reviewed reports and supporting materials for clarity and consistency with program objectives. As an initial step in the PY11 process evaluation, the Evaluators reviewed available program documents such as delivery schedules, sample reports and samples of any additional engagement materials. The purpose of reviewing these materials is to understand what information is communicated to participants, how it is communicated, and to identify any gaps or opportunities for improvement.

3.5.3 PROGRAM STAFF AND THIRD-PARTY IMPLEMENTER INTERVIEWS

The program staff in-depth interviews were conducted via telephone and address the key process evaluation objectives discussed previously. The initial evaluation interviews focus on the program history, design, and identifying areas for improvement, while the subsequent process evaluation interviews focused on "lessons learned" and the overall effectiveness of the program. These interviews are open-ended, in that there is a discussion guide, but responses will not be limited to a specific set of choices. Moreover, all respondents are promised confidentiality throughout the interview process to assure that these findings truly reflect program operations and activities. The results of these interviews were summarized for each program. Overall themes from these interviews are summarized for the entire portfolio.

The third-party implementer interviews were conducted by telephone. Particular attention was paid to the program implementers' perceptions of how the programs operate, what program data are tracked and captured, how that data are managed and maintained, and how the programs are promoted to motivate trade allies and customers.

3.5.4 TRADE ALLY INTERVIEWS

The Evaluators conducted trade ally surveys or in-depth interviews with participating trade allies. The specifics of these trade ally activities are described more fully in each Energy Smart Program chapter. These interviews focused on identifying areas of program effectiveness, overall satisfaction, and identifying barriers to program participation. The program staff/implementer provided the list of all participating trade allies; however, the actual respondents remain confidential. The results from these interviews are summarized at the program and portfolio level.

3.5.5 REVIEW OF PROGRAM MATERIALS

The Evaluators reviewed reports and supporting materials for clarity and consistency with program objectives. As an initial step in the PY11 process evaluation, the Evaluators reviewed available program documents such as delivery schedules, sample reports and samples of any additional engagement materials. The purpose of reviewing these materials is to understand what information is communicated to participants, how it is communicated, and to identify any gaps or opportunities for improvement.

3.5.6 PARTICIPANT SURVEYS

The Evaluators conducted surveys with C&I participants. These surveys focused on program awareness, participants' decision-making process, program operations, customer satisfaction with eligible measures, and satisfaction with the program as well as with ENO. These surveys also included questions to verify measure installations and collected other data necessary to support the impact evaluation.

3.5.7 BENCHMARK AND LITERATURE REVIEWS

The Evaluators conducted literature reviews of small business energy efficiency programs, commercial midstream programs, and publicly funded institution programs.

- **Small C&I Solutions program literature review:** The purpose of this review was to gather insight and information on other small business programs to assess how the program compared in terms of available measures, program design, and incentives. The review included a scan of information provided on utility's websites, as well as evaluation reports and conference proceedings. The review includes findings on program design, common challenges, and best practices.
- **Midstream offering literature review:** The purpose of this review was to provide information and insight into implementation of a similar program design, focusing on non-lighting measures. The Evaluators reviewed publicly available information on websites, evaluation reports, studies, and other publications related to commercial midstream programs. The findings were summarized, which include end use offerings, advantages and disadvantages of midstream program design, incentive structure, and implementation suggestions.
- **Publicly Funded Institutions program literature review:** The purpose of this review was to highlight the current practices for implementing energy efficiency programs designed for Publicly Funded Institutions (PFIs). PFIs (e.g., government buildings and public schools) are often subject to funding, regulatory, and timing constraints. The Evaluators used publicly available information from websites, case studies, and other publications regarding PFIs energy efficiency programs. They identified critical aspects of program design, delivery, end-use offerings, incentive levels, and marketing approaches used different stakeholders. Although the review is not exhaustive, the information gathered provides insight into current practices.

3.5.8 ANALYSYIS OF CENSUS DATA

The Evaluators conducted a review of publicly available data to summarize the current state of the small business environment in New Orleans, Orleans Parish, and Louisiana to help inform program design and implementation. Data from the U.S. Census was analyzed to assess the impacts of COVID-19 pandemic on small businesses, identified trends in business startups and closures, assessed local resources that might explain trends, and evaluated how these findings may affect small business participation in Energy Smart programs.

The Evaluators sough to answer the following questions:

- What are the characteristics of small businesses in Orleans Parish (e.g., total number of businesses and business types)?
- How have business trends changed over the course of the pandemic? How has the pandemic primarily affected businesses at given points in time?
- What are trends in terms of small business start-ups and small business closures? How does this intersect with COVID-19 pandemic?
- How might these trends be affecting participation in Energy Smart C&I programs?

The Evaluators reviewed several sources to gather data to understand the dynamics of COVID-19 pandemic on small business. In addition, raw data was analyzed or used data visualization tools, primarily from government sources. These sources are linked and described in the table below.

TABLE 3-12 SOURCES OF PRIMARY DATA ACCESSED

Study or Source Name	Description	Link
County Business Patterns 2018	These data are an annual series that provide county level economic data by industry.	CBP Census Data
Small Business Pulse Survey, 2020-to-date	This is a high-frequency survey, gathering data on the effect of changing business conditions during the COVID-19 pandemic on small businesses (single establishments under 500 employees).	Small Business Pulse Survey – Census
Business Formation Statistics	These data track business initiation activity at a state and regional level.	Business Formation Statistics
Retailer Sales Data	This interactive visualization allows users to understand the change in sales for retailers from 2019 to 2020.	Estimated Sales for US Retailers 19-20

To conduct this research, the Evaluators used data from the U.S. Census Bureau to assess how many businesses exist Orleans Parish and what type of businesses operate. Census data was also examined on business applications, providing data on the trend of business applications in the United States and Louisiana.

3.6 Cost-Effectiveness Evaluation

See Appendix B: Cost-Effectiveness Analysis for additional details on this approach. The results by each program and the portfolio for cost test is shown in the table below.

TABLE 3-13 PORTFOLIO COST-EFFECTIVENESS RESULTS

Program	TRC	UCT	RIM	PCT	SCT
HPwES	2.03	1.71	0.38	6.85	3.08
RLA	3.79	3.02	0.41	10.23	5.77
Multifamily Solutions	1.40	1.29	0.38	5.40	2.16
IQW	1.49	1.50	0.60	2.95	2.48
A/C Solutions	0.87	0.91	0.33	3.60	1.22
SK&E	0.65	0.49	0.23	9.23	0.87
AR&R Pilot	0.08	0.07	0.06	2.39	0.12
Behavioral	0.55	0.55	0.20	0.00	0.55
Rewards	0.00	0.00	0.00	1.00	0.00
EasyCool - DLC	0.00	0.00	0.00	0.00	0.00
EasyCool - BYOT	0.00	0.00	0.00	0.00	0.00
Small C&I Solutions	0.57	0.55	0.26	3.28	0.78
Large C&I Solutions	1.91	1.94	0.38	6.97	2.67
PFI	0.99	1.01	0.28	6.05	1.28
C&I NC	0.00	0.00	0.00	0.00	0.00
Large C&I DR	0.00	0.00	0.00	0.00	0.00
EasyCool for Business	0.00	0.00	0.00	0.00	0.00
Total	**1.06**	**0.99**	**0.33**	**6.35**	**1.55**

The details of each program evaluation are found in the sections below.

4 HOME PERFORMANCE WITH ENERGY STAR®

4.1 Summary

The tables below report *ex ante* gross, *ex post* gross, *ex post* net energy savings (kWh) (both annual and lifetime), demand reductions (kW), participation, and incentive spend by measure, where applicable.

TABLE 4-1 PY11 HPWES ENERGY SAVINGS (KWH)

Measure	*Ex ante* Gross Savings (kWh)	Realization Rate (kWh)	*Ex post* Gross Savings (kWh)	NTG	*Ex post* Net Savings (kWh)
Level I Assessment	0	N/A	0	N/A	0
1.5 Kitchen Aerator	616	100%	616	73%	448
1.0 Bathroom Aerator	1,608	100%	1,608	73%	1,169
1.5 Showerhead	7,524	100%	7,524	73%	5,467
Pipe Wrap	7,420	100%	7,420	73%	5,397
Indoor LED Lamp (Standard)	111,777	109%	122,294	73%	88,867
Indoor LED Lamp (Specialty)	145,580	112%	162,810	73%	118,309
Outdoor LED Lamp (Standard)	26,001	91%	23,661	73%	17,194
Outdoor LED Lamp (Specialty)	10,243	91%	9,321	73%	6,773
LED 15W PAR38 - LTN KIT	1,473,664	100%	1,473,724	65%	957,921
LED 15W A-Type - LTN KIT	763,701	100%	763,657	65%	496,377
LED 9W A-Type - LTN KIT	417,676	100%	417,734	65%	271,527
1.5 Showerhead - KIT	34,182	62%	21,251	91%	19,236
LED 9W A-Type - KIT	24,460	118%	28,902	64%	18,450
LED 15W A-Type - KIT	13,647	118%	16,151	64%	10,310
1.0 Bathroom Aerator - KIT	4,840	87%	4,219	94%	3,984
1.5 Kitchen Aerator - KIT	2,878	88%	2,532	93%	2,350
Central AC Tune-up	2,833	100%	2,833	82%	2,323
Smart Thermostat	65,170	100%	65,195	67%	43,681
Duct Sealing	767,928	94%	724,614	98%	710,119
Air Sealing	298,344	102%	304,539	100%	304,539
Attic Insulation	33,347	98%	32,607	91%	29,754
Tier 2 APS	31,354	100%	31,354	73%	22,785
Total	**4,244,792**	**100%**	**4,224,567**	**74%**	**3,136,976**

Sums may differ due to rounding.

TABLE 4-2 PY11 HPWES DEMAND REDUCTIONS (KW)

Measure	*Ex ante* Gross Demand (kW)	Realization Rate (kW)	*Ex post* Gross Demand (kW)	NTG	*Ex post* Net Demand (kW)
Level I Assessment	0.00	N/A	0.00	N/A	0.00
1.5 Kitchen Aerator	0.06	100%	0.06	73%	0.05
1.0 Bathroom Aerator	0.17	100%	0.17	73%	0.12
1.5 Showerhead	0.78	100%	0.78	73%	0.57
Pipe Wrap	0.84	100%	0.84	73%	0.61
Indoor LED Lamp (Standard)	18.98	105%	19.96	73%	14.50
Indoor LED Lamp (Specialty)	24.76	107%	26.57	73%	19.31
Outdoor LED Lamp (Standard)	0.81	0%	0.00	N/A	0.00
Outdoor LED Lamp (Specialty)	0.20	0%	0.00	N/A	0.00
LED 15W PAR38 - LTN KIT	0.00	N/A	0.00	N/A	0.00
LED 15W A-Type - LTN KIT	0.00	N/A	0.00	N/A	0.00
LED 9W A-Type - LTN KIT	70.78	98%	69.54	65%	45.20
1.5 Showerhead - KIT	0.00	N/A	2.21	91%	2.00
LED 9W A-Type - KIT	4.19	117%	4.91	64%	3.13
LED 15W A-Type - KIT	2.31	119%	2.74	64%	1.75
1.0 Bathroom Aerator - KIT	0.00	N/A	0.43	94%	0.41
1.5 Kitchen Aerator - KIT	0.00	N/A	0.26	93%	0.25
Central AC Tune-up	1.33	100%	1.33	82%	1.09
Smart Thermostat	0.00	N/A	0.00	N/A	0.00
Duct Sealing	278.90	95%	263.80	98%	258.52
Air Sealing	127.74	102%	130.40	100%	130.40
Attic Insulation	95.69	97%	92.72	91%	84.61
Tier 2 APS	3.03	100%	3.03	73%	2.20
Total	**630.57**	**98%**	**619.77**	**91%**	**564.73**

Sums may differ due to rounding.

TABLE 4-3 PY11 HPWES LIFETIME SAVINGS SUMMARY

Measure	EUL	*Ex post* Gross Lifetime Energy Savings (kWh)	*Ex post* Net Lifetime Energy Savings (kWh)
Level I Assessment	N/A	0	0
1.5 Kitchen Aerator	10	6,164	4,481
1.0 Bathroom Aerator	10	16,078	11,687
1.5 Showerhead	10	75,240	54,670
Pipe Wrap	13	96,464	70,155
Indoor LED Lamp (Standard)	17	2,107,130	1,531,176
Indoor LED Lamp (Specialty)	20	3,256,209	2,366,172
Outdoor LED Lamp (Standard)	17	407,677	296,245
Outdoor LED Lamp (Specialty)	20	186,422	135,466
LED 15W PAR38 - LTN KIT	20	29,474,489	19,158,418
LED 15W A-Type - LTN KIT	17	13,157,814	8,552,579
LED 9W A-Type - LTN KIT	17	7,197,551	4,678,408
1.5 Showerhead - KIT	10	212,511	192,359
LED 9W A-Type - KIT	17	497,977	317,885
LED 15W A-Type - KIT	17	278,281	177,642
1.0 Bathroom Aerator - KIT	10	42,194	39,836
1.5 Kitchen Aerator - KIT	10	25,320	23,498
Central AC Tune-up	19	53,821	44,133
Smart Thermostat	11	717,142	480,488
Duct Sealing	18	13,043,058	12,782,151
Air Sealing	11	3,349,925	3,349,925
Attic Insulation	20	652,138	595,071
Tier 2 APS	10	313,543	227,847
Total	**18**	**75,167,146**	**55,090,291**

Sums may differ due to rounding.

TABLE 4-4 PY11 HPWES COUNT OF MEASURES AND INCENTIVE SPEND

Measure	Participation (Count of Measures)	Incentive Spend ($)
Level I Assessment	629	$84,600
1.5 Kitchen Aerator	23	$115
1.0 Bathroom Aerator	25	$109
1.5 Showerhead	26	$369
Pipe Wrap	53	$293
Indoor LED Lamp (Standard)	450	$19,991
Indoor LED Lamp (Specialty)	476	$22,800
Outdoor LED Lamp (Standard)	28	$600
Outdoor LED Lamp (Specialty)	12	$352
LED 15W PAR38 - LTN KIT	4,369	$41,506
LED 15W A-Type - LTN KIT	4,369	$21,845
LED 9W A-Type - LTN KIT	4,369	$93,934
1.5 Showerhead - KIT	436	$3,357
LED 9W A-Type - KIT	436	$5,624
LED 15W A-Type - KIT	436	$2,507
1.0 Bathroom Aerator - KIT	436	$610
1.5 Kitchen Aerator - KIT	436	$981
Central AC Tune-up	3	$450
Smart Thermostat	159	$28,500
Duct Sealing	361	$122,869
Air Sealing	228	$107,111
Attic Insulation	11	$6,129
Tier 2 APS	131	$9,330
Total	**17,902**	**$573,983**

Sums may differ due to rounding.

4.2 Program Description

HPwES is designed to achieve long-term, significantly cost-effective electric savings through the use of local auditors and trade allies who will help residential customers analyze their energy use and identify opportunities to improve efficiency, install low-cost energy-saving measures, and identify and implement more comprehensive home efficiency projects. HPwES will offer three levels of home energy audits. The Level I Assessment will include a "walk-through" inspection and direct installation of low-cost measures, such as LEDs and water conservation measures. To generate additional savings at the time of the audit, demand response-enabled smart thermostats were added as a direct install measure. The Level II and III Assessments are comprehensive home inspections with diagnostic testing, performed by a qualified trade ally, targeted to achieve deeper savings within the home.

To meet the needs of New Orleans' unique housing stock of double shot-gun homes and smaller multifamily configurations, the offering now includes all buildings with four or fewer units in the HPwES offering. Structures of this size and construction type often behave and function more like single-family homes, with owners often occupying one of the units, thus minimizing the split-incentive barrier.

4.2.1 PROGRAM CHANGES

In response to the COVID-19 pandemic, the program began offering virtual home energy assessments in PY10. Customers were provided the option to participate in a virtual home assessment through their smart phone or tablet. Following the assessment, the program shipped a customized box of measures to the customer's home for self-installation.

The COVID-19 pandemic and variants have caused a reduction in activity due to crew availability and homeowner reluctance to have visitors. They do require their employees and trade allies to follow strict protocols.

4.2.2 OPERATIONS AND TRENDS

Program staff made some observations regarding customer interests, progress, and operations during the pandemic. They observed that smart thermostats have "really caught on." They are taking lots of phone calls on different types and questions about incentives. They observed that lighting and duct sealing may become a challenge, in general, as the program finds fewer opportunities for savings.

They noted that there are still plenty of opportunities with HPwES, but the new variant of the pandemic could be a barrier due to the face-to-face nature of these programs. On the other hand, they felt inflation might drive more people to the program looking to stretch their budgets.

4.2.3 PROGRAM DELIVERY CHANNELS AND EXPECTED SAVINGS

A total of 5,545 distinct households participated in PY11. Participation included:

- 629 homes receiving traditional assessments;
- 656 homes receiving major measures;
- 1,330 homes receiving direct install measures;
- 436 homes receiving HESKs; and
- 4,369 homes receiving LTN kits.

4.2.3.1 Home Energy Savings Kits (HESKs)

A total of Home Energy Savings Kits (HESK) 436 kits were distributed to residences through orders from the Online Marketplace (OLM). Kits were free of charge and included the following items:

- (3) 9W A-Type LEDs;
- (1) 15W A-Type LED;
- (1) 1.5 GPM Kitchen Aerator;
- (1) 1.0 GPM Bathroom Aerator;
- (1) 1.5 GPM Showerhead;
- Literature on included measures and
- Energy Smart promotional materials.

Expected and verified savings from the HESKs are presented in the sections below.

4.2.3.2 Light the Night Kits (LTN Kit)

New for PY11, the LTN kits were distributed to ENO customers that have the following characteristics:

- Customers who have not been served by a DI program (HPwES or IQW)
- Customers who have not requested a traditional kit
- Customers in neighborhoods with higher crime levels

The campaign premise is to "Light up the Night" and help people illuminate their porches and yards to help deter illegal/inappropriate behavior. A total of LTN 4,369 kits were distributed to residences through orders from the OLM. Kits were free of charge and included the following items:

- (5) 9W A-Type LEDs;
- (1) 15W A-Type LED;
- (2) 15W PAR38 LEDs;
- Literature on included measures; and
- Energy Smart promotional materials.

Expected and verified savings from the LTN Kits are presented in the sections below.

4.2.3.3 Direct Install and Major Measures

Below, Table 4-5 summarizes the total number of measures installed and the expected kWh and peak kW savings by measure. HESKs and LTN Kit (LTN KIT) savings are presented by the items that are included in each of the kits.

TABLE 4-5 PY11 HPWES SUMMARY OF MEASURES AND EXPECTED SAVINGS

Measure	Sum of Measures	*Ex ante* Gross Energy Savings (kWh)	*Ex ante* Gross Demand Reductions (kW)	% of kWh
Level I Assessment	629	0	0.00	0%
1.5 Kitchen Aerator	0	616	0.06	0%
1.0 Bathroom Aerator	0	1,608	0.17	0%
1.5 Showerhead	0	7,524	0.78	0%
Pipe Wrap	0	7,420	0.84	0%
Indoor LED Lamp (Standard)	14,355	111,777	18.98	3%
Indoor LED Lamp (Specialty)	18,257	145,580	24.76	3%
Outdoor LED Lamp (Standard)	398	26,001	0.81	1%
Outdoor LED Lamp (Specialty)	176	10,243	0.20	0%
LED 15W PAR38 - LTN KIT	34,984	1,473,664	0.00	35%
LED 15W A-Type - LTN KIT	15,675	763,701	0.00	18%
LED 9W A-Type - LTN KIT	78,377	417,676	70.78	10%
1.5 Showerhead - KIT	0	34,182	0.00	1%
LED 9W A-Type - KIT	4,693	24,460	4.19	1%
LED 15W A-Type - KIT	1,564	13,647	2.31	0%
1.0 Bathroom Aerator - KIT	0	4,840	0.00	0%
1.5 Kitchen Aerator - KIT	0	2,878	0.00	0%
Central AC Tune-up	0	2,833	1.33	0%
Smart Thermostat	0	65,170	0.00	2%
Duct Sealing	0	767,928	278.90	18%
Air Sealing	0	298,344	127.74	7%
Attic Insulation	0	33,347	95.69	1%
Tier 2 APS	0	31,354	3.03	1%
Total	**169,110**	**4,244,792**	**630.57**	**100%**

Sums may differ due to rounding.

Below, Figure 4-1 illustrates and compares the differences in kWh savings contributions by each DI and major measure provided during PY11.

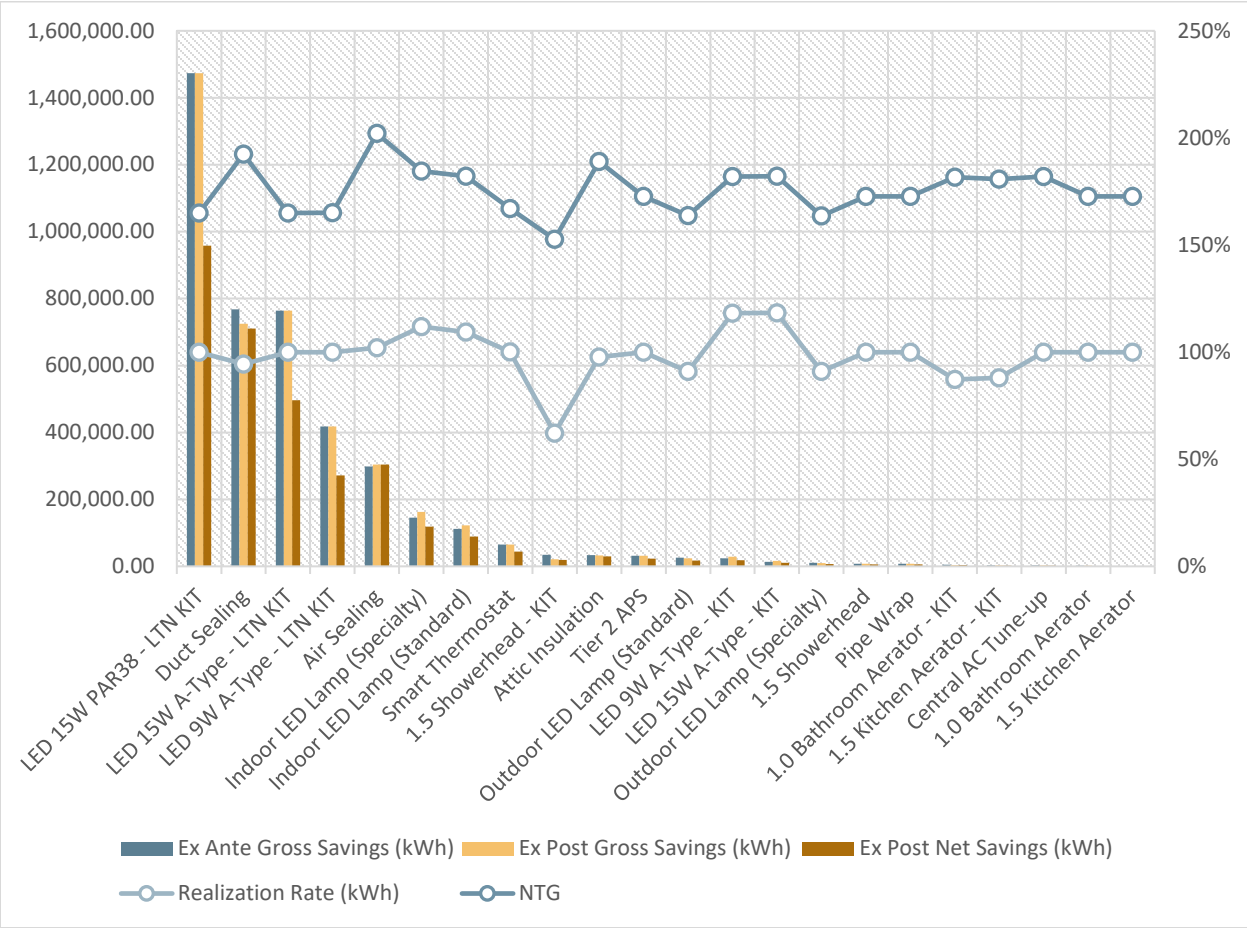


FIGURE 4-1 HPWES CONTRIBUTION TO SAVINGS BY MEASURE

Duct sealing contributes 18.1% of expected savings, air sealing projects contribute 7.0%, and LEDs contribute an additional 6.9%. The bulk of PY11 expected savings were from the Light the Night mailer kits (63%) and the duct sealing projects.

In PY9, there were 906 non-HESK projects summing to 2,262,170 kWh completed during an extended 15-month period. Normalizing these figures to a 12-month program year for an 'apples-to-apples' comparison yields an expected 651 projects summing to 1,554,997 kWh. During PY10, the program ran for only nine months, completing 585 projects summing to 282,412 kWh in non-HESK expected savings. A similar normalization process yields 780 projects and 376,549 kWh in a 12-month period. This is an approximate 76% drop in expected savings, which is most likely due to the COVID-19 pandemic. Due to the delayed launch of the of the program year, low customer intervention response rates, and interruptions to on-sites due to the pandemic, the performance of the program (and the evaluation results), in many cases, should be interpreted as idiosyncratic to PY10 because of the COVID-19 pandemic.

Finally, in PY11 there a total of 757 distinct non-kit homes accounting for 1,509,745 kWh of non-kit expected savings. The non-kit expected savings account for a 301% increase of expected savings,

compared to the normalized PY10 expected savings. The HESKs and then LTN Kits accounted for the remaining 2,735,047 kWh of expected savings.

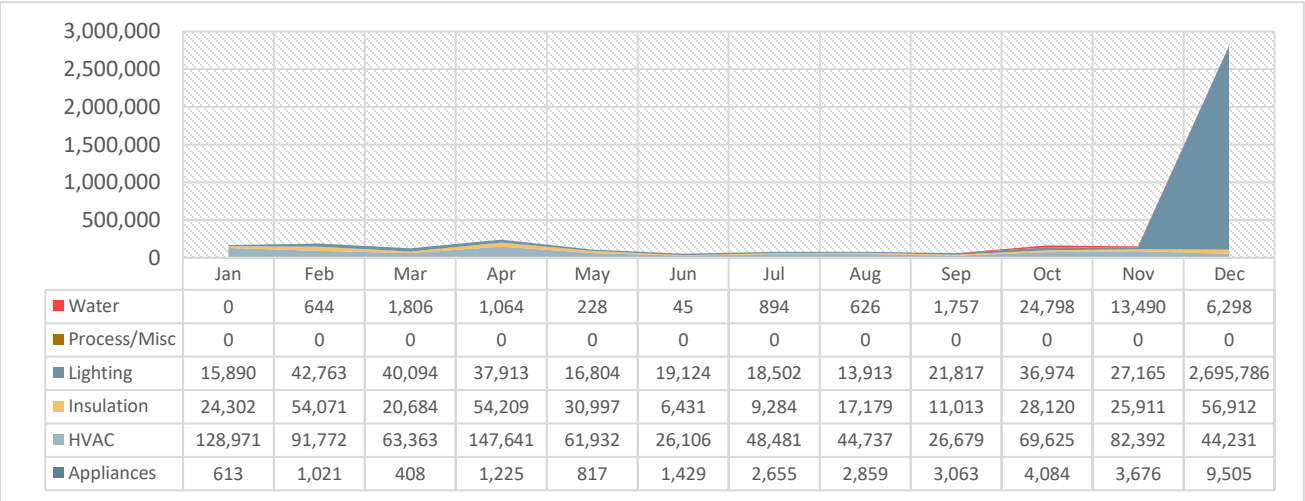
TABLE 4-6 PY11 HPWES PARTICIPATION AND EXPECTED SAVINGS BY PROGRAM YEAR

Program Year (PY)	Count of Homes	*Ex ante* Gross Energy Savings (kWh)	Expected kWh per Home
PY7 (nominal)	348	1,139,700	3,275
PY7 (adjusted)	496	1,624,400	3,275
PY8	739	2,416,122	3,269
PY9 (total)[11]	906	2,262,170	2,497
PY9 (calendar)[12]	651	1,554,997	2,389
PY10 (nominal)	585	282,412	483
PY10 (adjusted)	780	376,549	483
PY11	757	1,509,745	1,994

Between PY10 and PY11, HESK distribution and savings decreased by approximately 90%. Although there was a significant drop in HESKs savings, a large portion of expected savings was shifted over to the LTN Kits. The LTN Kits alone accounted for 62.5%, a significant portion of expected savings for PY11.

4.2.4 TIMING OF PROJECTS

The figure below shows *ex ante* energy savings (kWh) for HPwES by end use, by month. 64% of claimed energy savings were claimed by lighting measures in the month of December.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Water	0	644	1,806	1,064	228	45	894	626	1,757	24,798	13,490	6,298
Process/Misc	0	0	0	0	0	0	0	0	0	0	0	0
Lighting	15,890	42,763	40,094	37,913	16,804	19,124	18,502	13,913	21,817	36,974	27,165	2,695,786
Insulation	24,302	54,071	20,684	54,209	30,997	6,431	9,284	17,179	11,013	28,120	25,911	56,912
HVAC	128,971	91,772	63,363	147,641	61,932	26,106	48,481	44,737	26,679	69,625	82,392	44,231
Appliances	613	1,021	408	1,225	817	1,429	2,655	2,859	3,063	4,084	3,676	9,505

FIGURE 4-2 *EX ANTE* SAVINGS BY END USE BY MONTH

[11] Shown without HES Kits. Including data from HESKs, PY9 total household count is 6,280 and savings per home is 146 kWh.

[12] PY9 was an extended year, lasting 15 months. Figures presented here are normalized to represent a full program year (12 months).

4.2.5 TRADE ALLIES

There are 10 trade allies in the HPwES program. Nine of the reported trade allies perform weatherization work, including the following measures: duct sealing, attic insulation, air sealing. Two of the nine trade allies also perform HVAC projects, performing AC tune-ups in single-family homes.

Additionally, in place of trade allies, the implementer installs direct install measures, including the following: advanced power strips (APS), smart thermostats, pipe wrap, aerators, showerheads, and lighting. They also install duct sealing and air sealing. All assessments were performed by them as well, representing 74% of claimed savings.

The table below shows the distribution of savings across all trade allies and the implementer.

TABLE 4-7 HPWES TRADE ALLY ACTIVITY

Trade Ally	*Ex ante* Gross Energy Savings (kWh)	% of Savings
TA1	3,138,611	74%
TA2	623,636	15%
TA3	171,437	4%
TA4	128,472	3%
TA5	72,399	2%
TA6	44,984	1%
TA7	38,606	1%
TA8	15,054	0%
TA9	6,698	0%
TA10	4,896	0%

4.2.6 GOAL ACHIEVEMENT

Total verified savings and percentage of goals for the HPwES are summarized in the tables below.

TABLE 4-8 PY11 HPWES PROGRAM VERIFIED GROSS KWH SAVINGS

Program	*Ex post* Gross Energy Savings (kWh) Goal	*Ex ante* Gross Energy Savings (kWh)	*Ex post* Gross Energy Savings (kWh)	*Ex post* Net Energy Savings (kWh)	Realization Rate	NTG	% to Goal
HPwES	$4,027,638	$4,244,792	4,224,567	3,136,976	100%	74%	105%

TABLE 4-9 PY11 HPWES PROGRAM VERIFIED GROSS KW REDUCTIONS

Program	*Ex post* Gross Demand Reductions (kW) Target	*Ex ante* Gross Demand Reductions (kW)	*Ex post* Gross Demand Reductions (kW)	*Ex post* Net Demand Reductions (kW)	Realization Rate	NTG	% to Target
HPwES	619.77	630.57	619.77	564.73	98%	74%	50%

4.3 EM&V Methodology

The HPwES Program has received comprehensive impact and process evaluations in PY5 through PY9. The evaluations provided free-ridership estimates, discussions of program satisfaction and strategic recommendations for program improvement, and most/all measures offered by the program have deemed TRM savings. In the initial review of the PY11 program, the Evaluators concluded that the HPwES Program did not warrant more than a brief overview of program activity, supplemented with brief surveys of program trade allies.

The PY11 evaluation of HPwES included the following: project data review, desk reviews, and interviews with trade allies that participate in HPwES and other Energy Smart residential programs; and previous program year field visit results review instead of on-site testing and data collection.

Verified savings were calculated using methods and inputs in the NO TRM V4.0 and incorporated results from reviewing prior program years' field visit results to determine appropriate adjustment factors.

Additionally, the Evaluators incorporated results from a participant survey conducted in PY9 geared towards participants that received home energy kits. The Evaluators interviewed 178 PY9 HESK recipients to develop PY9 in-service rates and the percentage of homes with electric resistance water heating. Besides the LTN Kits, PY11 major savings components are duct sealings, air sealings, and LEDs. The following section discusses savings calculation methods for these measure in detail.

4.3.1 DEEMED SAVINGS CALCULATIONS

4.3.1.1 AC Tune-ups

Central Air Conditioner and Heat Pump Tune-Up savings were calculated using the following savings algorithms from the NO TRM V4.0, section C.3.7.

Deemed savings was calculated using test-in and test-out efficiency data.

$$kWh_{Savings\_Cooling} = CAP_c \times \frac{1\text{ kW}}{1{,}000\text{ W}} \times \left(\frac{1}{EER_{pre}} - \frac{1}{EER_{post}}\right) \times EFLH_C$$

$$kWh_{Savings\_Heating} = CAP_c \times \frac{1\text{ kW}}{1{,}000\text{ W}} \times \left(\frac{1}{HSPF_{pre}} - \frac{1}{HSPF_{post}}\right) \times EFLH_H$$

$$kW_{Savings} = CAP_c \times \frac{1\text{ kW}}{1{,}000\text{ W}} \times \left(\frac{1}{EER_{pre}} - \frac{1}{EER_{post}}\right) \times \%CF$$

Where:

CAP_C = Cooling capacity (in BTU)
EER_{pre} = Efficiency of the equipment prior to tune-up
EER_{post} = Nameplate efficiency of the existing equipment
$EFLH_C$ = Equivalent Full Load Hours - cooling (1,637)
$EFLH_H$ = Equivalent Full Load Hours - heating (600)

$HSPF_{pre}$ = Measured efficiency of the heating equipment before tune-up
$HSPF_{post}$ = Measured efficiency of the heating equipment after tune
CF = Coincidence factor = 0.77[13]

4.3.1.2 Air Sealing

Methods for calculating he deemed savings values for air infiltration reduction came from the NO TRM V4.0, Section C.4.7. Deemed savings multipliers were developed through EnergyGauge, a simulation software program. Multiple equipment configurations were simulated in in developing savings values denominated in deemed savings per CFM50 of air leakage rate reduction. Table 4-10 summarizes the deemed savings values for New Orleans.

TABLE 4-10 DEEMED SAVINGS VALUES FOR AIR INFILTRATION REDUCTION

Equipment Type	kWh/CFM Savings	kW/CFM Savings
Electric AC with Gas Heat	0.4108	0.000331
Elec. Resistance w/ AC	1.0180	0.000332
Heat Pump	0.7210	0.000332

For example, consider a residence with electric AC and gas heat located. If the residence had a leakage rate of 7,200 CFM50 before air infiltration reduction and a leakage rate of 3,500 CFM50 after, then the residence would have an annual savings of:

$$Air\ Infiltration\ Savings = 0.4108 \frac{kWh\ Savings}{CFM_{50}} \times \left(7{,}200\ CFM_{50\ pre} - 3{,}500\ CFM_{50\ post}\right)$$

$$Air\ Infiltration\ Savings = 1{,}519.96\ kWh$$

4.3.1.3 Duct Sealing

Duct sealing savings were calculated using the following savings algorithms from the NO TRM V4.0, Section C.3.8.

Energy (kWh) Savings:

$$kWh_{savings\ (Cooling)} = \frac{(DL_{pre} - DL_{post}) \times EFLH_C \times (h_{out}\rho_{out} - h_{in}\rho_{in}) \times 60}{1{,}000 \times SEER}$$

$$kWh_{savings\ (Heating)} = \frac{\left(DL_{pre} - DL_{post}\right)/(((CAP/12{,}000) \times 400) \times EFLH_h \times CAP \times TRFheat}{\eta\text{Heat} / 3{,}412}$$

Where:

DL_{pre} = Pre-improvement duct leakage at 25 Pa (ft3/min)
DL_{post} = Post-improvement duct leakage at 25 Pa (ft3/min)

[13] Developed through direct monitoring during the development of the NO TRM V4.0.

ΔDSE = Assumed improvement in distribution system efficiency = 5% = 0.05
$EFLH_C$ = Equivalent Full Load Hours - cooling (1,637)
h_{out} = Outdoor design specific enthalpy (Btu/lb)
h_{in} = Indoor design specific enthalpy (Btu/lb.)
ρ_{out} = Density of outdoor air at 95°F = 0.0740 (lb/ft3)[14]
ρ_{in} = Density of conditioned air at 75°F = 0.0756 (lb./ft3)
$EFLH_H$ = Equivalent Full Load Hours - heating (600)
$12{,}000$ = Btu/ton conversion factor
$TRFheat$ = Thermal Regain Factor for heating = 1.0 Unconditioned; 0.4 Semi-conditioned space
ηHeat = Efficiency in COP of Heating equipment = Actual. If unavailable, use 1.0.
$3{,}412$ = Conversion of BTU/kWh.

Demand (kW) Reductions:

$$kW_{reductions} = \frac{kWh_{savings\ (Cooling)}}{EFLH_C} \times CF$$

$kWh_{savings\ (Cooling)}$ = Calculated kWh savings for cooling

$EFLH_C$ = Equivalent Full Load Hours - cooling (1,637)

CF = Coincidence factor = 0.77

TABLE 4-11 DEEMED INPUT VALUES FOR DUCT SEALING CALCULATIONS

Parameter Input	Value
$EFLH_C$	1,637
$EFLH_H$	600
h_{out}	40
h_{in}	30
ρ_{in}	0.076
ρ_{out}	0.074
SEER	11.5
HSPF	7.30

4.3.1.4 LED Lamps

Methods for calculating the deemed savings values for LEDs came from NO TRM V4.0. The methodology for ENERGY STAR Directional and Decorative LEDs is found in Sections C.5.3 while the methodology for ENERGY STAR Omni-Directional LEDs is found in Section C.5.4.

$$kWh_{savings} = \left((W_{base} - W_{post})/1000\right) \times Hours \times ISR \times IEF_E$$

[14] ASHRAE Fundamentals 2009, Chapter 1: Psychometrics, Equation 11, Equation 41, Table 2.

$$kW_{savings} = \left((W_{base} - W_{post})/1000\right) \times CF \times ISR \times IEF_D$$

Where:

W_{base} = Based on wattage equivalent of the lumen output of the installed
W_{post} = Actual wattage of LED installed
$Hours$ = Average hours of use per year: 880.5 hours for indoor LEDs, 4,319 hours for outdoor
IEF_E = Interactive Effects Factor to account for cooling energy savings and heating energy penalties
IEF_D = Interactive Effects Factor to account for cooling demand reductions and heating energy penalties
CF = Coincidence Factor, (11.12%)
ISR = In-Service Rate (98.0% for direct install applications)

TABLE 4-12 LED ENERGY AND DEMAND INTERACTIVE FACTORS

Parameter Input	IEF_E	IEF_D
Gas Heat with AC	1.10	1.29
Electric Resistance Heat with AC	0.83	1.29
Heat Pump	0.96	1.29
Heating/Cooling Unknown[15]	0.91	1.21

4.3.1.5 Deemed Savings for Other HPwES Measures

For remaining HPwES program measures, the Evaluators used the following NO TRM V4.0 sections and tables to verify savings.

TABLE 4-13 NO TRM V4.0 SECTIONS FOR OTHER MEASURES - HPWES

Measure	TRM Section	Calculated / Deemed	TRM Table(s)	Table Page(s)
Aerators	C.2.4	Deemed	Table 42	C-55
Ceiling Insulation	C.4.2	Calculated	N/A	C-106
Pipe Wrap	C.2.3	Deemed	Table 40	C-51
Power Strips	C.1.6	Deemed	Table 12	C-19
Showerheads	C.2.5	Deemed	Table 47	C-60
Smart Thermostats	C.3.9	Deemed	Table 75	C-102

4.3.2 IN-SERVICE RATES FOR PY11

4.3.2.1 Air Sealing

During the site visits conducted in PY5 to PY8, the Evaluators' field staff conducted blower door testing from 198 homes to validate post-retrofit leakage estimates indicated in program tracking data. The

[15] Unknown factors are based on EnergyStar Interactive effects, weighted by primary data collected on New Orleans typical HVAC arrangements.

resulting average post-retrofit leakage estimate was calculated as 101.96% of expected leakage reductions. That is, of 198 homes the Evaluators found that air sealing $CFM_{50_{post}}$ results were 1.96% higher than those reported in tracking data. This factor was used to adjust the reported $CFM_{50_{post}}$ values in air sealing program data before conducting the final analysis. These results were applied for the PY11 evaluation.

4.3.2.2 Duct Sealing

During the site visits conducted in PY5 – PY8, the Evaluators' field staff conducted blower door testing from 320 homes to validate post-retrofit leakage estimates indicated in program tracking data. The resulting average is 93.78%. That is, of 320 homes the Evaluators found that duct sealing $CFM_{25_{post}}$ results were 6.22% lower than those reported in tracking data. This factor was used to adjust the reported $CFM_{25_{post}}$ values in duct sealing program data before conducting the final analysis. These results were applied for the PY11 evaluation.

4.3.2.3 Home Energy Saving Kits (HESKs)

The Evaluators interviewed 178 PY9 HESK recipients to develop PY9 in-service rates as well as the percentage of homes with electric resistance water heating. Overall results are shown below in Table 4-14

TABLE 4-14 PY9 HESK RECIPIENT SURVEY RESULTS APPLIED TO PY11

Kit Item	In-Service Rate	Percentage of Electric Resistance Water Heater
1.0 Bathroom Aerator	53.13%	40.79%
1.5 Kitchen Aerator	40.99%	40.79%
1.5 Showerhead	52.41%	40.79%
LED 15W A-Type	82.04%	0.0%
LED 9W A-Type	82.04%	0.0%

4.3.2.4 Light the Night (LTN) Kits

The Evaluators applied the deemed ISR for mailer kit LEDs as prescribed by the NO TRM V4.0 in Table C-130 in Section C.5.1. The deemed ISR of 71% was applied due to the measure being new for PY11.

4.4 Evaluation Findings

Evaluation findings can be reviewed in Section 4.1 Summary. Overall, the program resulted in 4,224,567 saved kWh and peak kW was reduced by 619.77 kW.

4.4.1 GROSS IMPACT FINDINGS

4.4.1.1 AC Tune-ups

Expected and verified savings for PY11 HPwES AC tune-ups are summarized below.

TABLE 4-15 PY11 HPWES EXPECTED AND VERIFIED AC TUNE-UPS SAVINGS

Ex ante Gross Energy Savings (kWh)	*Ex post* Gross Energy Savings (kWh)	Realization Rate kWh	*Ex ante* Gross Demand Reductions (kW)	*Ex post* Gross Demand Reductions (kW)	Realization Rate kW
2,833	2,833	100.0%	1.33	1.33	100.0%

4.4.1.2 Advanced Power Strips

Expected and verified savings for PY11 HPwES advanced power strips are summarized below.

TABLE 4-16 PY11 HPWES EXPECTED AND VERIFIED ADVANCED POWER STRIPS SAVINGS

Ex ante Gross Energy Savings (kWh)	*Ex post* Gross Energy Savings (kWh)	Realization Rate kWh	*Ex ante* Gross Demand Reductions (kW)	*Ex post* Gross Demand Reductions (kW)	Realization Rate kW
31,354	31,354	100.0%	3.03	3.03	100.0%

4.4.1.3 Aerators

Expected and verified savings for PY11 HPwES aerators are summarized below.

TABLE 4-17 PY11 HPWES EXPECTED AND VERIFIED AERATORS SAVINGS

Ex ante Gross Energy Savings (kWh)	*Ex post* Gross Energy Savings (kWh)	Realization Rate kWh	*Ex ante* Gross Demand Reductions (kW)	*Ex post* Gross Demand Reductions (kW)	Realization Rate kW
2,225	2,224	100%	0.23	0.23	100%

4.4.1.4 Air Sealing

The savings resulting from using NO TRM V4.0 algorithms and deemed savings parameters, plus the application of the field result average are summarized in Table 4-18.

TABLE 4-18 PY11 HPWES EXPECTED AND VERIFIED AIR SEALING SAVINGS

Ex ante Gross Energy Savings (kWh)	*Ex post* Gross Energy Savings (kWh)	Realization Rate kWh	*Ex ante* Gross Demand Reductions (kW)	*Ex post* Gross Demand Reductions (kW)	Realization Rate kW
298,344	304,539	102.1%	127.74	130.40	102.1%

4.4.1.5 Attic Insulation

Expected and verified savings for the PY11 HPwES attic insulation projects are summarized below.

TABLE 4-19 PY11 HPWES EXPECTED AND VERIFIED ATTIC INSULATION SAVINGS

Ex ante Gross Energy Savings (kWh)	*Ex post* Gross Energy Savings (kWh)	Realization Rate kWh	*Ex ante* Gross Demand Reductions (kW)	*Ex post* Gross Demand Reductions (kW)	Realization Rate kW
33,347	32,607	97.8%	95.69	92.72	96.9%

4.4.1.6 Duct Sealing

The savings resulting from using NO TRM V4.0 algorithms and deemed savings parameters, plus the application of the field result average are summarized in Table 4-20.

TABLE 4-20 PY11 HPWES EXPECTED AND VERIFIED DUCT SEALING SAVINGS

Ex ante Gross Energy Savings (kWh)	*Ex post* Gross Energy Savings (kWh)	Realization Rate kWh	*Ex ante* Gross Demand Reductions (kW)	*Ex post* Gross Demand Reductions (kW)	Realization Rate kW
767,928	724,614	94.4%	278.90	263.80	94.6%

4.4.1.7 HESKs

The savings resulting from using NO TRM V4.0 algorithms and deemed savings parameters, plus the application of the recipient survey results are summarized in Table 4-21.

TABLE 4-21 PY11 HPWES EXPECTED AND VERIFIED HESKS SAVINGS

Ex ante Gross Energy Savings (kWh)	*Ex post* Gross Energy Savings (kWh)	Realization Rate kWh	*Ex ante* Gross Demand Reductions (kW)	*Ex post* Gross Demand Reductions (kW)	Realization Rate kW
80,006	73,055	91.3%	6.50	10.56	162.6%

4.4.1.8 LEDs

Expected and verified savings for PY11 HPwES LEDs are summarized below.

TABLE 4-22 PY11 HPWES EXPECTED AND VERIFIED LED SAVINGS

Ex ante Gross Energy Savings (kWh)	*Ex post* Gross Energy Savings (kWh)	Realization Rate kWh	*Ex ante* Gross Demand Reductions (kW)	*Ex post* Gross Demand Reductions (kW)	Realization Rate kW
293,601	318,087	108.3%	44.76	46.53	104.0%

4.4.1.9 LTN Kits

The savings resulting from using NO TRM V4.0 algorithms and deemed savings parameters, plus the application of the mailer kit ISR of 71% are summarized in Table 4-23.

TABLE 4-23 PY11 HPWES EXPECTED AND VERIFIED LTN KITS SAVINGS

Ex ante Gross Energy Savings (kWh)	*Ex post* Gross Energy Savings (kWh)	Realization Rate kWh	*Ex ante* Gross Demand Reductions (kW)	*Ex post* Gross Demand Reductions (kW)	Realization Rate kW
2,655,041	2,655,115	100.0%	70.78	69.54	98.2%

4.4.1.10 Pipe Wrap

Expected and verified savings for the PY11 HPwES pipe wrap projects are summarized below.

TABLE 4-24 PY11 HPWES EXPECTED AND VERIFIED PIPE WRAP SAVINGS

Ex ante Gross Energy Savings (kWh)	*Ex post* Gross Energy Savings (kWh)	Realization Rate kWh	*Ex ante* Gross Demand Reductions (kW)	*Ex post* Gross Demand Reductions (kW)	Realization Rate kW
7,420	7,420	100.0%	0.84	0.84	100.0%

4.4.1.11 Showerheads

Expected and verified savings for PY11 HPwES showerheads are summarized below.

TABLE 4-25 PY11 HPWES EXPECTED AND VERIFIED SHOWERHEADS SAVINGS

Ex ante Gross Energy Savings (kWh)	*Ex post* Gross Energy Savings (kWh)	Realization Rate kWh	*Ex ante* Gross Demand Reductions (kW)	*Ex post* Gross Demand Reductions (kW)	Realization Rate kW
7,524	7,524	100.0%	0.78	0.78	100.0%

4.4.1.12 Smart Thermostats

Expected and verified savings for PY11 HPwES smart thermostats are summarized below.

TABLE 4-26 PY11 HPWES EXPECTED AND VERIFIED SMART THERMOSTAT SAVINGS

Ex ante Gross Energy Savings (kWh)	*Ex post* Gross Energy Savings (kWh)	Realization Rate kWh	*Ex ante* Gross Demand Reductions (kW)	*Ex post* Gross Demand Reductions (kW)	Realization Rate kW
65,170	65,195	100.0%	0.00	0.00	N/A

4.4.1.13 Avoided Replacement Cost

The Evaluators have added the benefits of avoided replacement costs (ARC). The table below summarize the ARC by measure in HPwES.

Information on methodology can be found in Section 3.4.1.3 Avoided Replacement Costs.

TABLE 4-27 SUMMARY OF ARC FOR HPWES

Measure	*Ex post* Gross ARCs ($)	*Ex post* Net ARCs ($)	NPV ARCs ($)
1.5 Kitchen Aerator	$0	$0	$0
1.0 Bathroom Aerator	$0	$0	$0
1.5 Showerhead	$0	$0	$0
Pipe Wrap	$0	$0	$0
Indoor LED Lamp (Standard)	$14,355	$10,431	$10,431
Indoor LED Lamp (Specialty)	$18,257	$13,267	$13,267
Outdoor LED Lamp (Standard)	$398	$289	$289
Outdoor LED Lamp (Specialty)	$176	$128	$128
LED 15W PAR38 - LTN KIT	$34,984	$22,740	$22,740
LED 15W A-Type - LTN KIT	$15,675	$10,189	$10,189
LED 9W A-Type - LTN KIT	$78,377	$50,945	$50,945
1.5 Showerhead - KIT	$0	$0	$0
LED 9W A-Type - KIT	$4,693	$2,996	$2,996
LED 15W A-Type - KIT	$1,564	$999	$999
1.0 Bathroom Aerator - KIT	$0	$0	$0
1.5 Kitchen Aerator - KIT	$0	$0	$0
Central AC Tune-up	$0	$0	$0
Smart Thermostat	$0	$0	$0
Duct Sealing	$0	$0	$0
Air Sealing	$0	$0	$0
Attic Insulation	$0	$0	$0
Tier 2 APS	$0	$0	$0
Total	**$168,481**	**$111,984**	**$111,984**

Sums may differ due to rounding.

4.4.2 NET IMPACT FINDINGS

During PY9 the Evaluators conducted NTG surveys. Their results have been applied to PY11. Below, PY9 methods are discussed below.

- Participant survey responses were used to estimate the net energy impacts of the program. The program net savings are equal to gross savings, less savings associated with free-ridership, plus participant spillover savings.
- To estimate program-level free-ridership, the Evaluator calculated free-ridership scores for major and direct install measures, weighted by the participants' gross energy savings and demand reductions. The major and direct install measure free-ridership ratios were used to factor the program verified gross savings for the two measure types to estimate free-ridership.
- A spillover ratio was developed by dividing the total energy savings and demand reductions resulting from spillover measures by the total gross energy savings and demand reductions for the sample of survey respondents.

Table 4-28 summarizes free-ridership findings by measure type. As shown, free-ridership was higher for the direct install measures than the rebated measures.

TABLE 4-28 PY9 HPWES FREE-RIDERSHIP BY MEASURE – APPLIED TO PY11

Measure	Number of Responses	Average Free-ridership
AC Tune-up	10	0%
Duct Sealing	34	2%
Air Sealing	3	0%
LEDs	76	39%
Advanced Power Strips	33	18%
Smart Thermostats	3	33%
Low-Flow Showerheads	2	25%

Table 4-29 summarizes the overall program net kWh savings and peak kW demand reduction impacts of all the measure offerings in the PY11 HPwES program.

TABLE 4-29 PY11 HPWES PROGRAM NET SAVINGS

Ex post Gross Energy Savings (kWh)	*Ex post* Net Energy Savings (kWh)	NTG kWh	*Ex post* Gross Demand Reductions (kW)	*Ex post* Net Demand Reductions (kW)	NTG kW
4,224,567	3,136,976	74.3%	619.77	564.73	91.1%

4.4.3 PROCESS FINDINGS

The Evaluators did not conduct a process evaluation in PY11 of the HPwES. Process activities were focused on C&I programs in PY11.

The HPwES program aligns with the Department of Energy ("DOE") requirements and uses a whole-house approach. This program may or may not include customer co-pay, dependent on the trade ally costs and if they exceed the incentive; all residential customers who live in a single-family home are eligible. The activities used to support this evaluation are summarized in Table 4-30.

TABLE 4-30 HPWES DATA COLLECTION ACTIVITIES

Evaluation Activity	Sample Size (Per-Year)	Year Conducted	Impact	Process
Staff/Implementer Interviews	3	PY10, PY11, PY12		X
Database Review	Census	PY10, PY11, PY12	X	X
Participant Survey	80	PY10, PY12	X	X
Trade Ally Survey	15	PY11		X
Desk Review	60	PY10, PY11, PY12	X	
On-Site Inspection	68	PY10	X	

4.5 Data Tracking Review

The Evaluators reviewed the tracking data provided and found the following issues. The following parameters were missing or incomplete for HPwES.

- **Installation dates**: the Evaluators could not determine when the project was completed
- **Trade ally information**: only the Trade Ally's company name was provided. If the Evaluators needed to conduct a Trade Ally interviews, the Evaluators would have needed to request additional information.
- **Participant information**: Some key elements in participant contact information was missing in the data, such as phone numbers, emails.
- **Measure-level** parameters required for savings calculations:
    - Duct Sealing: CFM25 values: there were a few projects that were missing CFM25 test-out values.
    - Ceiling Insulation: R-values: there were a handful of projects that were missing existing R-values (prior to retrofit) and applied square footage: there were a handful of projects that were missing square footage installed.

The Evaluators note that a supplemental tracking dataset was provided for this program and a few others. This data had all the fields that the program-specific dataset was missing for HPwES. However, the Evaluators noted that there were few inconsistencies with total program kWh savings, total kW reductions, and total project counts. Since the two did not align, it was difficult to know which was the best and final to utilize in the Evaluation.

4.6 Key Findings and Conclusions

The following summarizes the key findings and conclusions for the HPwES Program PY11 evaluation.

- **The HPwES Program performed well in PY111, achieving 99.5% of program *Ex ante* Gross Energy Savings (kWh).** Compared to the PY10 program, there was a 37.6% increase in expected savings in PY11. The core measures including duct sealing, LEDs, and air sealing continue to contribute to most expected savings. Moreover, the addition of the LTN kits to the program offering provided a significant portion of expected and verified program savings.

- **The Light the Night kits accounted for 62.7% of overall program expected savings.** The distribution of the LTN kits proved to be a successful component of the HPwES Program. Similar to the HESKs of PY10, the LTN kits provided the bulk of program savings through the distribution of a total of 4,369 kits.

4.7 Recommendations

The following summarizes key recommendations after completing the HPwES Program PY11 evaluation.

- **Consider aggregating all residential program data together to address macro-level database inconsistencies.** The review of program tracking data involved looking at two separate Excel

workbooks with inconsistent sizes and inconsistent heading titles for the same data point. One of the workbooks had missing data points required for calculation inputs while the other workbook had inconsistencies in overall program total *ex ante* kWh and incentives. The Evaluators suggest aggregating all of the residential data into one workbook, with a focus on providing all of the required fields for all measure calculations.

- **Consider adding dates to the project data.** The project data lacked both the installation date and the incentive payment date. Without that information, the Evaluators are unable to verify when the project occurred.

5 INCOME QUALIFIED WEATHERIZATION

5.1 Summary

The tables below report *ex ante* gross, *ex post* gross, *ex post* net energy savings (kWh) (both annual and lifetime), demand reductions (kW), participation, and incentive spend by measure, where applicable.

TABLE 5-1 PY11 IQW ENERGY SAVINGS (KWH)

Measure	*Ex ante* Gross Savings (kWh)	Realization Rate (kWh)	*Ex post* Gross Savings (kWh)	NTG	*Ex post* Net Savings (kWh)
Assessment	0	N/A	0	N/A	0
1.5 Kitchen Aerator	1,849	105%	1,944	100%	1,944
1.0 Bathroom Aerator	5,449	100%	5,471	100%	5,471
Pipe Wrap	12,396	100%	12,395	100%	12,395
1.5 Showerhead	18,240	98%	17,875	100%	17,875
Outdoor LED Lamp (Specialty)	19,089	89%	17,024	100%	17,024
Tier 2 APS	21,871	101%	22,078	100%	22,078
Outdoor LED Lamp (Standard)	70,683	89%	63,037	100%	63,037
Smart Thermostat	83,692	100%	83,724	100%	83,724
Indoor LED Lamp (Specialty)	207,821	106%	220,310	100%	220,310
Indoor LED Lamp (Standard)	227,562	106%	240,492	100%	240,492
Air Sealing	643,437	102%	656,048	100%	656,048
Attic Insulation	668,500	107%	714,623	100%	714,623
Duct Sealing	1,045,643	95%	997,662	100%	997,662
Total	**3,026,233**	**101%**	**3,052,682**	**100%**	**3,052,682**

Sums may differ due to rounding.

TABLE 5-2 PY11 IQW DEMAND REDUCTIONS (KW)

Measure	*Ex ante* Gross Demand (kW)	Realization Rate (kW)	*Ex post* Gross Demand (kW)	NTG	*Ex post* Net Demand (kW)
Assessment	0.00	N/A	0.00	N/A	0.00
1.5 Kitchen Aerator	0.19	105%	0.20	100%	0.20
1.0 Bathroom Aerator	0.56	100%	0.56	100%	0.56
Pipe Wrap	1.41	100%	1.41	100%	1.41
1.5 Showerhead	1.90	98%	1.86	100%	1.86
Outdoor LED Lamp (Specialty)	0.39	0%	0.00	N/A	0.00
Tier 2 APS	2.15	100%	2.15	100%	2.15
Outdoor LED Lamp (Standard)	2.20	0%	0.00	N/A	0.00
Smart Thermostat	0.00	N/A	0.00	N/A	0.00
Indoor LED Lamp (Specialty)	35.37	106%	37.33	100%	37.33
Indoor LED Lamp (Standard)	38.65	105%	40.50	100%	40.50
Air Sealing	297.57	102%	303.40	100%	303.40
Attic Insulation	2,076.16	102%	2,127.28	100%	2,127.28
Duct Sealing	381.44	96%	366.24	100%	366.24
Total	**2,837.99**	**102%**	**2,880.94**	**100%**	**2,880.94**

Sums may differ due to rounding.

TABLE 5-3 PY11 IQW LIFETIME SAVINGS SUMMARY

Measure	EUL	*Ex post* Gross Lifetime Energy Savings (kWh)	*Ex post* Net Lifetime Energy Savings (kWh)
Assessment	N/A	0	0
1.5 Kitchen Aerator	10	19,435	19,435
1.0 Bathroom Aerator	10	54,709	54,709
Pipe Wrap	13	161,137	161,137
1.5 Showerhead	10	178,752	178,752
Outdoor LED Lamp (Specialty)	17	293,318	293,318
Tier 2 APS	10	220,778	220,778
Outdoor LED Lamp (Standard)	17	1,086,122	1,086,122
Smart Thermostat	11	920,961	920,961
Indoor LED Lamp (Specialty)	20	4,406,191	4,406,191
Indoor LED Lamp (Standard)	20	4,809,849	4,809,849
Air Sealing	11	7,216,529	7,216,529
Attic Insulation	20	14,292,467	14,292,467
Duct Sealing	18	17,957,921	17,957,921
Total	**17**	**51,618,168**	**51,618,168**

Sums may differ due to rounding.

TABLE 5-4 PY11 IQW PARTICIPATION AND INCENTIVE SUMMARY

Measure	Participation (Count of Measures)	Incentive Spend ($)
Neg. Incentive Adjustment	3	-$324
Assessment	911	$123,775
Pos. Incentive Adjustment	2	$254
TA Cx Service Payment	1	$450
1.5 Kitchen Aerator	71	$370
1.0 Bathroom Aerator	76	$349
Pipe Wrap	107	$690
1.5 Showerhead	60	$880
Outdoor LED Lamp (Specialty)	17	$656
Tier 2 APS	83	$6,004
Outdoor LED Lamp (Standard)	77	$1,767
Smart Thermostat	226	$36,600
Indoor LED Lamp (Specialty)	746	$33,416
Indoor LED Lamp (Standard)	839	$40,200
Air Sealing	556	$402,469
Attic Insulation	231	$309,531
Duct Sealing	496	$371,454
Total	**4,502**	**$1,328,540**

Sums may differ due to rounding.

5.2 Program Description

The Income Qualified Weatherization (IQW) offering targets and offers comprehensive weatherization services to qualified low-income, single-family homes and low-rise, multi-family dwellings of four or fewer units. The IQW program offers comprehensive home assessments and the direct installation of measures through program staff, followed by deeper energy efficiency upgrades implemented through trade allies. The Program's objective is to educate customers on how they are using energy, identify opportunities for energy savings specific to their home, and prioritize a wide range of energy conservation measures that will allow them to save energy immediately.

The IQW offering provides customers with household incomes of 200% the federal poverty level with home energy upgrades at low or no cost. The offering includes a free home energy assessment performed by the implementation trade ally. Trade allies collect information to vet customers' income qualification through a series of questions.

The PY11 program was open and available to customers between April 1, 2021, and December 31, 2021.

5.2.1 PROGRAM CHANGES

Gas-heated homes are now eligible for the air sealing, attic insulation, and smart thermostat upgrades or installations through the offering, beginning last year, in PY10. Programmable thermostats have been removed from the offering due to their ineligibility. There were no changes in PY11.

5.2.2 OPERATIONS AND TRENDS

Program staff made some observations regarding customer interests, progress, and operations during the pandemic. They observed that smart thermostats have "really caught on." They are taking lots of phone calls on different types and questions about incentives. They observed that lighting and duct sealing may become a challenge, in general, as the program finds fewer opportunities for savings.

They noted that there are still plenty of opportunities with IQW, but the new variant of the pandemic could be a barrier due to the face-to-face nature of these programs. On the other hand, they felt inflation might drive more people to the program looking to stretch their budgets.

The evaluation approach for PY11 included the following activities: database review, desk reviews; and the application of program year field visit results from prior years instead of on-site testing and data collection.

A total of 2,137 (911 assessments, 1,226 participants) households participated in IQW. Table 5-5 summarizes the total number of homes that received an assessment or had a measure performed and the expected kWh and peak kW reductions by measure.

TABLE 5-5 PY11 IQW SUMMARY OF MEASURES AND EXPECTED SAVINGS

Measure	Sum of Measures	*Ex ante* Gross Energy Savings (kWh)	*Ex ante* Gross Demand Reductions (kW)	% of kWh
Neg. Incentive Adjustment	3	0	0.00	0%
Assessment	911	0	0.00	0%
Pos. Incentive Adjustment	2	0	0.00	0%
TA Cx Service Payment	1	0	0.00	0%
1.5 Kitchen Aerator	71	1,849	0.19	0%
1.0 Bathroom Aerator	76	5,449	0.56	0%
Pipe Wrap	107	12,396	1.41	0%
1.5 Showerhead	60	18,240	1.90	1%
Outdoor LED Lamp (Specialty)	17	19,089	0.39	1%
Tier 2 APS	83	21,871	2.15	1%
Outdoor LED Lamp (Standard)	77	70,683	2.20	2%
Smart Thermostat	226	83,692	0.00	3%
Indoor LED Lamp (Specialty)	746	207,821	35.37	7%
Indoor LED Lamp (Standard)	839	227,562	38.65	8%
Air Sealing	556	643,437	297.57	21%
Attic Insulation	231	668,500	2,076.16	22%
Duct Sealing	496	1,045,643	381.44	35%
Total	**4,502**	**3,026,233**	**2,837.99**	**100%**

Sums may differ due to rounding.

Below, Figure 5-1 shows individual measure contribution as part of the overall offering expected savings.

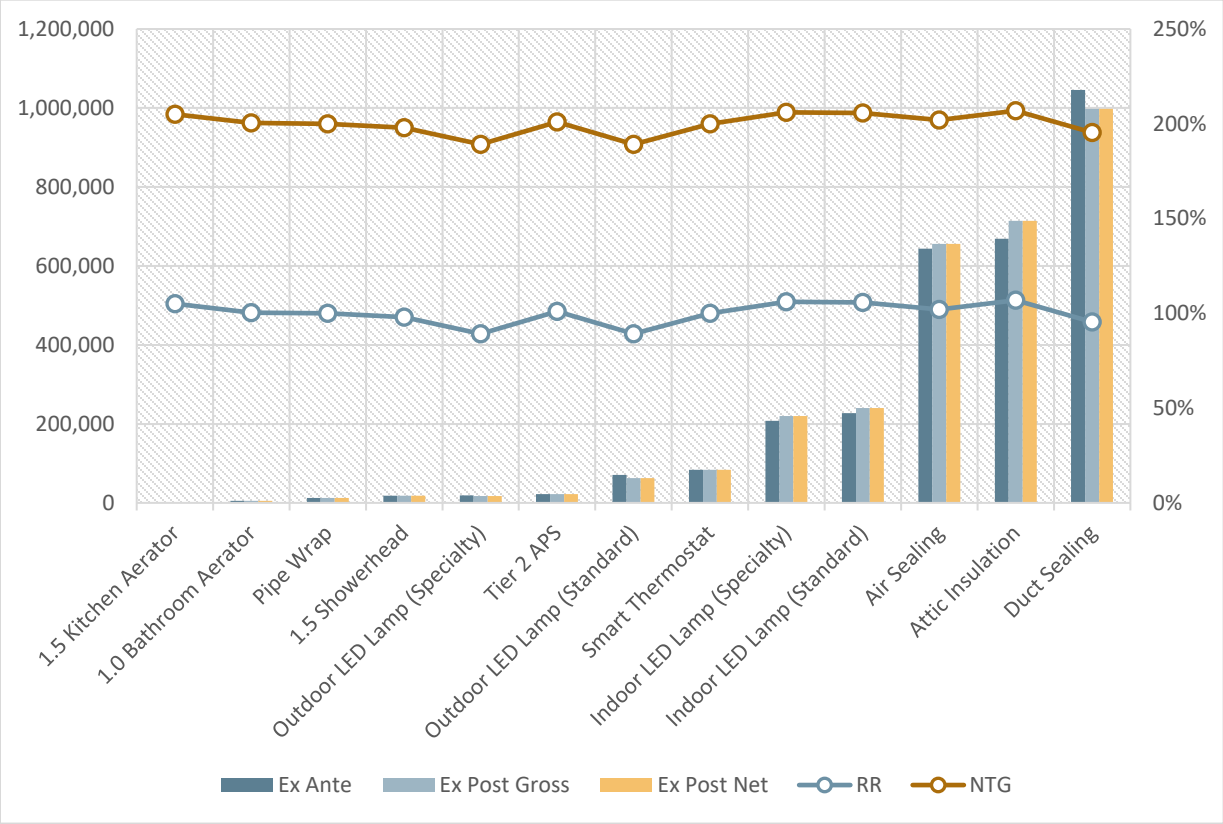


FIGURE 5-1 IQW SAVINGS CONTRIBUTION BY MEASURE

Duct sealing (35%), attic insulation (22%), air sealing (21%) and LED lamps (17%) were the high impact measures in the program, comprising of 95% of claimed savings.

In PY9, there were projects in 824 dwellings summing to 1,747,799 kWh of savings completed during an extended 15-month period. Normalizing these figures to a 12-month program year for a more accurate comparison yields an expected 659 dwellings summing to 1,398,239 kWh. During PY10 the offering ran for only nine months, completing projects in 424 dwellings summing to 793,585 kWh in expected savings. Normalizing these to a normal (12 month) program year yields 565 projects and 1,058,114 kWh in expected savings. These normalized sums are only used for illustrative comparative purposes.

Comparing these figures translates into a 24.3% drop in *Ex ante* Gross Energy Savings (kWh), while average dwelling kWh savings decreased by 11.8%. This is mostly due to the COVID-19 pandemic.

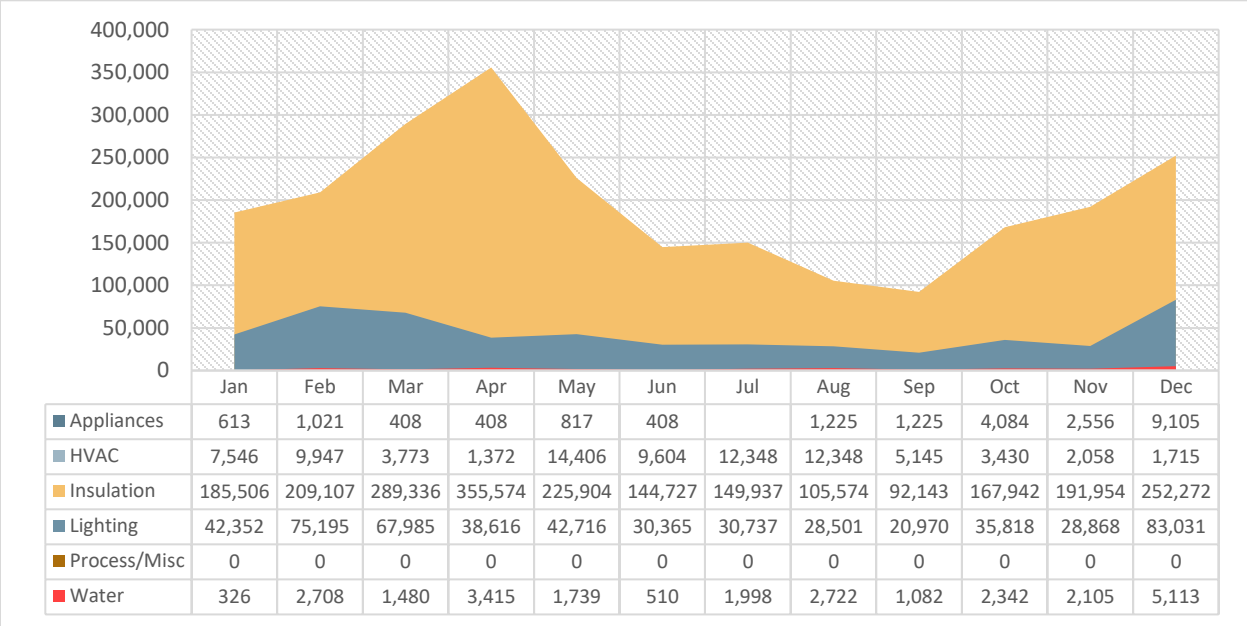
Finally, in PY11 there were a total of 1,200 distinct homes accounting for 3,026,233 kWh of expected savings. Compared to the adjusted PY10 findings, the overall PY11 savings account for a 704% increase of expected savings. Table 5-6 compares program years over a 5-year period.

TABLE 5-6 PY11 IQW PARTICIPATION AND EXPECTED SAVINGS BY PROGRAM YEAR

Program Year (PY)	Count of Homes	*Ex ante* Gross Energy Savings (kWh)	Expected kWh per Home
PY7 (nominal)	316	1,045,012	3,307
PY7 (normalized)	421	1,392,247	3,307
PY8	521	1,868,306	3,586
PY9 (total)	824	1,747,704	2,121
PY9 (calendar)	659	1,430,689	2,171
PY10 (nominal)	424	793,728	1,872
PY10 (normalized)	565	1,057,680	1,872
PY11	1,200	3,026,233	2,522

5.2.3 TIMING OF PROJECTS

The figure below shows *ex ante* energy savings (kWh) for IQW by end use, by month.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Appliances	613	1,021	408	408	817	408		1,225	1,225	4,084	2,556	9,105
HVAC	7,546	9,947	3,773	1,372	14,406	9,604	12,348	12,348	5,145	3,430	2,058	1,715
Insulation	185,506	209,107	289,336	355,574	225,904	144,727	149,937	105,574	92,143	167,942	191,954	252,272
Lighting	42,352	75,195	67,985	38,616	42,716	30,365	30,737	28,501	20,970	35,818	28,868	83,031
Process/Misc	0	0	0	0	0	0	0	0	0	0	0	0
Water	326	2,708	1,480	3,415	1,739	510	1,998	2,722	1,082	2,342	2,105	5,113

FIGURE 5-2 *EX ANTE* SAVINGS BY END USE BY MONTH

5.2.4 TRADE ALLIES

The IQW program had 14 participating trade allies in PY11. Thirteen of the reported trade allies perform weatherization work, including the following measures: duct sealing, attic insulation, air sealing.

Additionally, in place of trade allies, the implementer predominantly installs direct install measures, including the following: advanced power strips (APS), smart thermostats, pipe wrap, aerators, showerheads, and lighting. All assessments were performed by them as well, representing 32% of the claimed savings.

The table below shows the distribution of savings across all trade allies and the implementer.

TABLE 5-7 IQW TRADE ALLY ACTIVITY

Trade Ally	*Ex ante* Gross Energy Savings (kWh)	% of Savings
TA1	980,618	32%
TA2	668,653	22%
TA3	319,487	11%
TA4	286,458	9%
TA5	261,015	9%
TA6	184,666	6%
TA7	125,892	4%
TA8	51,398	2%
TA9	47,839	2%
TA10	44,616	1%
TA11	39,059	1%
TA12	7,387	0%
TA13	7,200	0%
TA14	1,947	0%

Sums may differ due to rounding.

5.2.5 GOAL ACHIEVEMENT

Total verified savings and percentage of goals for the IQW program are summarized in the table below.

TABLE 5-8 PY11 IQW PERFORMANCE TOWARDS GOALS AND TARGETS

Ex post Gross Energy Savings (kWh) Goal	% to kWh Goal	*Ex post* Gross Energy Savings (kWh)	*Ex post* Gross Savings (kW) Target	% to kW Target	*Ex post Gross* Savings (kW)
4,027,638	105%	4,224,567	1,228.69	50%	619.77

Sums may differ due to rounding.

5.3 EM&V Methodology

Impact savings were calculated using methods and inputs in the NO TRM V4.0 and incorporated results from historic on-site testing where appropriate. The bulk of PY11 savings comprised of ceiling/attic insulation, duct sealing, and air sealing projects. Impact methodologies for IQW are the same as described for HPwES, described in Section 4.3.1.

5.3.1 IN-SERVICE RATES FOR PY11

Impact methodology ISRs for IQW are the same as described for HPwES, described in Section 4.3.2. The ISRs apply to the air sealing and the duct sealing projects.

5.4 Evaluation Findings

5.4.1 GROSS IMPACT FINDINGS

The followings sections outline the results of the gross impact evaluation of the IQW program.

5.4.1.1 Aerators

Expected and verified savings for PY11 IQW aerators are summarized below.

TABLE 5-9 PY11 IQW EXPECTED AND VERIFIED AERATORS SAVINGS

Ex ante Gross Energy Savings (kWh)	*Ex post* Gross Energy Savings (kWh)	Realization Rate kWh	*Ex ante* Gross Demand Reductions (kW)	*Ex post* Gross Demand Reductions (kW)	Realization Rate kW
7,298	7,414	101.6%	0.75	0.77	101.6%

5.4.1.2 Advanced Power Strips

Expected and verified savings for PY11 IQW advanced power strips are summarized below.

TABLE 5-10 PY11 IQW EXPECTED AND VERIFIED ADVANCED POWER STRIPS SAVINGS

Ex ante Gross Energy Savings (kWh)	*Ex post* Gross Energy Savings (kWh)	Realization Rate kWh	*Ex ante* Gross Demand Reductions (kW)	*Ex post* Gross Demand Reductions (kW)	Realization Rate kW
21,871	22,078	100.9%	2.15	2.15	100.2%

5.4.1.3 Air Sealing

Expected and verified savings for the PY11 IQW air sealing projects are summarized below.

TABLE 5-11 PY11 IQW EXPECTED AND VERIFIED AIR SEALING SAVINGS

Ex ante Gross Energy Savings (kWh)	*Ex post* Gross Energy Savings (kWh)	Realization Rate kWh	*Ex ante* Gross Demand Reductions (kW)	*Ex post* Gross Demand Reductions (kW)	Realization Rate kW
643,437	656,048	102.0%	297.57	303.40	102.0%

5.4.1.4 Attic Insulation

Expected and verified savings for the PY11 IQW attic insulation projects are summarized below.

TABLE 5-12 PY11 IQW EXPECTED AND VERIFIED ATTIC INSULATION SAVINGS

Ex ante Gross Energy Savings (kWh)	*Ex post* Gross Energy Savings (kWh)	Realization Rate kWh	*Ex ante* Gross Demand Reductions (kW)	*Ex post* Gross Demand Reductions (kW)	Realization Rate kW
668,500	714,623	106.9%	2,076.16	2,127.28	102.5%

5.4.1.5 Duct Sealing

Expected and verified savings for the PY11 IQW duct sealing projects are summarized below.

TABLE 5-13 PY11 IQW EXPECTED AND VERIFIED DUCT SEALING SAVINGS

Ex ante Gross Energy Savings (kWh)	*Ex post* Gross Energy Savings (kWh)	Realization Rate kWh	*Ex ante* Gross Demand Reductions (kW)	*Ex post* Gross Demand Reductions (kW)	Realization Rate kW
1,045,643	997,662	95.4%	381.44	366.24	96.0%

5.4.1.6 LEDs

Expected and verified savings for PY11 IQW LEDs are summarized below.

TABLE 5-14 PY11 IQW EXPECTED AND VERIFIED LEDS SAVINGS

Ex ante Gross Energy Savings (kWh)	*Ex post* Gross Energy Savings (kWh)	Realization Rate kWh	*Ex ante* Gross Demand Reductions (kW)	*Ex post* Gross Demand Reductions (kW)	Realization Rate kW
525,156	540,862	103.0%	76.61	77.83	101.6%

5.4.1.7 Pipe Wrap

Expected and verified savings for the PY11 IQW pipe wrap projects are summarized below.

TABLE 5-15 PY11 IQW EXPECTED AND VERIFIED PIPE WRAP SAVINGS

Ex ante Gross Energy Savings (kWh)	*Ex post* Gross Energy Savings (kWh)	Realization Rate kWh	*Ex ante* Gross Demand Reductions (kW)	*Ex post* Gross Demand Reductions (kW)	Realization Rate kW
12,396	12,395	100.0%	1.41	1.41	100.0%

5.4.1.8 Showerheads

Expected and verified savings for PY11 IQW showerheads are summarized below.

TABLE 5-16 PY11 IQW EXPECTED AND VERIFIED SHOWERHEADS SAVINGS

Ex ante Gross Energy Savings (kWh)	*Ex post* Gross Energy Savings (kWh)	Realization Rate kWh	*Ex ante* Gross Demand Reductions (kW)	*Ex post* Gross Demand Reductions (kW)	Realization Rate kW
18,240	17,875	98.0%	1.90	1.86	98.0%

5.4.1.9 Smart Thermostats

Expected and verified savings for PY11 IQW smart thermostats are summarized below.

TABLE 5-17 PY11 IQW EXPECTED AND VERIFIED SMART THERMOSTATS SAVINGS

Ex ante Gross Energy Savings (kWh)	*Ex post* Gross Energy Savings (kWh)	Realization Rate kWh	*Ex ante* Gross Demand Reductions (kW)	*Ex post* Gross Demand Reductions (kW)	Realization Rate kW
83,692	83,724	100.0%	0.00	0.00	100.0%

5.4.1.10 Avoided Replacement Cost

The Evaluators have added the benefits of avoided replacement costs (ARC). The table below summarize the ARC by measure in IQW.

Information on methodology can be found in Section 3.4.1.3 Avoided Replacement Costs.

TABLE 5-18 SUMMARY OF ARC FOR IQW

Measure	*Ex post* Gross ARCs ($)	*Ex post* Net ARCs ($)	*NPV of* ARCs ($)
Tier 2 APS	$0	$0	$0
Smart Thermostat	$0	$0	$0
Pipe Wrap	$0	$0	$0
Outdoor LED Lamp (Standard)	$398	$289	$289
Outdoor LED Lamp (Specialty)	$176	$128	$128
LED 9W A-Type - LTN KIT	$78,377	$50,945	$50,945
LED 9W A-Type - KIT	$4,693	$2,996	$2,996
LED 15W PAR38 - LTN KIT	$34,984	$22,740	$22,740
LED 15W A-Type - LTN KIT	$15,675	$10,189	$10,189
LED 15W A-Type - KIT	$1,564	$999	$999
Indoor LED Lamp (Standard)	$14,355	$10,431	$10,431
Indoor LED Lamp (Specialty)	$18,257	$13,267	$13,267
Duct Sealing	$0	$0	$0
Central AC Tune-up	$0	$0	$0
Attic Insulation	$0	$0	$0
Air Sealing	$0	$0	$0
1.5 Showerhead - KIT	$0	$0	$0
1.5 Showerhead	$0	$0	$0
1.5 Kitchen Aerator - KIT	$0	$0	$0
1.5 Kitchen Aerator	$0	$0	$0
1.0 Bathroom Aerator - KIT	$0	$0	$0
1.0 Bathroom Aerator	$0	$0	$0
Total	**$168,481**	**$111,984**	**$111,984**

Sums may differ due to rounding.

5.4.2 NET IMPACT FINDINGS

The NTG ratio for the IQW offering was assumed to be 100% in line with common practice for estimation of low-income offering net savings, thus offering net savings are equal to program gross savings.

Table 5-19 summarizes the program net kWh savings and peak kW demand reduction impacts of the IQW Program.

TABLE 5-19 PY11 IQW PROGRAM NET SAVINGS

Verified Gross kWh Savings	Verified Net kWh Savings	kWh NTG	Verified Gross kW Reductions	Verified Net kW Reductions	kW NTG
3,052,682	3,052,682	100%	2,880.94	2,880.94	100%

Sums may differ due to rounding.

Individual measure net savings are summarized in Section 5.1 of this chapter.

5.4.3 PROCESS FINDINGS

The Evaluators did not conduct a process evaluation in PY11 of the IQW program. Process activities were focused on C&I programs in PY11. Table 5-20 summarizes the process evaluation activities for the IQW program.

TABLE 5-20-LOW INCOME WEATHERIZATION DATA COLLECTION ACTIVITIES

Evaluation Activity	Sample Size (Per-Year)	Year Conducted	Impact	Process
Staff/Implementer Interviews	3	PY10, PY11, PY12	X	X
Database Review	Census	PY10, PY11, PY12	X	X
Trade Ally Interviews	6	PY11		X
Participant Survey	25	PY11	X	X
On-Site Inspections	70	PY11	X	
Data Collection Form Review	Census	PY11		X

The general approach to evaluating savings for the IQW mirrors that of the Home Performance with ENERGY STAR program in using a combining a deem-and-count approach stratified by space heating fuel. The NTGR will be stipulated at 100% in accordance with industry common practice for income-qualified programs.

5.5 Data Tracking Review

The Evaluators reviewed the tracking data provided and found the following issues. The following parameters were missing or incomplete for IQW.

- **Installation dates**: the Evaluators could not determine when the project was completed.
- **Trade ally information**: only the Trade Ally's company name was provided. If the Evaluators needed to conduct a Trade Ally interviews, the Evaluators would have needed to request additional information.
- **Participant information**: some key elements in participant contact information was missing in the data, such as phone numbers, emails.
- **Indication of Low-Income eligibility:** the Evaluators noted missing information noting whether a participant qualified for LIHEAP and if a participant is over 65 years old.
- **Measure-level parameters required for savings calculations:**
    - Air Infiltration: CFM50 values: there were a couple of projects that were missing CFM25 test-out values.

- Duct Sealing: CFM25 values: there were a few projects that were missing CFM25 test-out values.
- Ceiling Insulation: R-values: there were a handful of projects that were missing existing R-values (prior to retrofit) and applied square footage: there were a handful of projects that were missing square footage installed.

The Evaluators note that a supplemental tracking dataset was provided for this program and a few others. This data had all the fields that the program-specific dataset was missing for IQW. However, the Evaluators noted that there were few inconsistencies with total program kWh savings, total kW reductions, and total project counts. Since the two did not align, it was difficult to know which was the best and final to utilize in the Evaluation.

5.6 Key Findings and Conclusions

The following summarizes the key findings and conclusions for the IQW Program PY11 evaluation.

- **The IQW Program performed well in PY11, achieving 100.9% of program *ex ante* gross energy savings (kWh).** Additionally, compared to PY10, there was an increase in participation and an increase of 186% in claimed program savings.

5.7 Recommendations

The following summarizes key recommendations after completing the IQW Program PY11 evaluation.

- ***Consider aggregating all residential program data together to address macro-level database inconsistencies.*** *The review of program tracking data involved looking at two separate Excel workbooks with inconsistent sizes and inconsistent heading titles for the same data point. One of the workbooks had missing data points required for calculation inputs while the other workbook had inconsistencies in overall program total ex ante kWh and incentives. The Evaluators suggest aggregating all of the residential data into one workbook, with a focus on providing all of the required fields for all measure calculations.*

6 RETAIL LIGHTING AND APPLIANCE

6.1 Summary

The tables below report *ex ante* gross, *ex post* gross, *ex post* net energy savings (kWh) (both annual and lifetime), demand reductions (kW), participation, and incentive spend, by measure, where applicable.

TABLE 6-1 PY11 RLA ENERGY SAVINGS (KWH)

Measure	*Ex ante* Gross Savings (kWh)	Realization Rate (kWh)	*Ex post* Gross Savings (kWh)	NTG	*Ex post* Net Savings (kWh)
Indoor LED Lamp (Specialty)	4,742,169	112%	5,298,701	41%	2,177,766
Indoor LED Lamp (Standard)	8,000,105	100%	7,974,815	87%	6,906,189
Outdoor LED Lamp (Specialty)	156,070	91%	142,019	41%	58,370
Giveaway LED 9W A19	98,676	86%	85,232	64%	54,548
1.5 Kitchen Aerator	2,385	100%	2,385	78%	1,849
1.0 Bathroom Aerator	4,779	100%	4,779	78%	3,705
1.5 Showerhead	19,152	100%	19,152	78%	14,851
Pipe Wrap	6,432	100%	6,431	78%	4,987
Heat Pump Water Heater	16,559	97%	16,098	84%	13,458
Water Cooler	482	100%	482	73%	353
Dehumidifier	1,850	111%	2,056	78%	1,594
Pool Pump	4,781	273%	13,055	89%	11,645
Refrigerator	5,132	101%	5,192	52%	2,679
Tier 1 APS	19,951	100%	19,951	78%	15,470
Window AC	4,096	181%	7,396	63%	4,667
Smart Thermostat	1,938,636	100%	1,939,371	78%	1,503,793
Nest Power Connector	0	N/A	0	N/A	0
Smart Thermostat Sensor	0	N/A	0	N/A	0
Smart Thermostat Trim Kit	0	N/A	0	N/A	0
Smart Thermostat Wall Plate	0	N/A	0	N/A	0
Total	**15,021,255**	**103%**	**15,537,114**	**69%**	**10,775,926**

Sums may differ due to rounding.

TABLE 6-2 PY11 RLA DEMAND REDUCTIONS (KW)

Measure	*Ex ante* Gross Demand (kW)	Realization Rate (kW)	*Ex post* Gross Demand (kW)	NTG	*Ex post* Net Demand (kW)
Indoor LED Lamp (Specialty)	805.41	112%	900.01	41%	369.91
Indoor LED Lamp (Standard)	1,358.58	100%	1,354.57	87%	1,173.06
Outdoor LED Lamp (Specialty)	3.57	0%	0.00	N/A	0.00
Giveaway LED 9W A19	16.89	143%	24.13	64%	15.44
1.5 Kitchen Aerator	0.25	100%	0.25	78%	0.19
1.0 Bathroom Aerator	0.49	100%	0.49	78%	0.38
1.5 Showerhead	1.99	100%	1.99	78%	1.54
Pipe Wrap	0.74	100%	0.74	78%	0.57
Heat Pump Water Heater	1.45	97%	1.41	84%	1.18
Water Cooler	0.05	100%	0.05	73%	0.04
Dehumidifier	0.42	111%	0.47	78%	0.36
Pool Pump	0.88	283%	2.49	89%	2.22
Refrigerator	0.74	102%	0.76	52%	0.39
Tier 1 APS	2.28	100%	2.28	78%	1.77
Window AC	2.16	161%	3.48	63%	2.20
Smart Thermostat	0.00	N/A	0.00	N/A	0.00
Nest Power Connector	0.00	N/A	0.00	N/A	0.00
Smart Thermostat Sensor	0.00	N/A	0.00	N/A	0.00
Smart Thermostat Trim Kit	0.00	N/A	0.00	N/A	0.00
Smart Thermostat Wall Plate	0.00	N/A	0.00	N/A	0.00
Negative Incentive Adjustment	0.00	N/A	0.00	N/A	0.00
Positive Incentive Adjustment	0.00	N/A	0.00	N/A	0.00
Total	**2,195.91**	**104%**	**2,293.12**	**68%**	**1,569.25**

Sums may differ due to rounding.

TABLE 6-3 PY11 RLA LIFETIME SAVINGS SUMMARY

Measure	EUL	*Ex post* Gross Lifetime Energy Savings (kWh)	*Ex post* Net Lifetime Energy Savings (kWh)
Indoor LED Lamp (Specialty)	20	105,974,025	43,555,324
Indoor LED Lamp (Standard)	17	137,406,054	118,993,643
Outdoor LED Lamp (Specialty)	20	2,840,386	1,167,399
Giveaway LED 9W A19	17	1,468,539	939,865
1.5 Kitchen Aerator	10	23,852	18,495
1.0 Bathroom Aerator	10	47,786	37,054
1.5 Showerhead	10	191,520	148,505
Pipe Wrap	13	83,607	64,829
Heat Pump Water Heater	10	160,976	134,576
Water Cooler	13	6,263	4,593
Dehumidifier	11	22,616	17,536
Pool Pump	17	221,935	197,966
Refrigerator	20	103,831	53,577
Tier 1 APS	10	199,512	154,702
Window AC	11	77,662	49,005
Smart Thermostat	11	21,333,078	16,541,726
Nest Power Connector	N/A	0	0
Smart Thermostat Sensor	N/A	0	0
Smart Thermostat Trim Kit	N/A	0	0
Smart Thermostat Wall Plate	N/A	0	0
Negative Incentive Adjustment	N/A	0	0
Positive Incentive Adjustment	N/A	0	0
Total	**17**	**270,161,643**	**182,078,794**

Sums may differ due to rounding.

TABLE 6-4 PY11 RLA COUNT OF MEASURES AND INCENTIVE SPEND

Measure	Participation (Count of Measures)	Incentive Spend ($)
Indoor LED Lamp (Specialty)	2,371	$288,382
Indoor LED Lamp (Standard)	2,683	$459,180
Outdoor LED Lamp (Specialty)	136	$2,514
Giveaway LED 9W A19	6	$9,648
1.5 Kitchen Aerator	53	$178
1.0 Bathroom Aerator	50	$107
1.5 Showerhead	61	$475
Pipe Wrap	83	$1,016
Heat Pump Water Heater	10	$4,400
Water Cooler	1	$50
Dehumidifier	14	$400
Pool Pump	5	$1,500
Refrigerator	87	$4,350
Tier 1 APS	256	$5,304
Window AC	42	$2,250
Smart Thermostat	3,979	$564,673
Nest Power Connector	2	$0
Smart Thermostat Sensor	10	$0
Smart Thermostat Trim Kit	246	$0
Smart Thermostat Wall Plate	96	$0
Negative Incentive Adjustment	1	-$27
Positive Incentive Adjustment	1	$1,643
Total	**10,193**	**$1,346,043**

Sums may differ due to rounding.

TABLE 6-5 PY11 RLA NON-ENERGY BENEFITS SUMMARY

Measure	*Ex post* Net ARCs ($)	*Ex post* Net Water Savings (gallons)	*Ex post* Net Avoided Arrearages
Indoor LED Lamp (Specialty)	$44,857	0	$0
Indoor LED Lamp (Standard)	$198,575	0	$0
Outdoor LED Lamp (Specialty)	$1,198	0	$0
Giveaway LED 9W A19	$14,769	0	$0
1.5 Kitchen Aerator	$0	18,495	$0
1.0 Bathroom Aerator	$0	37,054	$0
1.5 Showerhead	$0	148,505	$0
Pipe Wrap	$0	0	$0
Heat Pump Water Heater	$0	0	$0
Water Cooler	$0	0	$0
Dehumidifier	$0	0	$0
Pool Pump	$0	0	$0
Refrigerator	$0	0	$0
Tier 1 APS	$0	0	$0
Window AC	$0	0	$0
Smart Thermostat	$0	0	$0
Nest Power Connector	$0	0	$0
Smart Thermostat Sensor	$0	0	$0
Smart Thermostat Trim Kit	$0	0	$0
Smart Thermostat Wall Plate	$0	0	$0
Negative Incentive Adjustment	$0	0	$0
Positive Incentive Adjustment	$0	0	$0
Total	**$259,399**	**204,054**	**$0**

Sums may differ due to rounding.

6.2 Program Description

The Retail Lighting and Appliances (RLA) offering provides Point-of- Purchase discounts for light emitting diodes (LEDs) through participating retailers, as well as mail-in rebates (downstream rebates) for refrigerators, window ACs, pool pumps, smart thermostats, and heat pump water heaters.

A complete list of eligible items is listed below:

- Aerators
- Showerheads
- Advanced Power Strips
- Light Emitting Diode (LED) Lamps;
- ENERGY STAR Pool Pumps;
- ENERGY STAR Smart Thermostats;
- ENERGY STAR Dehumidifiers;
- ENERGY STAR Water Coolers;
- ENERGY STAR Refrigerators;
- ENERGY STAR Window Air Conditioner (AC); and
- ENERGY STAR Heat Pump Water Heaters (HPWH).

6.2.1 PROGRAM CHANGES

There were no changes to the RLA program in PY11.

6.2.2 OPERATION AND TRENDS

The evaluation approach for PY11 included the following activities: data review, desk reviews; and application of program year field visit results from prior years instead of on-site testing and data collection.

The tables below summarize the total number of measures distributed through the program and expected savings.

TABLE 6-6 PY11 RLA SUMMARY OF MEASURES AND EXPECTED SAVINGS

Measure	Sum of Measures	*Ex ante* Gross Energy Savings (kWh)	*Ex ante* Gross Demand Reductions (kW)	% of kWh
Indoor LED Lamp (Specialty)	2,371	4,742,169	805.41	31.6%
Indoor LED Lamp (Standard)	2,683	8,000,105	1,358.58	53.3%
Outdoor LED Lamp (Specialty)	136	156,070	3.57	1.0%
Giveaway LED 9W A19	6	98,676	16.89	0.7%
1.5 Kitchen Aerator	53	2,385	0.25	0.0%
1.0 Bathroom Aerator	50	4,779	0.49	0.0%
1.5 Showerhead	61	19,152	1.99	0.1%
Pipe Wrap	83	6,432	0.74	0.0%
Heat Pump Water Heater	10	16,559	1.45	0.1%
Water Cooler	1	482	0.05	0.0%
Dehumidifier	14	1,850	0.42	0.0%
Pool Pump	5	4,781	0.88	0.0%
Refrigerator	87	5,132	0.74	0.0%
Tier 1 APS	256	19,951	2.28	0.1%
Window AC	42	4,096	2.16	0.0%
Smart Thermostat	3,979	1,938,636	0.00	12.9%
Nest Power Connector	2	0	0.00	0.0%
Smart Thermostat Sensor	10	0	0.00	0.0%
Smart Thermostat Trim Kit	246	0	0.00	0.0%
Smart Thermostat Wall Plate	96	0	0.00	0.0%
Negative Incentive Adjustment	1	0	0.00	0.0%
Positive Incentive Adjustment	1	0	0.00	0.0%
Total	**10,193**	**15,021,255**	**2,195.91**	**100%**

Sums may differ due to rounding.

The figure below illustrates and compares the differences in kWh savings contributions by each measure provided during PY11.

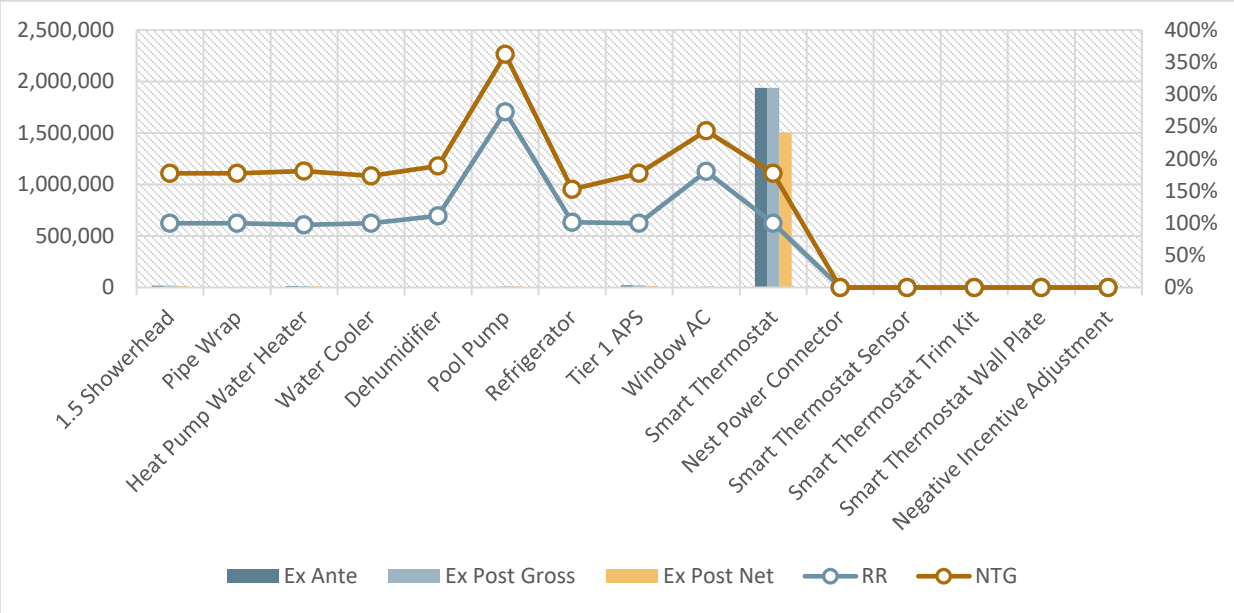
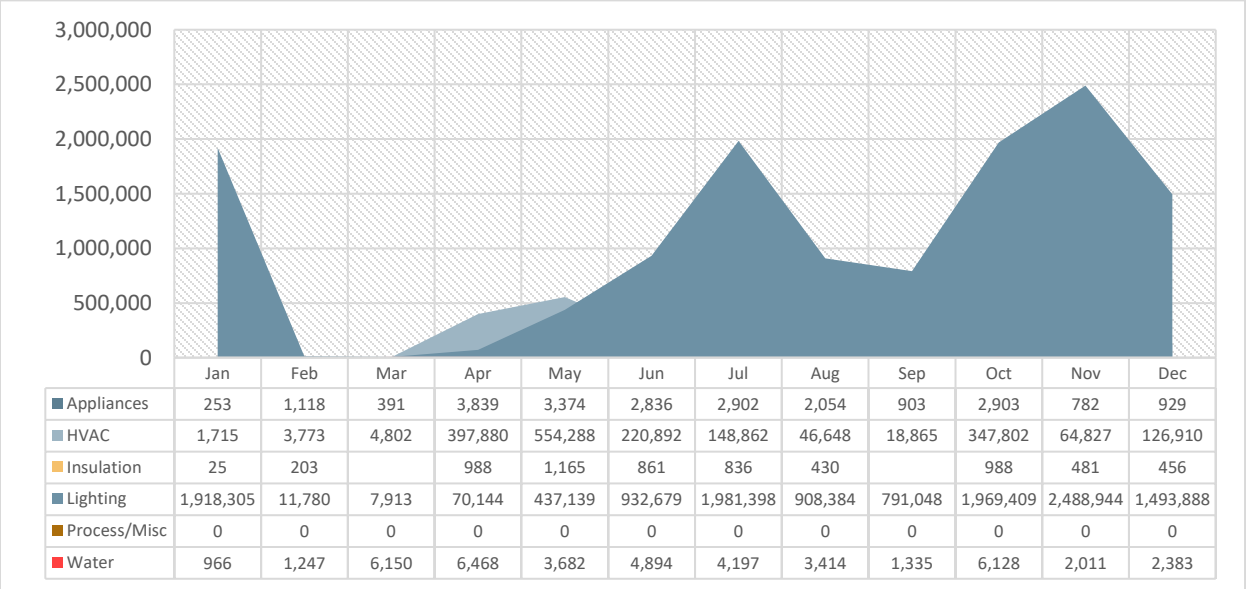


FIGURE 6-1 RLA CONTRIBUTION TO SAVINGS BY MEASURE

LED lamps (87%) and smart thermostats (13%) were the high impact measures in PY11.

6.2.3 TIMING OF PROJECTS

The figure below shows *ex ante* energy savings (kWh) for RLA by end use, by month



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Appliances	253	1,118	391	3,839	3,374	2,836	2,902	2,054	903	2,903	782	929
HVAC	1,715	3,773	4,802	397,880	554,288	220,892	148,862	46,648	18,865	347,802	64,827	126,910
Insulation	25	203		988	1,165	861	836	430		988	481	456
Lighting	1,918,305	11,780	7,913	70,144	437,139	932,679	1,981,398	908,384	791,048	1,969,409	2,488,944	1,493,888
Process/Misc	0	0	0	0	0	0	0	0	0	0	0	0
Water	966	1,247	6,150	6,468	3,682	4,894	4,197	3,414	1,335	6,128	2,011	2,383

FIGURE 6-2 *EX ANTE* SAVINGS BY END USE BY MONTH

6.2.4 TRADE ALLIES

There are no reported trade allies in the RLA program.

6.2.5 GOAL ACHIEVEMENT

Total verified savings and percentage of goals for the RLA Program are summarized in Table 6-7.

TABLE 6-7 PY11 RLA SUMMARY OF GOAL ACHIEVEMENT

Ex post Gross Energy Savings (kWh) Goal	% to kWh Goal	*Ex post* Gross Energy Savings (kWh)	*Ex post* Gross Savings (kW) Target	% to kW Target	*Ex post* Gross Savings (kW)
7,384,715	421%	31,074,228	1,062.27	432%	4,586.24

6.3 EM&V Methodology

The RLA offering has received comprehensive impact and process evaluations in PY5 through PY9. The evaluations provided free-ridership estimates, discussions of program satisfaction and strategic recommendations for program improvement, and most/all measures offered by the program have deemed TRM savings. In the initial review of the PY11 program, the Evaluators concluded that the RLA offering did not warrant more than a brief overview of program activity.

Most of the impact methodologies for RLA measures are the same as described for HPwES, described in Section 4.3.1. The following section discusses savings calculation methods for measures not covered in the HPwES chapter.

6.3.1 DEEMED SAVINGS CALCULATIONS

6.3.1.1 Giveaway LED 9W A19s

Methods for calculating the deemed savings values for Giveaway LEDs came from NO TRM V4.0. The methodology for ENERGY STAR Omni-Directional LEDs is found in Section C.5.4. The methodology for the giveaway LEDs is the same as for the LEDs in the HPwES Program.

$$kWh_{savings} = \left((W_{base} - W_{post})/1000\right) \times Hours \times ISR \times IEF_E$$

$$kW_{savings} = \left((W_{base} - W_{post})/1000\right) \times CF \times ISR \times IEF_D$$

Additionally, in PY9, the Evaluators conducted a participant survey that aimed to determine an in-service rate for similar giveaway kits that were distributed to PY9 HPwES participants. The giveaway kit items included aerators, showerheads, and LEDs. An ISR of 82% was calculated based on participant survey responses, based on the number of total LEDs received that were installed and in use. The Evaluators applied the 82% ISR for the giveaway kit LEDs in PY11.

Finally, an additional ISR of 60% was applied to account for the delivery mechanism of the giveaway LEDs. This additional ISR accounts for the fact that the LEDs were given away instead of shipped out to customers that requested them.

6.3.1.2 Heat Pump Water Heaters (HPWHs)

HPWH savings were calculated using the savings methodology from the NO TRM V4.0, section C.2.1.5. The following equations outline the methodology that the Evaluators adhered to.

$$kWh_{Savings} = \frac{\rho \times C_p \times V \times \left(T_{SetPoint} - T_{Supply}\right) \times \left(\frac{1}{EF_{pre}} - \left(\frac{1}{(EF_{post} \times (1 + PA\%)} \times Adj\right)\right)}{3{,}412\ Btu/kWh}$$

$$kW_{savings} = kWh_{savings} \times Ratio\ {}^{Peak\ kW}_{Annual\ kWh}$$

Where:

ρ = Water density = 8.33 lb/gal
C_p = Specific heat of water = 1 BTU/ lb · °F
V = Estimated annual hot water use (gal)
$T_{SetPoint}$ = Water heater set point = 123.61 °F
T_{Supply} = Average New Orleans area supply water temperature = 74.8 °F
EF_{pre} = Baseline uniform energy factor value
EF_{post} = Actual uniform energy factor value of efficient HPWH
$PA\%$ = Performance Adjustment to adjust the HPWH EF relative to ambient air temperature[16]
Adj = HPWH-specific adjustment factor to account for cooling bonus and heating penalty
$3{,}412$ = conversion factor to convert BTU to kWh

6.3.1.3 Window AC Replacement

Savings for window air conditioners were calculated using the savings methodology from the NO TRM V4.0, Section C.3.2.4.

$$kWh_{Savings} = CAP_c \times \frac{1\ \text{kW}}{1{,}000\ \text{W}} \times \left(\frac{1}{CEER_{base}} - \frac{1}{CEER_{Eff}}\right) \times EFLH_C \times RAF$$

$$kW_{Reductions} = CAP_c \times \frac{1}{1{,}000} {}^{W}/_{kW} \times \left(\frac{1}{CEER_{base}} - \frac{1}{CEER_{Eff}}\right) \times \%CF$$

Where:

CAP_c = Cooling capacity in BTU
$CEER_{base}$ = Combined energy-efficiency ratio of baseline equipment
$CEER_{Eff}$ = Combined energy-efficiency ratio of efficient equipment
$EFLH_C$ = Equivalent Full Load Hours - cooling (1,637)
RAF = Room AC adjustment factor = 0.49
CF = Peak coincidence factor = 0.77

6.3.1.4 Deemed Savings for Other RLA Measures

For remaining RLA program measures, the Evaluators used the following NO TRM V4.0 sections and tables to verify savings. The NO TRM V4.0 sections are outline in Table 6-8 below.

[16] Per DOE guidance, $PA\% = 0.00008 \times T_{amb}^3 + 0.0011 \times T_{amb}^2 - 0.4833 \times T_{amb} + 0.0857$

TABLE 6-8 NO TRM V4.0 SECTIONS FOR OTHER MEASURES - RLA

Measure	TRM Section	Calculated / Deemed	TRM Table(s)	Table Page(s)
Dehumidifiers	C.1.8	Deemed	Table C-17	C-25
Pool Pumps	C.1.9	Deemed	Table C-20	C-29
Refrigerators	C.1.10	Deemed	Table C-24	C-35
Water Coolers	C.1.4	Deemed	Table C-9	C-13

6.4 Evaluation Findings

Section 6.1 Summary presents the results of the evaluation for the RLA program by measure.

6.4.1 GROSS IMPACT FINDINGS

6.4.1.1 Aerators

Expected and verified savings for PY11 RLA aerators are summarized below.

TABLE 6-9 PY11 RLA EXPECTED AND VERIFIED AERATORS SAVINGS

Ex ante Gross Energy Savings (kWh)	*Ex post* Gross Energy Savings (kWh)	Realization Rate kWh	*Ex ante* Gross Demand Reductions (kW)	*Ex post* Gross Demand Reductions (kW)	Realization Rate kW
7,164	7,164	100.0%	0.74	0.74	100.0%

6.4.1.2 Advanced Power Strips

Expected and verified savings for PY11 RLA advanced power strips are summarized below.

TABLE 6-10 PY11 RLA EXPECTED AND VERIFIED ADVANCED POWER STRIPS SAVINGS

Ex ante Gross Energy Savings (kWh)	*Ex post* Gross Energy Savings (kWh)	Realization Rate kWh	*Ex ante* Gross Demand Reductions (kW)	*Ex post* Gross Demand Reductions (kW)	Realization Rate kW
19,951	19,951	100.0%	2.28	2.28	100.0%

6.4.1.3 Dehumidifier

Expected and verified savings for PY11 RLA dehumidifiers are summarized below.

TABLE 6-11 PY11 RLA EXPECTED AND VERIFIED DEHUMIDIFIER SAVINGS

Ex ante Gross Energy Savings (kWh)	*Ex post* Gross Energy Savings (kWh)	Realization Rate kWh	*Ex ante* Gross Demand Reductions (kW)	*Ex post* Gross Demand Reductions (kW)	Realization Rate kW
1,850	2,056	111.1%	0.42	0.47	111.0%

6.4.1.4 Giveaway LEDs (9W A19)

Expected and verified savings for PY11 RLA giveaway LEDs are summarized below.

TABLE 6-12 PY11 RLA EXPECTED AND VERIFIED GIVEAWAY LED SAVINGS

Ex ante Gross Energy Savings (kWh)	*Ex post* Gross Energy Savings (kWh)	Realization Rate kWh	*Ex ante* Gross Demand Reductions (kW)	*Ex post* Gross Demand Reductions (kW)	Realization Rate kW
98,676	85,232	86.4%	16.89	24.13	142.9%

6.4.1.5 Heat Pump Water Heaters (HPWHs)

Expected and verified savings for PY11 RLA heat pump water heaters are summarized below.

TABLE 6-13 PY11 RLA EXPECTED AND VERIFIED HPWH SAVINGS

Ex ante Gross Energy Savings (kWh)	*Ex post* Gross Energy Savings (kWh)	Realization Rate kWh	*Ex ante* Gross Demand Reductions (kW)	*Ex post* Gross Demand Reductions (kW)	Realization Rate kW
16,559	16,098	97.2%	1.45	1.41	97.2%

6.4.1.6 LED Lamps

Expected and verified savings for PY11 RLA LEDs are summarized below. These LEDs exclude the giveaway LEDs presented in Table 6-12.

TABLE 6-14 PY11 RLA EXPECTED AND VERIFIED LED SAVINGS

Ex ante Gross Energy Savings (kWh)	*Ex post* Gross Energy Savings (kWh)	Realization Rate kWh	*Ex ante* Gross Demand Reductions (kW)	*Ex post* Gross Demand Reductions (kW)	Realization Rate kW
12,898,344	13,415,535	104.0%	2,167.56	2,254.58	104.0%

6.4.1.7 Pipe Wrap

Expected and verified savings for PY11 RLA pipe wrap projects are summarized below.

TABLE 6-15 PY11 RLA EXPECTED AND VERIFIED PIPE WRAP SAVINGS

Ex ante Gross Energy Savings (kWh)	*Ex post* Gross Energy Savings (kWh)	Realization Rate kWh	*Ex ante* Gross Demand Reductions (kW)	*Ex post* Gross Demand Reductions (kW)	Realization Rate kW
6,432	6,431	100.0%	0.74	0.74	100.0%

6.4.1.8 Pool Pumps

Expected and verified savings for PY11 RLA pool pumps are summarized below. The higher realization rate may be possibly due to an improper calculation in the *ex ante* estimations that resulted in 0 kWh energy savings and 0 kW reductions shown in the program tracking data. This issue affected 3 of the 5 pool pump projects.

TABLE 6-16 PY11 RLA EXPECTED AND VERIFIED POOL PUMPS SAVINGS

Ex ante Gross Energy Savings (kWh)	*Ex post* Gross Energy Savings (kWh)	Realization Rate kWh	*Ex ante* Gross Demand Reductions (kW)	*Ex post* Gross Demand Reductions (kW)	Realization Rate kW
4,781	13,055	273.1%	0.88	2.49	283.0%

6.4.1.9 Refrigerator Replacement

ENERGY STAR Refrigerator savings were calculated using the deemed savings from the NO TRM V4.0 Section C.1.4.1. After verifying model configurations and features, deemed savings were assigned to each unit using TRM.

Expected and verified savings for PY11 RLA refrigerators are summarized below.

TABLE 6-17 PY11 RLA EXPECTED AND VERIFIED REFRIGERATORS SAVINGS

Ex ante Gross Energy Savings (kWh)	*Ex post* Gross Energy Savings (kWh)	Realization Rate kWh	*Ex ante* Gross Demand Reductions (kW)	*Ex post* Gross Demand Reductions (kW)	Realization Rate kW
5,132	5,192	101.2%	0.74	0.76	101.8%

6.4.1.10 Showerheads

Expected and verified savings for PY11 RLA showerheads are summarized below.

TABLE 6-18 PY11 RLA EXPECTED AND VERIFIED SHOWERHEAD SAVINGS

Ex ante Gross Energy Savings (kWh)	*Ex post* Gross Energy Savings (kWh)	Realization Rate kWh	*Ex ante* Gross Demand Reductions (kW)	*Ex post* Gross Demand Reductions (kW)	Realization Rate kW
19,152	19,152	100.0%	1.99	1.99	100.0%

6.4.1.11 Smart Thermostats

Savings for smart thermostats were calculated using the savings methodology from the NO TRM V4.0, section C.3.9. Expected and verified savings for PY11 RLA smart thermostats are summarized below.

TABLE 6-19 PY11 RLA EXPECTED AND VERIFIED SMART THERMOSTATS SAVINGS

Ex ante Gross Energy Savings (kWh)	*Ex post* Gross Energy Savings (kWh)	Realization Rate kWh	*Ex ante* Gross Demand Reductions (kW)	*Ex post* Gross Demand Reductions (kW)	Realization Rate kW
1,938,636	1,939,371	100.0%	0.00	0.00	100.0%

6.4.1.12 Water Coolers

Savings for water coolers were calculated using the savings methodology from the NO TRM V4.0, section C.1.4.4. Expected and verified savings for PY11 RLA water coolers are summarized below.

TABLE 6-20 PY11 RLA EXPECTED AND VERIFIED WATER COOLERS SAVINGS

Ex ante Gross Energy Savings (kWh)	*Ex post* Gross Energy Savings (kWh)	Realization Rate kWh	*Ex ante* Gross Demand Reductions (kW)	*Ex post* Gross Demand Reductions (kW)	Realization Rate kW
482	482	100%	0.05	0.05	100%

6.4.1.13 Window Air Conditioners

Savings for window air conditioners were calculated using the savings methodology from the NO TRM V4.0, Section C.3.2.4. Expected and verified savings for PY11 RLA window air conditioners are

summarized below. The higher realization rates may be due to the way the *ex ante* estimations were calculated. The *ex ante* estimations may be based on deemed savings, whereas *ex post* verified equipment information and followed the formulaic approach in the NO TRM V4.0.

TABLE 6-21 PY11 RLA EXPECTED AND VERIFIED WINDOW ACS SAVINGS

Ex ante Gross Energy Savings (kWh)	*Ex post* Gross Energy Savings (kWh)	Realization Rate kWh	*Ex ante* Gross Demand Reductions (kW)	*Ex post* Gross Demand Reductions (kW)	Realization Rate kW
4,096	7,396	181%	2.16	3.48	161%

6.4.1.14 Avoided Replacement Cost

The Evaluators have added the benefits of avoided replacement costs (ARC). The table below summarize the ARC by measure in RLA.

Information on methodology can be found in Section 3.4.1.3 Avoided Replacement Costs.

TABLE 6-22 SUMMARY OF ARC FOR RLA

Measure	*Ex Post* Gross ARCs ($)	*Ex Post* Net ARCs ($)	NPV *of* ARCs ($)
Indoor LED Lamp (Specialty)	$109,141	$44,857	$44,857
Indoor LED Lamp (Standard)	$229,301	$198,575	$198,575
Outdoor LED Lamp (Specialty)	$2,915	$1,198	$1,198
Giveaway LED 9W A19	$23,077	$14,769	$14,769
1.5 Kitchen Aerator	$0	$0	$0
1.0 Bathroom Aerator	$0	$0	$0
1.5 Showerhead	$0	$0	$0
Pipe Wrap	$0	$0	$0
Heat Pump Water Heater	$0	$0	$0
Water Cooler	$0	$0	$0
Dehumidifier	$0	$0	$0
Pool Pump	$0	$0	$0
Refrigerator	$0	$0	$0
Tier 1 APS	$0	$0	$0
Window AC	$0	$0	$0
Smart Thermostat	$0	$0	$0
Nest Power Connector	$0	$0	$0
Smart Thermostat Sensor	$0	$0	$0
Smart Thermostat Trim Kit	$0	$0	$0
Smart Thermostat Wall Plate	$0	$0	$0
Negative Incentive Adjustment	$0	$0	$0
Positive Incentive Adjustment	$0	$0	$0
Total	**$364,434**	**$259,399**	**$259,399**

Sums may differ due to rounding.

6.4.2 NET IMPACT FINDINGS

To estimate net savings in the PY11 offering, the Evaluators applied the results from PY9 measurements. The following sections describe the approach used to measure net savings for the lighting and appliance components of the PY9 RLA offering.

6.4.2.1 Lighting Component – Methodology

The Evaluators estimated NTG for upstream bulbs using a price response model, wherein a regression is developed to estimate the relationship between price and quantity sold. Program sales data are, by their nature, non-negative integer values (i.e., count data). Typical ordinary least squares (OLS) estimation procedures are designed to deal with continuous dependent variables that are normally distributed. Count data dependent variables can be adapted for OLS estimation through logarithmic or square root transformations, but these models may produce nonsensical predictions, such as negative sales. The Evaluators used a negative binomial model to account for the right-skewed relationship between prices and quantities.

The typical price elasticity model assumes that four broad factors affect bulb sales: prices, bulb models, promotional events, and seasonal trends. The final model used dummy variables to control for seasonal effects (month dummies) and bulb type (model number dummies). A separate model was run for each bulb type (Omni-directional LED and Specialty LED). The basic equation of the price response model was structured as follows (for bulb model i, in period t):

$$\ln(Q_{it}) = \beta_1 + \beta_2 * \ln(P_{it}) + \beta_3 EventDummy_{it} + \sum_{\pi} \beta_\pi ModelNumberDummy_i + \sum_{\gamma} \beta_\gamma MonthDummy_t + \varepsilon_{it}$$

Where:

$\ln$ = Natural logarithm

Q_{it} = Quantity of bulb packs, i, sold during week, t

P_{it} = Retail price (after markdown) for package of bulbs, i, during week, t

$EventDummy_{it}$ = Binary variable equaling 1 if a promotional even occurred at retailer selling bulb pack, i, during week, t; otherwise equaling 0

$ModelNumberDummy_i$ = Binary variable equaling 1 for each unique model; otherwise, 0

$MonthDummy_t$ = Binary variable equaling 1 in each month; otherwise, 0

The β_2 coefficient in the model represents average price elasticity of demand holding the effects of all other independent variables constant. The β_3 coefficient captures the impact of promotional events on bulb sales. Under the counterfactual scenario where no program exists, the $EventDummy_{it}$ variable is always zero, indicating the absence of program sponsored promotional events.

Free-ridership ratios were calculated as follows. First, the price response model was used to estimate bulb package sales under program and non-program pricing scenarios. The non-program scenario represents pricing at original retail levels along with the absence of any program-sponsored promotional events. Bulb package sales under both scenarios were multiplied by the number of bulbs per package to

arrive at total bulb sales under the program and non-program scenarios. Finally, deemed savings values (gross kWh) were applied to the estimated number of bulbs sold under both scenarios. The final price response model was used to estimate a free-ridership as described in the equation below:

$$Free\ ridership\ ratio = \frac{\sum_i^n (E\left[Bulbs_{NoProgram_i}\right] * kWh_i)}{\sum_i^n (E\left[Bulbs_{Program_i}\right] * kWh_i)}$$

Where:

$E\left[Bulbs_{NoProgram_i}\right]$ = the expect number of bulbs of type, i, purchased for given original retail pricing (as predicted by the model)

$E\left[Bulbs_{Program_i}\right]$ = the expect number of bulbs of type, i, given program discounted pricing (as predicted by the model)

kWh_i = average gross kWh savings for bulb type, i

The price response modeling approach is advantageous in that it is built upon actual sales data from participating retailers (as opposed to relying on consumer self-report surveys). There are, however, a number of limitations for the approach. Most importantly, non-program sales data was unavailable for inclusion in the model. As a result, the modeling of price impacts may fit program sales data well, but it is uncertain whether those price effects apply well to prices outside of program ranges. Additionally, for past analyses, during the sales period analyzed there is normally pricing variation for a subset of bulb models, limiting the ability of the model to predict price response effects in a robust manner. Finally, there were likely variables that affect sales levels for LEDs that were not captured by the program tracking data; thus, presenting a risk of omitted variable bias in addition to the inherent amount of error from statistical modeling.

6.4.2.2 Lighting Component – Results

The Evaluators ran separate models for each bulb type (i.e., LED Standard/Omni-directional, and LED Specialty/Directional). The model coefficients for each model are shown in the tables below. The Evaluators normally include a variable for promotional extra markdown/giveaway events, but no promotional events took place in PY9. The effect of promotional events is therefore absorbed by the other covariates although its omission usually has an insignificant effect on the overall free-ridership rate. Additional covariates were tested in the modeling process, including store number and retailer type, but these did not result in a better fit and caused issues with overfitting. The coefficients on program price are negative (the expected direction) and statistically significant at the 99% level.

As shown in Table 6-23, the Evaluators estimated the free-ridership rate for upstream LEDs overall to be 33.4% using the price response model. The free-ridership rate for Specialty LEDs is 66.9%, while the free-ridership rate for Omni-directional LEDs is 21.4%. The Evaluators also performed a literature review for spillover and estimated a spillover rate of 8%.

TABLE 6-23 PY9 RLA RESULTS OF SPILLOVER BENCHMARKING STUDY – APPLIED TO PY11

Program Administrator	Year	Methodology	Spillover
Progress Energy Carolinas	2012	General population survey	7%
Xcel Energy Minnesota	2012	Participant survey	10%
Public Service Company of New Mexico	2013	Participant survey	11%
Xcel Energy Colorado	2015	Lighting study	8%
ComEd Illinois	2015	In-store intercepts	7%
Ameren Illinois	2015	In-store intercepts	7%
Xcel Energy Minnesota	2012	Participant survey	10%
Average Spillover from Benchmarking Study			**8%**

The NTG ratio for the program overall is 74.6%. The NTG ratio is estimated using the following formula: NTG = 1 – Free-ridership + Spillover. The NTG ratios for each bulb type are outlined in the table below.

TABLE 6-24 PY9 RLA NTG RATIO RESULTS BY BULB TYPE – APPLIED TO PY11

Bulb Type	Free-ridership	Spillover	NTGR
Specialty LED	66.9%	8.0%	41.1%
Omni-directional LED	21.4%	8.0%	86.6%
All	**33.4%**	**8.0%**	**74.6%**

The following two tables below summarize the price response regression coefficients for both the Omni-directional and the Specialty LED bulb types, respectively.

TABLE 6-25 PY9 RLA PRICE RESPONSE MODEL RESULTS: OMNI-DIRECTIONAL LEDS

Coefficient	Estimate	Std Err	Statistic	P Value	90% CI Lower	90% CI Upper
(Intercept)	2.695	0.106	25.364	0.000	2.519	2.870
Program Price	-0.211	0.011	-19.889	0.000	-0.229	-0.194
Jan	-0.803	0.192	-4.177	0	-1.12	-0.486
Feb	-1.381	0.286	-4.837	0	-1.852	-0.91
Mar	-0.202	0.084	-2.411	0.016	-0.34	-0.064
May	-0.321	0.116	-2.759	0.006	-0.514	-0.129
June	-0.509	0.094	-5.426	0	-0.664	-0.354
July	-0.602	0.109	-5.53	0	-0.781	-0.422
Aug	-0.429	0.103	-4.167	0	-0.598	-0.259
Sept	-0.33	0.114	-2.908	0.004	-0.518	-0.143
Oct	-0.267	0.106	-2.518	0.012	-0.441	-0.092
Nov	-0.632	0.19	-3.323	0.001	-0.946	-0.318
Dec	-0.489	0.093	-5.261	0	-0.643	-0.336
LEDstd_A19_2	0.928	0.109	8.535	0.000	0.749	1.108

TABLE 6-26 PY9 RLA PRICE RESPONSE MODEL RESULTS: SPECIALTY LEDS

Coefficient	Estimate	Std Err	Statistic	P Value	90% CI Lower	90% CI Upper
(Intercept)	5.277	0.275	19.163	0.000	4.823	5.731
Program Price	-0.036	0.009	-3.930	0.000	-0.052	-0.021
Jan	-0.795	0.135	-5.865	0.000	-1.018	-0.571
Feb	-0.420	0.230	-1.825	0.068	-0.800	-0.040
Mar	0.008	0.071	0.112	0.911	-0.109	0.125
May	-0.558	0.098	-5.701	0.000	-0.719	-0.396
June	-0.668	0.090	-7.400	0.000	-0.817	-0.519
July	-0.721	0.101	-7.105	0.000	-0.888	-0.553
Aug	-0.427	0.095	-4.508	0.000	-0.583	-0.271
Sept	-0.556	0.103	-5.394	0.000	-0.726	-0.386
Oct	-0.621	0.094	-6.624	0.000	-0.776	-0.466
Nov	-0.582	0.166	-3.502	0.000	-0.856	-0.308
Dec	-0.526	0.081	-6.457	0.000	-0.660	-0.391
LEDspec_BA10_6[17]	1.041	0.541	1.924	0.054	0.148	1.933

6.4.2.3 Appliance Component – Results

Participant survey responses were used to estimate free-ridership for ENERGY STAR refrigerators and room air conditioners, and participant spillover for the offering. The methodology used is described in detail in Section 3.4.2.1.

A literature review was performed for heat pump water heaters and ENERGY STAR pool pumps. Table 6-27 and Table 6-28 summarize the free-ridership findings for these two measures. The Evaluators applied the average free-ridership ratio.

TABLE 6-27 PY9 RLA FREE-RIDERSHIP FINDINGS FOR HEAT PUMP WATER HEATERS – APPLIED TO PY11

Program Year	State	Free-ridership
2015-2016	WY	18%
2015	MO	19%
2012	IL	14%
Average		**17%**

TABLE 6-28 PY9 RLA FREE-RIDERSHIP FINDINGS FOR POOL PUMPS – APPLIED TO PY11

Program Year	State	Free-ridership
2014	MI	0%
2015	MI	0%
2018	TX	7%
2017	NV	30%
2016	CO	20%
Average		**11%**

[17] Only one bulb model number is shown here for the sake of brevity, although each bulb model received its own coefficient.

6.4.2.4 Net Savings Results

Net savings results can be found in Section 6.1 Summary. Table 6-29 summarizes the free-ridership findings for refrigerators, window air conditioners, pool pumps, and HP water heaters.

TABLE 6-29 PY9 RLA SUMMARY OF FREE-RIDERSHIP SELF-REPORTED NTG – APPLIED TO PY11

Measure	NTG
ENERGY STAR Refrigerator	51.6%
ENERGY STAR Window Air Conditioner	63.1%
ENERGY STAR Pool Pumps	89.2%
Heat Pump Water Heaters	83.6%

One respondent reported installing an ENERGY STAR dishwasher that qualified as spillover.

Free-ridership for the appliance component of the offering was estimated by applying the measure-level free-ridership to the measure savings. Program level spillover was estimated by applying a ratio of the survey respondent reported spillover savings to the total verified gross savings for survey respondents to the program gross savings.

Table 6-30 summarizes the application of PY9 NTG surveys results to the appliances portion the PY11 RLA Program.

TABLE 6-30 SUMMARY OF PY11 RLA NET SAVINGS – APPLIANCE COMPONENT

Verified Gross kWh Savings	Verified Net kWh Savings	kWh NTG	Verified Gross kW Reductions	Verified Net kW Reductions	kW NTG
1,983,649	1,538,189	77.5%	8.66	6.40	74.0%

Table 6-31 summarizes the application of PY9 NTG surveys results to the appliances portion the PY11 RLA Program.

TABLE 6-31 PY11 RLA PROGRAM NET SAVINGS

Verified Gross kWh Savings	Verified Net kWh Savings	kWh NTG	Verified Gross kW Reductions	Verified Net kW Reductions	kW NTG
15,537,114	10,775,926	69.4%	2,293.12	1,569.27	68.4%

6.4.3 PROCESS FINDINGS

The Evaluators did not conduct a process evaluation in PY11 of the Retail Lighting and Appliance program. Process activities were focused on C&I programs in PY11.

The Retail Lighting & Appliances Program (RLA) provides retail markdown incentives for efficiency lighting as well as end-user incentives for window air conditioners, high efficiency refrigerators, and other appliances. The program is transitioning away from lighting, and as a result many evaluation activities are unwarranted. This current program cycle is the last cycle that would operate under current applicable codes and standards, and it is expected that residential LEDs will play a smaller role in Energy Smart after PY12.

The table below summarizes data collection activities.

TABLE 6-32 RLA DATA COLLECTION ACTIVITIES

Evaluation Activity	Sample Size (Per-Year)	Year Conducted	Impact	Process
Staff/Implementer Interviews	2-3/ year	PY10, PY11, PY12	X	X
Database Review	Census	PY10, PY11, PY12	X	X
General population survey	200	PY10	X	X
Appliance Rebate Survey	35	PY10, PY12	X	X

6.5 Data Tracking Review

The Evaluators reviewed the tracking data provided and found the following issues. The following parameters were missing or incomplete for RLA.

- **Trade ally information**: only the Trade Ally's company name was provided. If the Evaluators needed to conduct a Trade Ally interviews, the Evaluators would have needed to request additional information.
- **Participant information**: some key elements in participant contact information was missing in the data, such as phone numbers, emails.
- **Measure-level parameters required for savings calculations:** Although there were some measure fields missing for some of the measure offerings, make and model numbers were provided for the Evaluators to look up pertinent measure information.

The Evaluators note that a supplemental tracking dataset was provided for this program and a few others. This data had all the fields that the program-specific dataset was missing for RLA. However, the Evaluators noted that there were few inconsistencies with total program kWh savings, total kW reductions, and total project counts. Since the two did not align, it was difficult to know which was the best and final to utilize in the Evaluation.

6.6 Key Findings and Conclusions

The following summarizes the key findings and conclusions for the RLA program PY11 evaluation.

- **The RLA program performed well in PY11, achieving 103.4% of program *Ex ante* Gross Energy Savings (kWh).** Compared to PY10 RLA program results, there was an increase of 53% of expected savings. The LEDs in PY11 accounted for a 50% increase of expected savings compared to the prior year.
- **There were a few tracking data inconsistencies that affected the expected savings for a few projects.** There were three pool pumps that did not have any claimed savings, resulting in a higher realization rate. Additionally, there were a few dehumidifier projects that had inconsistent expected savings, despite being the same make and model.

6.7 Recommendations

The following summarizes key recommendations after completing the RLA Program PY11 evaluation.

- ***Consider aggregating all residential program data together to address macro-level database inconsistencies.*** *The review of program tracking data involved looking at two separate Excel workbooks with inconsistent sizes and inconsistent heading titles for the same data point. One of the workbooks had missing data points required for calculation inputs while the other workbook had inconsistencies in overall program total ex ante kWh and incentives. The Evaluators suggest aggregating all of the residential data into one workbook, with a focus on providing all of the required fields for all measure calculations.*

7 MULTIFAMILY SOLUTIONS

7.1 Summary

The tables below report *ex ante* gross, *ex post* gross, *ex post* net energy savings (kWh) (both annual and lifetime), demand reductions (kW), participation, and incentive spend, by measure, where applicable.

TABLE 7-1 PY11 MULTIFAMILY SOLUTIONS ENERGY SAVINGS (KWH)

Measure	*Ex ante* Gross Savings (kWh)	Realization Rate (kWh)	*Ex post* Gross Savings (kWh)	NTG	*Ex post* Net Savings (kWh)
Duct Sealing	1,040,832	95%	992,794	90%	892,621
Air Sealing	125,924	102%	128,393	95%	121,973
Indoor LED Lamp (Specialty)	18,882	98%	18,541	90%	16,670
Indoor LED Lamp (Standard)	63,046	93%	58,680	90%	52,759
Outdoor LED Lamp (Specialty)	23,280	89%	20,761	90%	18,666
1.0 Bathroom Aerator	7,550	100%	7,548	90%	6,786
1.5 Kitchen Aerator	7,826	100%	7,826	90%	7,036
1.5 Showerhead	55,176	100%	55,176	90%	49,609
Pipe Wrap	1,291	100%	1,291	96%	1,244
Incentive Adjustment	0	N/A	0	N/A	0
Total	**1,343,807**	**96%**	**1,291,009**	**90%**	**1,167,364**

Sums may differ due to rounding.

TABLE 7-2 PY11 MULTIFAMILY SOLUTIONS DEMAND REDUCTIONS (KW)

Measure	*Ex ante* Gross Demand (kW)	Realization Rate (kW)	*Ex post* Gross Demand (kW)	NTG	*Ex post* Net Demand (kW)
Duct Sealing	294.54	98%	289.15	90%	259.98
Air Sealing	42.59	102%	43.43	95%	41.25
Indoor LED Lamp (Specialty)	3.21	98%	3.15	90%	2.83
Indoor LED Lamp (Standard)	10.70	102%	10.89	90%	9.80
Outdoor LED Lamp (Specialty)	0.73	0%	0.00	90%	0.00
1.0 Bathroom Aerator	0.78	100%	0.78	90%	0.70
1.5 Kitchen Aerator	0.82	100%	0.82	90%	0.74
1.5 Showerhead	5.74	100%	5.74	90%	5.16
Pipe Wrap	0.15	100%	0.15	96%	0.14
Incentive Adjustment	0.00	N/A	0.00	N/A	0.00
Total	**359.25**	**99%**	**354.10**	**91%**	**320.59**

Sums may differ due to rounding.

TABLE 7-3 PY11 MULTIFAMILY SOLUTIONS LIFETIME SAVINGS SUMMARY

Measure	EUL	*Ex post* Gross Lifetime Energy Savings (kWh)	*Ex post* Net Lifetime Energy Savings (kWh)
Duct Sealing	18	17,870,293	16,067,180
Air Sealing	11	1,412,319	1,341,703
Indoor LED Lamp (Specialty)	20	370,822	333,406
Indoor LED Lamp (Standard)	17	1,011,060	909,044
Outdoor LED Lamp (Specialty)	20	415,212	373,317
1.0 Bathroom Aerator	10	75,475	67,860
1.5 Kitchen Aerator	10	78,256	70,360
1.5 Showerhead	10	551,760	496,087
Pipe Wrap	13	16,787	16,171
Incentive Adjustment	N/A	0	0
Total	**17**	**21,801,984**	**19,675,129**

Sums may differ due to rounding.

TABLE 7-4 PY11 MULTIFAMILY SOLUTIONS PARTICIPATION AND INCENTIVE SUMMARY

Measure	Participation (Count of Measures)	Incentive Spend ($)
Duct Sealing	458	$178,977
Air Sealing	150	$37,333
Indoor LED Lamp (Specialty)	168	$3,540
Indoor LED Lamp (Standard)	304	$11,991
Outdoor LED Lamp (Specialty)	40	$800
1.0 Bathroom Aerator	130	$338
1.5 Kitchen Aerator	291	$1,460
1.5 Showerhead	239	$2,544
Pipe Wrap	9	$102
Incentive Adjustment	313	$7,015
Total	**2,102**	**$244,100**

Sums may differ due to rounding.

7.2 Program Description

The Multifamily offering was introduced in PY7. The offering is designed to promote energy efficiency in the multifamily sector by offering home energy walkthrough assessments and deeper energy assessments to multifamily customers. Incentives are provided to trade allies for installation of pre-approved measures. The program has the same design elements as HPwES, but targets homes with five or more attached dwelling units. Any property with more than one meter is considered a multifamily property. This channel was developed to work towards overcoming the "split incentive" barrier to multifamily program participation; multifamily dwelling units have historically been underserved as owners are often unwilling to make significant investments in energy efficiency when the utility bill is paid by tenants. Multifamily tenants who meet requirements for the Income Qualified Weatherization program are assessed and served through that channel instead of the traditional Multifamily channel.

The PY11 program was open and available to customers between April 1, 2021, and December 31, 2021.

7.2.1 PROGRAM CHANGES

There were no recorded changes to Multifamily Solutions in PY11.

7.2.2 OPERATIONS AND TRENDS

The evaluation approach for PY11 included the following activities: project data review, desk reviews; and the application of program year field visit results from prior years instead of on-site testing and data collection.

Records indicated a total of 775 projects were completed in seven large apartment complexes. Table 7-5 summarizes the total number of homes a measure was installed in and/or performed at, total measures installed/performed and the expected kWh and peak kW reductions by measure.

TABLE 7-5 PY11 MULTIFAMILY SUMMARY OF MEASURES AND EXPECTED SAVINGS

Measure	Sum of Measures	*Ex ante* Gross Energy Savings (kWh)	*Ex ante* Gross Demand Reductions (kW)	% of kWh
Duct Sealing	458	1,040,832	294.54	77.5%
Air Sealing	150	125,924	42.59	9.4%
Indoor LED Lamp (Specialty)	168	18,882	3.21	1.4%
Indoor LED Lamp (Standard)	304	63,046	10.70	4.7%
Outdoor LED Lamp (Specialty)	40	23,280	0.73	1.7%
1.0 Bathroom Aerator	130	7,550	0.78	0.6%
1.5 Kitchen Aerator	291	7,826	0.82	0.6%
1.5 Showerhead	239	55,176	5.74	4.1%
Pipe Wrap	9	1,291	0.15	0.1%
Incentive Adjustment	313	0	0.00	0.0%
Total	**2,102**	**1,343,807**	**359.25**	**100%**

Sums may differ due to rounding.

The following figures shows the contribution to savings by measure in the Multifamily Solutions program.

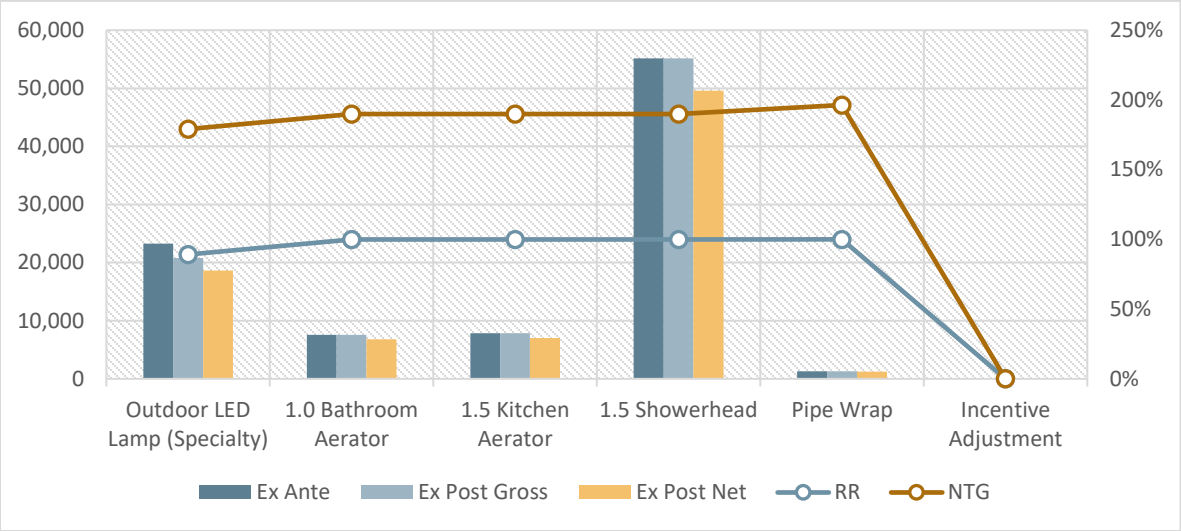


FIGURE 7-1 MULTIFAMILY SOLUTIONS ENERGY SAVINGS SUMMARY (KWH)

Duct sealing contributes 77.5% of expected savings, air sealing contributes 9.4% of expected savings, LEDs contribute 7.8%, and finally showerheads account for 4.1% expected savings. All other measures each contribute about 1% or less for each.

In PY9 468 projects, summing to 1,329,283 kWh, were completed during an extended 15-month period. During the 2019 calendar year the program achieved 1,244,469 kWh from 466 households. During PY10 the offering ran for only nine months, completing 544 projects summing to 454,304 in expected savings. Normalizing these to a 12-month program year for a more accurate comparison yields 725 projects and 605,739 kWh in expected savings, a 56.7% decrease overall. These normalized sums are only used for illustrative comparative purposes.

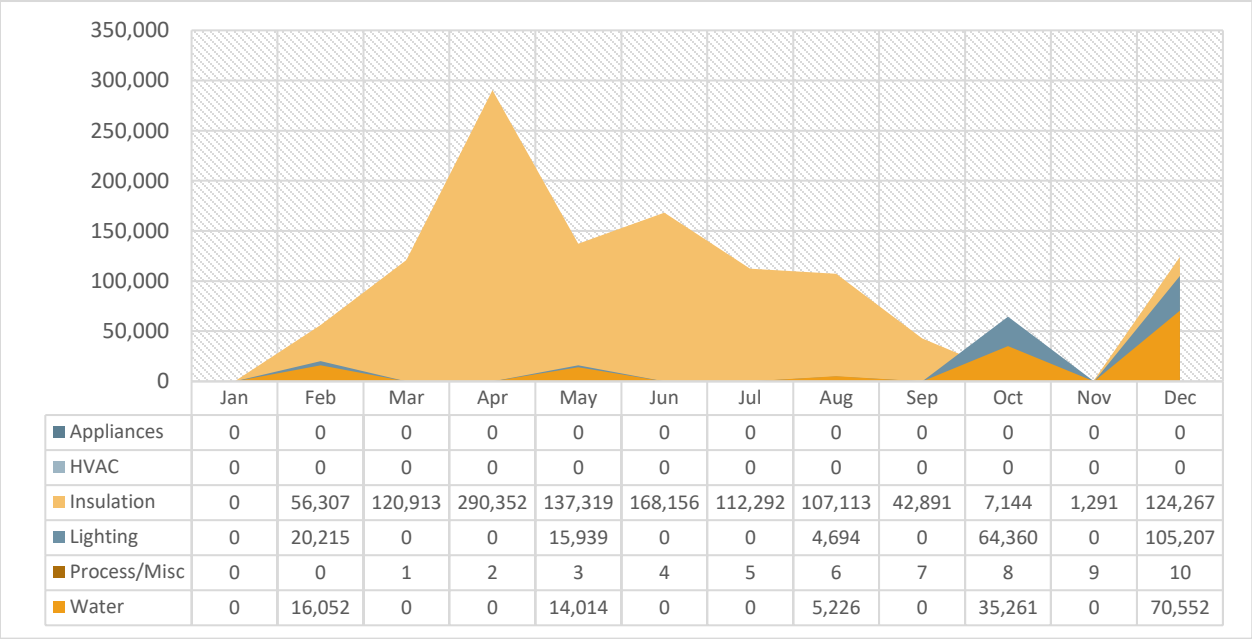
Finally, in PY11 there were 775 projects that accounted for 1,343,807 kWh. Taking the normalized program results from PY10, the PY11 participation increased by 7% and expected savings increased by 122%. A summary outlining program results from the last five years is shown below in Table 7-6.

TABLE 7-6 PY11 MULTIFAMILY PARTICIPATION AND EXPECTED SAVINGS BY PROGRAM YEAR

Program Year (PY)	Count of Homes	*Ex ante* Gross Energy Savings (kWh)	Expected kWh per Home
PY7 (nominal)	261	343,424	1,316
PY7 (adjusted)	348	457,898	1,316
PY8	504	836,131	1,659
PY9 (total)	468	1,329,283	2,840
PY9 (calendar)	466	1,244,469	2,671
PY10 (nominal)	544	454,304	835
PY10 (adjusted)	725	605,739	835
PY11	775	1,343,807	1,734

7.2.3 TIMING OF PROJECTS

The figure below shows *ex ante* energy savings (kWh) for Multifamily solutions by end use, by month.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Appliances	0	0	0	0	0	0	0	0	0	0	0	0
HVAC	0	0	0	0	0	0	0	0	0	0	0	0
Insulation	0	56,307	120,913	290,352	137,319	168,156	112,292	107,113	42,891	7,144	1,291	124,267
Lighting	0	20,215	0	0	15,939	0	0	4,694	0	64,360	0	105,207
Process/Misc	0	0	1	2	3	4	5	6	7	8	9	10
Water	0	16,052	0	0	14,014	0	0	5,226	0	35,261	0	70,552

FIGURE 7-2 *EX ANTE* SAVINGS BY END USE BY MONTH

7.2.4 TRADE ALLIES

The Multifamily Solutions program had four participating trade allies in PY11. Three of the reported trade allies perform weatherization work, including the following measures: duct sealing and air sealing.

Additionally, in place of trade allies, the implementer predominately installs direct install measures, including the following: pipe wrap, aerators, showerheads, and lighting. These measure are also assigned an incentive bonus, representing 6% of the claimed savings.

The table below shows the distribution of savings across all trade allies.

TABLE 7-7 MULTIFAMILY SOLUTIONS TRADE ALLY ACTIVITY

Trade Ally	*Ex ante* Gross Energy Savings (kWh)	% of Savings
TA1	866,618	29%
TA2	177,051	6%
TA3	168,726	6%
TA4	131,412	4%

Sums may differ due to rounding.

7.2.5 GOAL ACHIVEMENT

Total verified savings and percentage of goals for the program are summarized in Table 7-8.

TABLE 7-8 PY11 MULTIFAMILY SUMMARY OF GOAL ACHIEVEMENT

Ex post Gross Energy Savings (kWh) Goal	% to kWh Goal	*Ex post* Gross Energy Savings (kWh)	*Ex post* Gross Savings (kW) Target	% to kW Target	*Ex post* Gross Savings (kW)
1,289,414	100%	1,291,009	349.05	101%	354.10

7.3 EM&V Methodology

The Multifamily Solutions program has received comprehensive impact and process evaluations in PY7 through PY9. The evaluations provided free-ridership estimates, discussions of program satisfaction and strategic recommendations for program improvement, and most/all measures offered by the program have deemed TRM savings. In the initial review of the PY11 program, the Evaluators concluded that the Multifamily offering did not warrant more than a brief overview of program activity.

7.3.1 IN-SERVICE RATES FOR PY11

Impact methodology ISRs for the program are the same as described for HPwES, in Section 4.3.1. The ISRs apply to the air sealing and the duct sealing projects.

7.4 Evaluation Findings

Evaluation results for the Multifamily Solutions program can be found in Section 7.1 Summary.

7.4.1 GROSS IMPACT FINDINGS

7.4.1.1 Aerators

Expected and verified savings for aerators are summarized below.

TABLE 7-9 PY11 MULTIFAMILY EXPECTED AND VERIFIED AERATORS SAVINGS

Ex ante Gross Energy Savings (kWh)	*Ex post* Gross Energy Savings (kWh)	Realization Rate kWh	*Ex ante* Gross Demand Reductions (kW)	*Ex post* Gross Demand Reductions (kW)	Realization Rate kW
15,376	15,373	100.0%	1.60	1.60	100.0%

7.4.1.2 Air Sealing

Expected and verified savings for the air sealing projects are summarized below.

TABLE 7-10 PY11 MULTIFAMILY EXPECTED AND VERIFIED AIR SEALING SAVINGS

Ex ante Gross Energy Savings (kWh)	*Ex post* Gross Energy Savings (kWh)	Realization Rate kWh	*Ex ante* Gross Demand Reductions (kW)	*Ex post* Gross Demand Reductions (kW)	Realization Rate kW
125,924	128,393	102.0%	42.59	43.43	102.0%

7.4.1.3 Duct Sealing

Expected and verified savings for the duct sealing projects are summarized below.

TABLE 7-11 PY11 MULTIFAMILY EXPECTED AND VERIFIED DUCT SEALING SAVINGS

Ex ante Gross Energy Savings (kWh)	*Ex post* Gross Energy Savings (kWh)	Realization Rate kWh	*Ex ante* Gross Demand Reductions (kW)	*Ex post* Gross Demand Reductions (kW)	Realization Rate kW
1,040,832	992,794	95.4%	294.54	289.15	98.2%

7.4.1.4 LEDs

Expected and verified savings for LEDs are summarized below.

TABLE 7-12 PY11 MULTIFAMILY EXPECTED AND VERIFIED LED SAVINGS

Ex ante Gross Energy Savings (kWh)	*Ex post* Gross Energy Savings (kWh)	Realization Rate kWh	*Ex ante* Gross Demand Reductions (kW)	*Ex post* Gross Demand Reductions (kW)	Realization Rate kW
105,208	97,982	93.1%	14.64	14.04	95.9%

7.4.1.5 Pipe Wrap

Expected and verified savings for the pipe wrap projects are summarized below.

TABLE 7-13 PY11 MULTIFAMILY EXPECTED AND VERIFIED PIPE WRAP SAVINGS

Ex ante Gross Energy Savings (kWh)	*Ex post* Gross Energy Savings (kWh)	Realization Rate kWh	*Ex ante* Gross Demand Reductions (kW)	*Ex post* Gross Demand Reductions (kW)	Realization Rate kW
1,291	1,291	100.0%	0.15	0.15	100.0%

7.4.1.6 Showerheads

Expected and verified savings for showerheads are summarized below.

TABLE 7-14 PY11 MULTIFAMILY EXPECTED AND VERIFIED SHOWERHEADS SAVINGS

Ex ante Gross Energy Savings (kWh)	*Ex post* Gross Energy Savings (kWh)	Realization Rate kWh	*Ex ante* Gross Demand Reductions (kW)	*Ex post* Gross Demand Reductions (kW)	Realization Rate kW
55,176	55,176	100.0%	5.74	5.74	100.0%

7.4.1.7 Avoided Replacement Cost

The Evaluators have added the benefits of avoided replacement costs (ARC). The table below summarize the ARC by measure in MF Solutions.

Information on methodology can be found in Section 3.4.1.3 Avoided Replacement Costs.

TABLE 7-15 SUMMARY OF ARC FOR MF SOLUTIONS

Measure	*Ex post* Gross ARCs ($)	*Ex post* Net ARCs ($)	NPV ARCs ($)
Duct Sealing	$0	$0	$0
Air Sealing	$0	$0	$0
Indoor LED Lamp (Specialty)	$2,835	$2,549	$2,549
Indoor LED Lamp (Standard)	$8,571	$7,707	$7,707
Outdoor LED Lamp (Specialty)	$400	$360	$360
1.0 Bathroom Aerator	$0	$0	$0
1.5 Kitchen Aerator	$0	$0	$0
1.5 Showerhead	$0	$0	$0
Pipe Wrap	$0	$0	$0
Incentive Adjustment	$0	$0	$0
Total	**$11,806**	**$10,615**	**$10,615**

Sums may differ due to rounding.

7.4.2 NET IMPACT FINDINGS

Participant survey responses were used to estimate the net energy impacts of the program. The offering net savings are equal to gross savings, less savings associated with free-ridership, plus participant spillover savings. For the program, the Evaluators developed estimates of net savings using a combination of deemed values and PY9 results and applied them to PY11.

The overall net to gross ratios applied were: 89.9% for energy savings; and 92.3% for peak demand reductions. Table 7-16 summarizes the program net kWh savings and peak kW demand reduction impacts of the program.

TABLE 7-16 PY11 MULTIFAMILY SOLUTIONS PROGRAM NET SAVINGS

Verified Gross kWh Savings	Verified Net kWh Savings	kWh NTG	Verified Gross kW Reductions	Verified Net kW Reductions	kW NTG
1,291,009	1,167,364	90.4%	354.10	320.59	90.5%

Individual measure net savings are summarized in Section 7.1 Summary.

7.4.3 PROCESS FINDINGS

The Evaluators did not conduct a process evaluation in PY11 of the Multifamily Solutions program. Process activities were focused on C&I programs in PY11.

The program provides in-unit direct install (DI) improvements, air conditioning tune-ups, and weatherization improvements for multifamily properties. Table 7-17 summarizes the data collection activities for the Multifamily Program.

TABLE 7-17-ENERGY SMART FOR MULTIFAMILY DATA COLLECTION ACTIVITIES

Evaluation Activity	Sample Size (Per-Year)	Year Conducted	Impact	Process
Staff/Implementer Interviews	3	PY10, PY11, PY12		X
Database Review	Census	PY10, PY11, PY12	X	
Occupant Surveys	70	PY12	X	X
Property Manger Interviews	6	PY10, PY12	X	X
On-site Inspection	70	PY10	X	

7.5 Data Tracking Review

The Evaluators reviewed the tracking data provided and found the following issues. The following parameters were missing or incomplete for Multifamily Solutions.

- **Installation dates**: the Evaluators could not determine when the project was completed.
- **Trade ally information**: only the trade ally's company name was provided. If the Evaluators needed to conduct a trade ally interviews, the Evaluators would have needed to request additional information.
- **Participant information**: some key elements in participant contact information was missing in the data, such as phone numbers and emails.
- **Measure-level parameters required for savings calculations:**
    - Air Infiltration: Heating type: there were a handful of projects that were missing heating type
    - Duct Sealing: CFM25 values: there were a few projects that were missing CFM25 test-out values.

The Evaluators note that a supplemental tracking dataset was provided for this program and a few others. This data had all the fields that the program-specific dataset was missing for Multifamily Solutions. However, the Evaluators noted that there were few inconsistencies with total program kWh savings, total kW reductions, and total project counts. Since the two did not align, it was difficult to know which was the best and final to utilize in the Evaluation.

7.6 Key Findings and Conclusions

The following summarizes the key findings and conclusions for the Multifamily Solutions program evaluation.

- **The Multifamily Solutions program performed relatively well in PY11, achieving 96.1% of program *ex ante* gross energy savings (kWh).** Despite falling just short of fully realizing all projects for the PY11 program, the program has been consistent in its measure offerings while continuing to increase overall portfolio contribution. Compared to PY10, there was an overall increase in participation of 7%, accounting for an increase of 122% expected savings.

7.7 Recommendations

The following summarizes key recommendations after completing the Multifamily Solutions program evaluation.

- ***Consider aggregating all residential program data together to address macro-level database inconsistencies.*** *The review of program tracking data involved looking at two separate Excel workbooks with inconsistent sizes and inconsistent heading titles for the same data point. One of the workbooks had missing data points required for calculation inputs while the other workbook had inconsistencies in overall program total ex ante kWh and incentives. The Evaluators suggest aggregating all the residential data into one workbook, with a focus on providing all of the required fields for all measure calculations.*

8 AIR CONDITIONING SOLUTIONS

8.1 Summary

The tables below report *ex ante* gross, *ex post* gross, *ex post* net energy savings (kWh) (both annual and lifetime), demand reductions (kW), participation, and incentive spend, by measure, where applicable.

TABLE 8-1 PY11 AC SOLUTIONS ENERGY SAVINGS (KWH)

Measure	*Ex ante* Gross Savings (kWh)	Realization Rate (kWh)	*Ex post* Gross Savings (kWh)	NTG	*Ex post* Net Savings (kWh)
Central AC with ECM	2,734	100%	2,734	90%	2,458
Central AC Tune Up SF	652,862	100%	652,881	90%	586,940
Central AC Tune Up MF	39,938	100%	39,941	90%	35,907
Duct Sealing SF	187,043	95%	176,801	90%	158,944
Heat Pump	1,292	103%	1,334	90%	1,199
Ductless Heat Pump	745	200%	1,490	90%	1,340
Smart Thermostat	99,813	100%	99,851	90%	89,766
Total	**984,427**	**99%**	**975,031**	**90%**	**876,553**

Sums may differ due to rounding.

TABLE 8-2 PY11 AC SOLUTIONS DEMAND REDUCTIONS (KW)

Measure	*Ex ante* Gross Demand (kW)	Realization Rate (kW)	*Ex post* Gross Demand (kW)	NTG	*Ex post* Net Demand (kW)
Central AC with ECM	1.28	100%	1.29	90%	1.16
Central AC Tune Up SF	306.99	100%	307.00	90%	275.99
Central AC Tune Up MF	18.78	100%	18.78	90%	16.88
Duct Sealing SF	68.94	95%	65.34	90%	58.74
Heat Pump	0.25	85%	0.21	90%	0.19
Ductless Heat Pump	0.10	200%	0.21	90%	0.18
Smart Thermostat	0.00	N/A	0.00	N/A	0.00
Total	**396.34**	**99%**	**392.82**	**90%**	**353.15**

Sums may differ due to rounding.

TABLE 8-3 PY11 AC SOLUTIONS LIFETIME SAVINGS SUMMARY

Measure	EUL	*Ex post* Gross Lifetime Energy Savings (kWh)	*Ex post* Net Lifetime Energy Savings (kWh)
Central AC with ECM	19	51,946	46,700
Central AC Tune Up SF	10	6,528,807	5,869,397
Central AC Tune Up MF	10	399,411	359,070
Duct Sealing SF	18	3,182,417	2,860,993
Heat Pump	16	21,337	19,182
Ductless Heat Pump	18	26,820	24,111
Smart Thermostat	11	1,098,359	987,425
Total	**12**	**11,309,097**	**10,166,878**

Sums may differ due to rounding.

TABLE 8-4 PY11 AC SOLUTIONS COUNT OF MEASURES AND INCENTIVE SPEND

Measure	Participation (Count of Measures)	Incentive Spend ($)
Central AC with ECM	3	$500
Central AC Tune Up SF	709	$105,750
Central AC Tune Up MF	71	$8,875
Duct Sealing SF	91	$29,714
Heat Pump	1	$250
Ductless Heat Pump	1	$500
Smart Thermostat	290	$70,250
Incentive Adjustment	1	$13
Total	**1,167**	**$215,852**

Sums may differ due to rounding.

8.2 Program Description

AC Solutions provides financial incentives to encourage residential customers to improve the efficiency of their HVAC systems. Incentives are provided for a tune-up of the system, HVAC system replacements, duct sealing and installing smart thermostats.

Tune-ups are provided by a qualified trade ally and involve testing the performance of the unit before and after measures are implemented. Typical measures implemented as part of the tune-up procedure include air flow correction; cleaning of the indoor blower, evaporator coils, condenser coils; and correction of refrigerant charge (if necessary).

Duct sealing is performed by applying mastic sealant or metal tape to the distribution system of air conditioning systems. Duct sealing performance is tested by taking the pre-measurement and post-measurement cubic feet per minute (CFM) leakage rate.

Incentives are provided for replacement of air conditioning systems and heat pump systems. Incentives for air conditioner replacements range from $50 to $150, depending on the size and SEER of the new

unit. Incentives for ducted heat pumps range from $150 to $250, depending on size and SEER of the new unit. Ductless heat pumps may receive incentives ranging from $250 to $500 depending on the size of the unit.

8.2.1 PROGRAM CHANGES

There were no recorded changes to the AC Solutions program in PY11.

8.2.2 OPERATIONS AND TRENDS

The evaluation approach for PY11 included the following activities: project data review, desk reviews; and the application of program year field visit results from prior years instead of on-site testing and data collection.

A total of 788 households participated in the A/C Solutions Program. Table 8-5 summarizes the total number of measures installed and/or performed and the expected kWh and peak kW savings by measure.

TABLE 8-5 PY11 AC SOLUTIONS SUMMARY OF MEASURES AND EXPECTED SAVINGS

Measure	Sum of Measures	*Ex ante* Gross Energy Savings (kWh)	*Ex ante* Gross Demand Reductions (kW)	% of kWh
Central AC with ECM	3	2,734	1.28	0.3%
Central AC Tune Up SF	709	652,862	306.99	66.3%
Central AC Tune Up MF	71	39,938	18.78	4.1%
Duct Sealing SF	91	187,043	68.94	19.0%
Heat Pump	1	1,292	0.25	0.1%
Ductless Heat Pump	1	745	0.10	0.1%
Smart Thermostat	290	99,813	0.00	10.1%
Incentive Adjustment	1	0	0.00	0.0%
Total	**1,167**	**984,427**	**396.34**	**100%**

Below, Figure 8-1 shows individual measure contribution to the overall program expected savings.

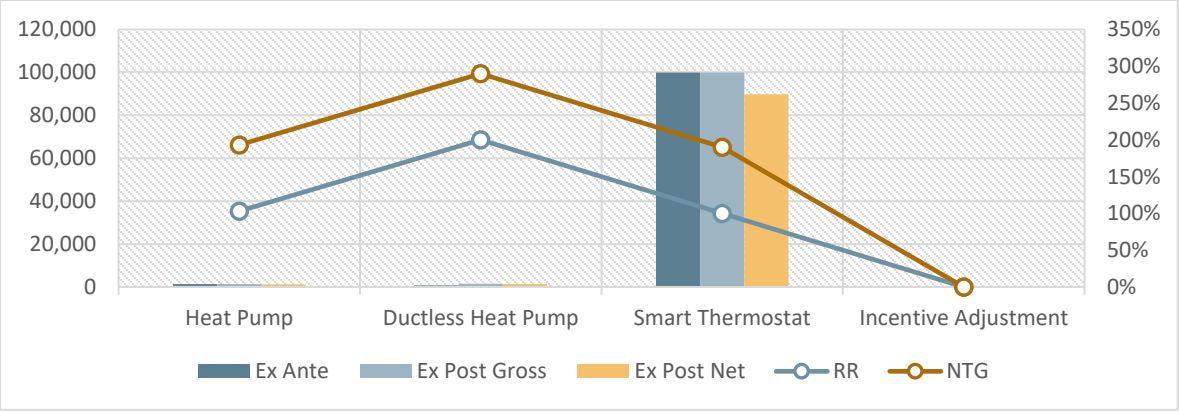


FIGURE 8-1 AC SOLUTIONS COMBINED SAVINGS CONTRIBUTION BY MEASURE

AC tune-ups (71%), duct sealing (19%) and smart thermostats (10%) were the high impact measures in the AC Solutions program.

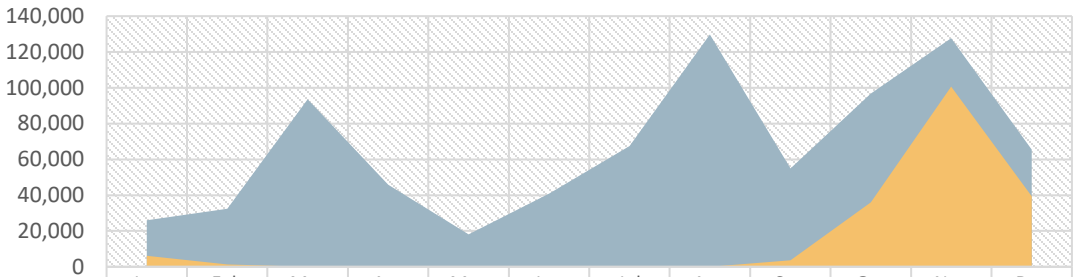
In PY9, there were 687 households summing to 2,294,095 kWh that participated during an extended 15-month period. During the 2019 calendar year the program achieved 2,287,604 kWh of savings from 682 households. During PY10 the program ran for only nine months, completing projects in 540 dwellings summing to 786,017 kWh in expected savings. Normalizing these to a 12-month program year for a more accurate comparison yields 720 projects and 1,048,023 kWh in expected savings. These normalized sums are only used for illustrative comparative purposes. Comparing these figures translates into a 65.7% drop in *Ex ante* Gross Energy Savings (kWh), while average dwelling kWh savings decreased by 56.3%.

However, due to the delayed launch of the of the program year and interruptions to on-sites due to the pandemic, the performance of the program (and the evaluation results), in many cases, should be interpreted as idiosyncratic to PY10 because of the COVID-19 pandemic.

Finally, in PY11, there were 788 total distinct homes accounting for a total 984,427 kWh of expected savings. Taking the normalized program results from PY10 into consideration, despite PY11 participation increasing by 9%, expected savings slightly decreased by 6%.

8.2.3 TIMING OF PROJECTS

The figure below shows *ex ante* energy savings (kWh) for HPwES by end use, by month.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Appliances	0	0	0	0	0	0	0	0	0	0	0	0
HVAC	26,013	32,418	93,479	45,841	18,129	40,745	67,455	129,751	54,990	96,728	127,709	65,540
Insulation	6,072	1,282	0	0	0	0	0	0	3,574	36,066	100,628	39,421
Lighting	0	0	0	0	0	0	0	0	0	0	0	0
Process/Misc	0	0	0	0	0	0	0	0	0	0	0	0
Water	0	0	0	0	0	0	0	0	0	0	0	0

FIGURE 8-2 *EX ANTE* BY END USE BY MONTH

8.2.4 TRADE ALLIES

The AC Solutions program had ten (10) participating trade allies in PY11. Nine of the reported trade allies installed some combination of smart thermostats, duct sealing and performed AC tune-ups. Two of which only performed AC tune-ups. The remaining trade ally installed a ductless heat pump. Five

projects had no reported trade ally and included a heat pump and the installation of a Central AC system.

The table below shows the distribution of savings across all trade allies.

TABLE 8-6 AC SOLUTIONS TRADE ALLY ACTIVITY

Trade Ally	*Ex ante* Gross Energy Savings (kWh)	% of Savings
TA1	594,230	60%
TA2	200,414	20%
TA3	68,029	7%
TA4	45,726	5%
TA5	32,007	3%
TA6	22,308	2%
TA7	10,470	1%
TA8	7,546	1%
TA9	745	0%

Sums may differ due to rounding.

8.2.5 GOAL ACHIEVEMENT

Total verified savings and percentage of goals for the AC Solutions Program are summarized in Table 8-7.

TABLE 8-7 PY11 AC SOLUTIONS SUMMARY OF GOAL ACHIEVEMENT

Ex post Gross Energy Savings (kWh) Goal	% to kWh Goal	*Ex post* Gross Energy Savings (kWh)	*Ex post* Gross Savings (kW) Target	% to kW Target	*Ex post* Gross Savings (kW)
2,388,674	41%	975,031	687.42	57%	392.82

8.3 EM&V Methodology

Impact savings were calculated using methods and inputs in the NO TRM V4.0 and incorporated results from historic on-site testing where appropriate. PY11 major savings components are AC tune-ups and duct sealing projects. Impact methodologies for the AC Solutions Program are the same as described for HPwES in Section 4.3.1, Measures not covered are described below.

8.3.1 DEEMED SAVINGS CALCLULATIONS

8.3.1.1 AC Replacement

Central AC replacement savings were calculated using the savings methodology from the NO TRM V4.0, section C.3.1.2. The following equations outline the methodology that the Evaluators adhered to.

$$kWh_{Savings} = CAP_c \times \frac{1\text{ kW}}{1{,}000\text{ W}} \times \left(\frac{1}{SEER_{pre}} - \frac{1}{SEER_{post}}\right) \times EFLH_C$$

$$kW_{Reductions} = CAP_c \times \frac{1\text{ kW}}{1{,}000\text{ W}} \times \left(\frac{1}{EER_{pre}} - \frac{1}{EER_{post}}\right) \times \%\text{CF}$$

Where:

CAP_C = Cooling capacity (in BTU)
$SEER_{pre}$ = Measured efficiency of the heating equipment before tune-up
$SEER_{post}$ = Measured efficiency of the heating equipment after tune
EER_{pre} = Full-load efficiency of baseline equipment
EER_{post} = Full-load efficiency of efficient equipment
$EFLH_C$ = Equivalent Full Load Hours - cooling (1,637)
$\%CF$ = Peak coincidence factor

TABLE 8-8 CENTRAL AC REPLACEMENT SCENARIO BASELINES

Replacement Scenario	SEER	EER
New Construction / Replace-on-Burnout	14	11.8
Early Retirement	13	11.2

8.3.1.2 HP Replacement

Central HP replacement savings were calculated using the savings methodology from the NO TRM V4.0, section C.3.4.5. The following equations outline the methodology that the Evaluators adhered to.

$$kWh_{Savings\ (Cooling)} = CAP_C \times \frac{1\text{ kW}}{1{,}000\text{ W}} \times \left(\frac{1}{SEER_{pre}} - \frac{1}{SEER_{post}}\right) \times EFLH_C$$

$$kWh_{Savings\ (Heating)} = CAP_H \times \frac{1\text{ kW}}{1{,}000\text{ W}} \times \left(\frac{1}{HSPF_{pre}} - \frac{1}{HSPF_{post}}\right) \times EFLH_H$$

$$kW_{Reductions} = CAP_C \times \frac{1\text{ kW}}{1{,}000\text{ W}} \times \left(\frac{1}{EER_{pre}} - \frac{1}{EER_{post}}\right) \times \%\text{CF}$$

Where:

CAP_H = Heating capacity of HP (in BTU)

$HSPF_{pre}$ = Heating Season Performance Factor of baseline equipment

$HSPF_{post}$ = Heating Season Performance Factor of efficient equipment

TABLE 8-9 CENTRAL AC REPLACEMENT SCENARIO BASELINES

Replacement Scenario	SEER	EER	HSPF
New Construction / Replace-on-Burnout	14	11.8	8.2 (Split)
New Construction / Replace-on-Burnout	14	11.8	8.2 (Packaged)
Early Retirement – Heat Pump Replacement	13	11.2	7.7
NC / ROB – ER to HP Replacement	14	1	3.41
ER – ER to Heat Pump Replacement	13	11.2	3.41

8.3.1.3 Deemed Savings for Other AC Solutions Measures

For remaining AC Solutions Program measures, the Evaluators used the following NO TRM V4.0 sections and tables to verify savings. The NO TRM V4.0 sections are outline in Table 8-10 below.

TABLE 8-10 NO TRM V4.0 SECTIONS FOR OTHER MEASURES – A/C SOLUTIONS

Measure	TRM Section	Calculated / Deemed	TRM Table(s)	Table Page(s)
Ductless Heat Pump	C.3.6	Calculated	N/A	C-109

8.3.2 IN-SERVICE RATES FOR PY11

Impact methodology ISRs for the AC Solutions Program are the same as described for HPwES, in Section 4.3.1. The ISRs apply to the duct sealing projects.

8.4 Evaluation Findings

The findings of the evaluation are found in Section 8.1 Summary.

8.4.1 GROSS IMPACT FINDINGS

8.4.1.1 Central AC Replacement

In PY11, the AC Solutions offering incentivized 3 central AC replacements. Expected and verified savings for PY11 AC Solutions central AC replacement projects are summarized below.

TABLE 8-11 PY11 AC SOLUTIONS EXPECTED AND VERIFIED CENTRAL AC REPLACEMENT SAVINGS

Ex ante Gross Energy Savings (kWh)	*Ex post* Gross Energy Savings (kWh)	Realization Rate kWh	*Ex ante* Gross Demand Reductions (kW)	*Ex post* Gross Demand Reductions (kW)	Realization Rate kW
2,734	2,734	100.0%	1.28	1.29	100.1%

8.4.1.2 Central HP Replacement

In PY11, the AC Solutions offering incentivized 1 central HP replacement. Expected and verified savings for PY11 AC Solutions central HP replacement projects are summarized below.

TABLE 8-12 PY11 AC SOLUTIONS EXPECTED AND VERIFIED CENTRAL HP REPLACEMENT SAVINGS

Ex ante Gross Energy Savings (kWh)	*Ex post* Gross Energy Savings (kWh)	Realization Rate kWh	*Ex ante* Gross Demand Reductions (kW)	*Ex post* Gross Demand Reductions (kW)	Realization Rate kW
1,292	1,334	103.2%	0.25	0.21	84.7%

8.4.1.3 Central AC Tune-ups

In PY11, the AC Solutions offering incentivized 780 central AC tune-ups. Expected and verified savings for PY11 AC Solutions central AC tune-up projects are summarized below.

TABLE 8-13 PY11 AC SOLUTIONS EXPECTED AND VERIFIED CENTRAL AC TUNE-UPS SAVINGS

Ex ante Gross Energy Savings (kWh)	*Ex post* Gross Energy Savings (kWh)	Realization Rate kWh	*Ex ante* Gross Demand Reductions (kW)	*Ex post* Gross Demand Reductions (kW)	Realization Rate kW
692,800	692,822	100.0%	325.77	325.78	100.0%

8.4.1.4 Ductless Heat Pump

The PY11 AC Solutions program rebated 1 ductless heat pump. The Evaluators calculated savings for the replacement as new construction (NC) and replacement on burnout (ROB) with the current minimum code as baseline: 14 SEER, 11.8 EER and 8.2 (split) or 8.0 (packaged) HSPF. Methods for calculating the deemed savings values came from the NO TRM V4.0, section C.3.6. Ductless Heat Pump. Deemed per-unit kWh and kW reductions were applied to all units installed during PY11.

TABLE 8-14 DUCTLESS HEAT PUMP DEEMED SAVINGS PER TONNAGE

Replacement Scenario	Deemed kWh per Ton	Deemed kW per Ton	Average Tons	Deemed kWh per Unit	Deemed kW per Unit
NC and ROB	599	0.0606	3.01	1,801	0.18
Early Replacement (ER) HP	745	0.1026	3.01	2,239	0.31

The higher realization rate is due to the *ex ante* estimations assuming the quantity (1) instead of the rated tonnage of the system (2) for use in the deemed savings per equipment tonnage.

TABLE 8-15 PY11 AC SOLUTIONS EXPECTED AND VERIFIED DUCTLESS HP SAVINGS

Ex ante Gross Energy Savings (kWh)	*Ex post* Gross Energy Savings (kWh)	Realization Rate kWh	*Ex ante* Gross Demand Reductions (kW)	*Ex post* Gross Demand Reductions (kW)	Realization Rate kW
745	1,490	200.0%	0.10	0.21	200.2%

8.4.1.5 Duct Sealing

In PY11, the AC Solutions offering incentivized 91 duct sealing projects. Expected and verified savings for the PY11 AC Solutions duct sealing projects are summarized below.

TABLE 8-16 PY11 AC SOLUTIONS EXPECTED AND VERIFIED DUCT SEALING SAVINGS

Ex ante Gross Energy Savings (kWh)	*Ex post* Gross Energy Savings (kWh)	Realization Rate kWh	*Ex ante* Gross Demand Reductions (kW)	*Ex post* Gross Demand Reductions (kW)	Realization Rate kW
187,043	176,801	94.5%	68.94	65.34	94.8%

8.4.1.6 Smart Thermostats

In PY11, the AC Solutions offering incentivized 91 smart thermostats. Expected and verified savings for PY11 AC Solutions smart thermostats are summarized below.

TABLE 8-17 PY11 MULTIFAMILY EXPECTED AND VERIFIED SMART THERMOSTATS SAVINGS

Ex ante Gross Energy Savings (kWh)	*Ex post* Gross Energy Savings (kWh)	Realization Rate kWh	*Ex ante* Gross Demand Reductions (kW)	*Ex post* Gross Demand Reductions (kW)	Realization Rate kW
99,813	99,851	100.0%	0.00	0.00	N/A

8.4.1.7 Avoided Replacement Cost

There were no Avoided Replacement Costs.

8.4.2 NET IMPACT FINDINGS

The Evaluators applied the PY9 net-to-gross ratio to estimate the net impacts of the AC Solutions offering. As in PY9, program savings were largely the result of duct sealing and tune-up measures with system replacements accounting for a limited share of projects, thus results are still applicable. The net to gross ratios applied were:

- 89.9% for kWh energy savings; and
- 89.9% for kW peak demand reductions.

Using the results of the net savings survey above, the Evaluators calculated net kWh savings and kW reductions by measure. Results for overall verified net savings are shown below in Table 8-18.

TABLE 8-18 PY11 AC SOLUTIONS PROGRAM NET SAVINGS

Ex post Gross Energy Savings (kWh)	*Ex post* Net Energy Savings (kWh)	kWh NTG	*Ex post* Gross Demand Reductions (kW)	*Ex post* Net Demand Reductions (kW)	kW NTG
975,031	876,553	89.9%	392.82	353.15	89.9%

8.4.3 PROCESS FINDINGS

The Evaluators did not conduct a process evaluation in PY11 of the AC Solutions program. Process activities were focused on C&I programs in PY11.

The AC Solutions program has achieved energy and demand savings associated with Heating, Ventilation, and Air Conditioning (HVAC) retrofits and tune-ups for residential and commercial customers. Homes and businesses are serviced by program trade allies.

The program administrator provides trade ally recruitment, training, qualification, data acquisition tools and guidelines, and quality assurance and oversight. Under this program, qualified trade allies will perform services such as refrigerant charge adjustment, airflow optimization, coil cleaning, and air filter replacement. Incentives for HVAC system upgrades are available in addition to these services. Table summarizes the planned process evaluation activities for the A/C Solutions program.

TABLE 8-19 AC SOLUTIONS DATA COLLECTION ACTIVITIES

Evaluation Activity	Sample Size (Per-Year)	Year Conducted	Impact	Process
Staff/Implementer Interviews	3	PY10, PY11, PY12		X
Database Review	Census	PY10, PY11, PY12	X	X
Trade Ally Interviews	5	PY10	X	X
Participant Survey	80	PY10	X	X
Data Collection Form Review	Census	PY10		X
Billing analysis to determine average E_{base} in kWh per ton	Near-Census	PY10, PY12	X	
Records review to establish *RelSav* from field measurements	40	PY10, PY12	X	

HVAC savings have been well-established in the NO TRM V4.0 via metering and billing analysis studies. In PY11, savings for these measures are fully deemed based on the NO TRM V4.0.

8.5 Data Tracking Review

The Evaluators reviewed the tracking data provided and found the following issues. The following parameters were missing or incomplete for AC Solutions.

- **Installation dates**: the Evaluators could not determine when the project was completed.
- **Trade ally information**: only the Trade Ally's company name was provided. If the Evaluators needed to conduct a Trade Ally interviews, the Evaluators would have needed to request additional information.
- **Participant information**: some key elements in participant contact information was missing in the data, such as phone numbers and emails.
- **Measure-level parameters required for savings calculations:**
    - Duct Sealing: CFM25 values: there were a few projects that were missing CFM25 test-out values.
    - HVAC measures: Although there were some missing fields for various HVAC measures, make and model numbers were provided for the Evaluators to look up pertinent measure information.

The Evaluators note that a supplemental tracking dataset was provided for this program and a few others. This data had all the fields that the program-specific dataset was missing for AC Solutions. However, the Evaluators noted that there were few inconsistencies with total program kWh savings, total kW reductions, and total project counts. Since the two did not align, it was difficult to know which was the best and final to utilize in the Evaluation.

8.6 Key Findings and Conclusions

The following summarizes the key findings and conclusions for the AC Solutions Program PY11 evaluation.

- **The program performed well in PY11, achieving 99.0% of program *ex ante* gross energy savings (kWh).** Compared to the nominal PY10 program findings, the program experienced an increase in expected savings, accounting for a 25% increase.
- **The program offerings remained relatively consistent with prior years.** There were central HP replacements that were added into the PY11 offerings, further contributing to its success.

8.7 Recommendations

The following summarizes key recommendations after completing the AC Solutions Program PY11 evaluation.

- ***Consider aggregating all program data together to address macro-level database inconsistencies.*** *The review of data involved looking at two separate workbooks with inconsistent sizes and inconsistent heading titles for the same data point. One had missing data points required for calculation inputs while the other had inconsistencies in overall program total ex ante kWh and incentives. The Evaluators suggest aggregating all the program data into one workbook, with a focus on providing all of the required fields for all measure calculations.*

9 SCHOOL KITS AND EDUCATION

9.1 Summary

The tables below report *ex ante* gross, *ex post* gross, *ex post* net energy savings (kWh) (both annual and lifetime), demand reductions (kW), participation, and incentive spend, by measure, where applicable.

TABLE 9-1 PY11 SK&E ENERGY SAVINGS (KWH)

Measure	*Ex ante* Gross Savings (kWh)	Realization Rate (kWh)	*Ex post* Gross Savings (kWh)	NTG	*Ex post* Net Savings (kWh)
School Kits	786,200	103%	811,149	79%	637,991
Total	**786,200**	**103%**	**811,149**	**79%**	**637,991**

Sums may differ due to rounding.

TABLE 9-2 PY11 SK&E DEMAND REDUCTIONS (KW)

Measure	*Ex ante* Gross Demand (kW)	Realization Rate (kW)	*Ex post* Gross Demand (kW)	NTG	*Ex post* Net Demand (kW)
School Kits	111.96	104%	116.58	79%	91.69
Total	**111.96**	**104%**	**116.58**	**79%**	**91.69**

Sums may differ due to rounding.

TABLE 9-3 PY11 SK&E LIFETIME SAVINGS SUMMARY

Measure	EUL	*Ex post* Gross Lifetime Energy Savings (kWh)	*Ex post* Net Lifetime Energy Savings (kWh)
School Kits	14	11,653,422	9,165,735
Total	**14**	**11,653,422**	**9,165,735**

Sums may differ due to rounding.

TABLE 9-4 PY11 SK&E PARTICIPATION AND INCENTIVE SUMMARY

Measure	Participation (Count of Measures)	Incentive Spend ($)
School Kits	37	$93,065
Total	**37**	**$93,065**

Sums may differ due to rounding.

Below, Table 4-5 summarizes the total number of measures installed and the expected kWh and peak kW savings by kits.

TABLE 9-5 PY11 SK&E SUMMARY OF MEASURES AND EXPECTED SAVINGS

Measure	Sum of Measures	*Ex ante* Gross Energy Savings (kWh)	*Ex ante* Gross Demand Reductions (kW)	% of kWh
School Kits	37	786,200	111.96	100%
Total	**37**	**786,200**	**111.96**	**100%**

Kits were reported with measure information.

9.2 Program Description

School Kits and Education (SK&E) provides classroom education on energy use and saving energy, as well as energy efficiency kits to students. In addition, the SK&E staff performs outreach activities to promote energy efficiency, and the rebates and discounts offered by ENO through the program.

The kit component of the program includes a 45 to 90-minute presentation given by program staff to 6th and 10th grade students. The presentation focuses on energy use and the importance of conservation. Students also receive an energy efficiency kit that contains the following items:

- Four 9W LEDs and two 15W LEDs;
- Two low-flow faucet aerators;
- One low-flow showerhead;
- A flow-rate bag for measuring the flow rate of faucets and showers;
- A flyer that describes the kit items and their benefits, and other Energy Smart offerings; and
- QR codes printed by each item that link to installation videos to aid in installation.

The adult outreach activities are intended to educate the organizations' members about energy efficiency and the program. The outreach activities include:

- Presentations at neighborhood groups and churches;
- Attendance at fairs and festivals; and
- Hosting tables at public events and public buildings.

9.2.1 OPERATIONS AND TRENDS

The SK&E program received comprehensive impact and process evaluations in PY5 and PY6. The evaluations provided free-ridership estimates, discussions of program satisfaction and strategic recommendations for program improvement. In the initial review of the PY11 program, the Evaluators concluded that the SK&E program did not warrant more than a brief overview of program activity.

9.2.2 TIMING OF PROJECTS

There are no reported dates in the SK&E program data.

9.2.3 TRADE ALLIES

There are no reported trade allies in the SK&E program data.

9.2.4 GOAL ACHIEVEMENT

Total verified savings and percentage of goals for the program are summarized in Table 9-6.

TABLE 9-6 PY11 SK&E SUMMARY OF GOAL ACHIEVEMENT

Ex post Gross Energy Savings (kWh) Goal	% to kWh Goal	*Ex post* Gross Energy Savings (kWh)	*Ex post* Gross Savings (kW) Target	% to kW Target	*Ex post* Gross Savings (kW)
681,132	119%	811,149	80.91	144%	116.58

9.3 EM&V Methodology

Electricity savings and peak demand reductions of the PY11 SK&E offering were estimated using inputs from the NO TRM V4.0. Measure-specific savings are provided below.

9.3.1 DEEMED SAVINGS CALCULATIONS

Calculation inputs for LED savings are outlined below.

TABLE 9-7 ENERGY STAR OMNIDIRECTIONAL LEDS – DEEMED SAVINGS PER LAMP

Minimum Lumens	Maximum Lumens	LED Wattage	Incandescent Equivalent 1st Tier EISA 2007 (W_{base})
310	749	7	29
750	1,049	9	43
1,050	1,489	12	53
1,490	2,600	15	72

$$kWh_{savings} = \left((W_{base} - W_{post})/1000\right) \times Hours \times ISR^{18} \times IEF_E{}^{19}$$

$$9W\ LED\ kWh_{savings} = 4\ \times \left(\frac{(43-9)}{1000}\right) \times 819.43 \times 1 \times 0.91 = 101.41\ kWh$$

$$15W\ LED\ kWh_{savings} = 2\ \times \left(\frac{(72-15)}{1000}\right) \times 819.43 \times 1 \times 0.91 = 85.01\ kWh$$

Deemed savings for faucet aerators are outlined below.

[18] 100% in this calculation. Measure-specific ISR applied after.

[19] Unknown heating type: 0.91

TABLE 9-8 FAUCET AERATORS – DEEMED SAVINGS

Efficient GPM Rating	Deemed kWh Savings	Deemed kW Reductions
1.5 GPM	26.80	0.0028
1.0 GPM	44.66	0.0046

Deemed savings for low-flow showerheads are outlined below.

TABLE 9-9 FAUCET AERATORS – DEEMED SAVINGS

1.50 GPM Showerhead Deemed Savings		
Water gal. saved /year/showerhead @ 1.5 GPM	2,860	
$T_{\_Supply}$	74.8°F	
$T_{\_Mixed}$	106.8°F	
Water heater EF (excluding standby losses)	0.98 (Electric Resistance) / 2.2 (Heat Pump)	
Energy Savings	Electric: 26.8 kWh	Heat Pump: 11.94 kWh
Demand Savings	Electric: 0.0028 kW	Heat Pump: 0.0012 kW

9.3.2 IN-SERVICE RATES

During the PY6 – PY8 evaluations, school kits were distributed along with a survey form to be filled out by students and parents, then returned. The forms included questions regarding which measures had been installed in the home as well as home characteristics. This information was used to determine in-service rates of each measure provided, and the prevalence of electric water heating in homes as a whole. Data from PY6 - PY8 were averaged to create deemed ISRs for each measure. These ISRs were applied to PY11.

Table 9-10 shows the ISRs found in the PY6 - PY8 evaluations. Along with resulting averages, which were applied to savings estimates shown above.

TABLE 9-10 PY11 SK&E SUMMARY OF IN-SERVICE AND WATER HEATING TYPE RATES

Kit Item	PY6	PY7	PY8	Average (PY11)
9W LED	68%	72%	70%	**70.1%**
15W LED	62%	75%	77%	**71.2%**
Bathroom Aerator 1.5	41%	47%	47%	**45.3%**
Kitchen Aerator 1.5	42%	46%	47%	**44.8%**
Showerhead	58%	64%	64%	**62.1%**
Electric Water Heating %	55%	47%	59%	**55.4%**

9.4 Evaluation Findings

Evaluation findings are reported in Section 9.1 Summary.

9.4.1 GROSS IMPACT FINDINGS

Ex post gross savings are 811,149 kWh and 116.58 kW, 103.2% and 104.1% of respective kWh and kW expectations. Savings are summarized in Table 9-11 below.

TABLE 9-11 PY11 SK&E EXPECTED AND VERIFIED SAVINGS

Ex ante Gross Energy Savings (kWh)	*Ex post* Gross Energy Savings (kWh)	Realization Rate kWh	*Ex ante* Gross Demand Reductions (kW)	*Ex post* Gross Demand Reductions (kW)	Realization Rate kW
786,200	811,149	103.2%	111.96	116.58	104.1%

9.4.1.1 Avoided Replacement Cost

The Evaluators have added the benefits of avoided replacement costs (ARC). The table below summarize the ARC by measure in SK&E.

Information on methodology can be found in Section 3.4.1.3 Avoided Replacement Costs.

TABLE 9-12 SUMMARY OF ARC FOR SK&E

Measure	*Ex post* Gross ARCs ($)	*Ex post* Net ARCs ($)	NPV ARCs ($)
School Kits	$75,345	$59,261	$59,261
Total	**$75,345**	**$59,261**	**$59,261**

Sums may differ due to rounding.

9.4.2 NET IMPACT FINDINGS

The Evaluators established NTG ratios were based on primary research completed in PY5 and PY6. In total, 43 program participants completed the survey for the 2015 and 2016 evaluations. The Evaluators surveyed 43 parent/guardian participants and estimated NTG ratios for each of the kit's measures. These NTG ratios were applied to the PY10 and PY11 participants.

Table 9-13 summarizes the average free-ridership scores by measure. The results presented show free-ridership highest for LEDs. This indicates that a higher percentage of participants are more familiar with energy efficient lighting measures.

TABLE 9-13 SK&E AVERAGE FREE-RIDERSHIP BY MEASURE

Measure	Average Free-ridership
Bathroom Aerator 1.5 GPM	13%
Kitchen Aerator 1.5 GPM	13%
Showerhead	11%
9W LED	33%
15W LED	22%[20]

Free-ridership for the program was estimated by applying measure level free-ridership to verified gross kWh savings and peak kW reductions. As seen in Table 9-13 above, the overall Net-to-Gross ratio for this program was 78.7%.

Results for overall verified net savings are shown below in Table 9-14.

TABLE 9-14 PY11 SK&E PROGRAM NET SAVINGS

Verified Gross kWh Savings	Verified Net kWh Savings	kWh NTG	Verified Gross kW Reductions	Verified Net kW Reductions	kW NTG
811,149	637,991	78.7%	116.58	91.69	78.7%

Net kWh savings totaled to 637,991 kWh and equal 78.7% of gross program savings. Net kW reductions totaled 89.57 kW.

Individual measure net savings are summarized in Section 9.1 Summary.

9.4.3 PROCESS FINDINGS

The Evaluators did not conduct a process evaluation in PY11 of the SK&E program. Process activities were focused on C&I programs in PY11.

The evaluation of the SK&E is dependent upon collection of adequate data at the time of implementation. The past survey issued to program participants by program staff collected in-service rate data for the equipment included with the kit. Further, this survey allowed participants to indicate willingness to complete a telephone or web-based survey. Our approach for this program was to survey respondents, which have agreed to provide the needed contact information.

The survey collected key data points including:

- What items in the kit did they install;
- What type of water heating do they have; and
- Basic satisfaction rating questions.

With this data, we then applied in-service rates and stipulated per-unit savings to develop program savings results.

[20] Based on PYs 5 and 6 18W CFL responses.

TABLE 9-15-SCHOOL KITS & EDUCATION DATA COLLECTION ACTIVITIES

Evaluation Activity	Sample Size (Per-Year)	Year Conducted	Impact	Process
Database Review	Census	PY10, PY11, PY12	X	
Participant Survey	80	PY10	X	X

9.5 Data Tracking Review

The Evaluators reviewed the tracking data provided and found the following issues. The following parameters were missing or incomplete for SK&E.

- **Shipping dates**: the Evaluators could not determine when the kits were shipped to participating schools.
- **Participant information**: some key elements in participant contact information was missing in the data, such as phone numbers and emails.
- **Measure-level parameters required for savings calculations:** Historically, kit contents and measure-specific information has not been provided in the tracking data and instead has been provided as supplemental information through emails. It may be unclear from the tracking data alone to determine what the kits contain as measures.

There were no supplemental data available for this pilot program.

9.6 Key Findings and Conclusions

The following summarizes the key findings and conclusions for the SK&E Program PY11 evaluation.

- **The SK&E program performed well in PY11, achieving 103.2% of program *ex ante* gross energy savings (kWh).** There was an overall increase in participation compared to PY10. In PY10, 25 schools participated in the program while in PY11 there were 37 that participated. The increase in school participation accounts for a 68% of increase in expected savings compared to PY10.
- **The SK&E program offerings have been successful in providing energy efficient devices as well as energy efficiency education to 6th and 10th grade students across ENO territory over multiple years.** The program offerings have remained consistent with devices included in kits while increasing the total expected program savings.

9.7 Recommendations

The following summarizes key recommendations after completing the SK&E Program PY11 evaluation.

- ***Consider aggregating all residential program data together to address macro-level database inconsistencies.*** *The review of program tracking data involved looking at two separate Excel workbooks with inconsistent sizes and inconsistent heading titles for the same data point. One of the workbooks had missing data points required for calculation inputs while the other workbook had inconsistencies in overall program total ex ante kWh and incentives. The Evaluators suggest aggregating all of the residential data into one workbook, with a focus on providing all of the required fields for all measure calculations.*

- ***Consider adding hot water restrictor valves into the kit offerings.*** *These come in both automatic and manual configurations, with both functioning to cut water use from the shower prior to reaching temperature. The manual version of the restrictor valve can be installed alongside a low flow showerhead, or a showerhead can be included instead which has this functionality integrated.*

10 APPLIANCE RECYCLING AND REPLACEMENT PILOT

10.1 Summary

The tables below report *ex ante* gross, *ex post* gross, *ex post* net energy savings (kWh) (both annual and lifetime), demand reductions (kW), participation, and incentive spend, by measure, where applicable.

TABLE 10-1 PY11 AR&R PILOT ENERGY SAVINGS (KWH)

Measure	*Ex ante* Gross Savings (kWh)	Realization Rate (kWh)	*Ex post* Gross Savings (kWh)	NTG	*Ex post* Net Savings (kWh)
Recycled Freezer	1,320	100%	1,321	60%	793
Replaced Refrigerator	11,432	110%	12,587	55%	6,923
Recycled Refrigerator	53,328	100%	53,375	58%	30,691
Total	**66,080**	**102%**	**67,284**	**57%**	**38,406**

Sums may differ due to rounding.

TABLE 10-2 PY11 AR&R PILOT DEMAND REDUCTIONS (KW)

Measure	*Ex ante* Gross Demand (kW)	Realization Rate (kW)	*Ex post* Gross Demand (kW)	NTG	*Ex post* Net Demand (kW)
Recycled Freezer	0.16	100%	0.16	60%	0.10
Replaced Refrigerator	1.75	105%	1.83	55%	1.01
Recycled Refrigerator	0.57	1,150%	6.59	58%	3.79
Total	**2.48**	**346%**	**8.59**	**57%**	**4.90**

Sums may differ due to rounding.

TABLE 10-3 PY11 AR&R PILOT LIFETIME SAVINGS SUMMARY

Measure	EUL	*Ex post* Gross Lifetime Energy Savings (kWh)	*Ex post* Net Lifetime Energy Savings (kWh)
Recycled Freezer	12	15,858	9,515
Replaced Refrigerator	17	213,984	117,691
Recycled Refrigerator	17	907,372	521,739
Total	**17**	**1,137,214**	**648,945**

Sums may differ due to rounding.

TABLE 10-4 PY11 AR&R PILOT COUNT OF MEASURES AND INCENTIVE SPEND

Measure	Participation (Count of Measures)	Incentive Spend ($)
Recycled Freezer	2	$100
Replaced Refrigerator	100	$80,000
Recycled Refrigerator	48	$2,400
Total	**150**	**$82,500**

Sums may differ due to rounding.

10.2 Program Description

The Appliance Recycling and Replacement Pilot Program (AR&R pilot) offering encourages early recycling of qualifying low efficiency appliances, such as refrigerators and freezers, for residential customers. The Pilot program also offers refrigerator replacement options for income-qualified residential customers. This new offering goes beyond federal recycling requirements using environmentally friendly best practices for recycling all components of each appliance.

The AR&R pilot program is designed to help ENOs residential customers recycle inefficient appliances to receive a new efficient refrigerator appliance replacement. The Pilot program adheres to the following guidelines:

- Only residential customers that receive their electric service from ENOs can participate in this pilot;
- Standard size refrigerators and freezers are eligible (10-30 cubic feet); mini fridges are not eligible;
- Only refrigerators or freezers that are in operating condition qualify for recycling or replacement. If the unit is not functional, as determined by the Implementer staff onsite, the unit will not be collected, and the customer will not receive an incentive;
- Customers are required to be onsite at the time of appliance testing and collection;
- The Implementer will recycle and replace a maximum of one appliance per year, per customer account; and
- Customers are eligible to receive an incentive of $50 per appliance recycled and may receive an energy efficient replacement refrigerator, if qualified and supplies are available.

10.2.1OPRATIONS AND TRENDS

The AR&R pilot program was introduced to the ENO residential portion of the portfolio in PY10, but PY11 is the first year in which savings are being claimed. The PY11 evaluation of the AR&R pilot program included the following: project data review, desk reviews, and literature reviews to determine NTG ratios for each of the measures.

The following table provides the contribution to program savings and participation.

TABLE 10-5 MEASURE LEVEL CONTRIBUTION TO SAVINGS AND PARTICIPATION

Measure	Sum of Measures	*Ex ante* Gross Energy Savings (kWh)	*Ex ante* Gross Demand Reductions (kW)	% of kWh
Recycled Freezer	2	1,320	0.16	2%
Replaced Refrigerator	100	11,432	1.75	17%
Recycled Refrigerator	48	53,328	0.57	81%
Total	**150**	**66,080**	**2.48**	**100%**

Sums may differ due to rounding.

The figure below shows the contribution to energy savings (kWh) by measure along with evaluation impacts.

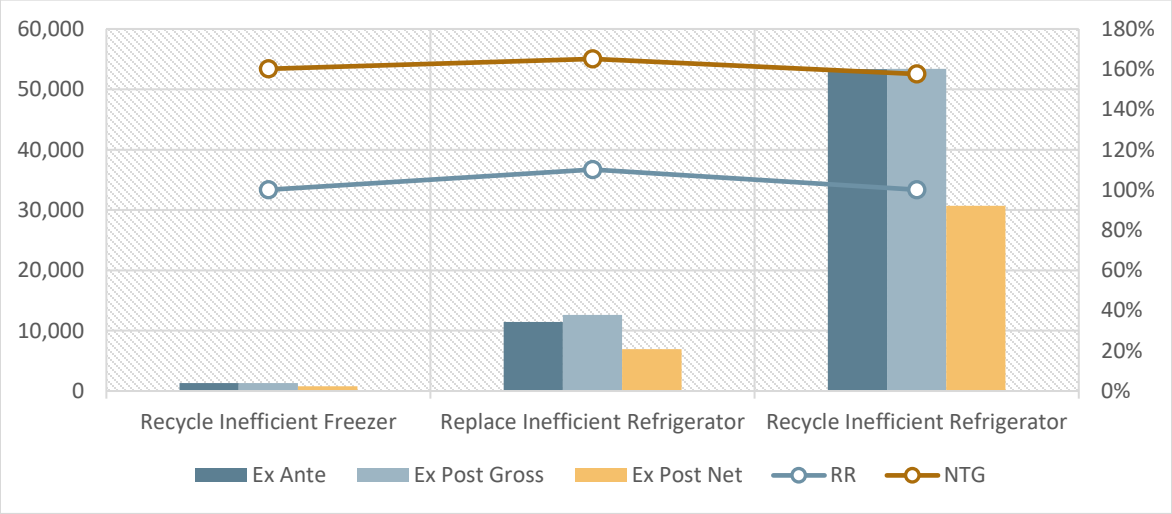
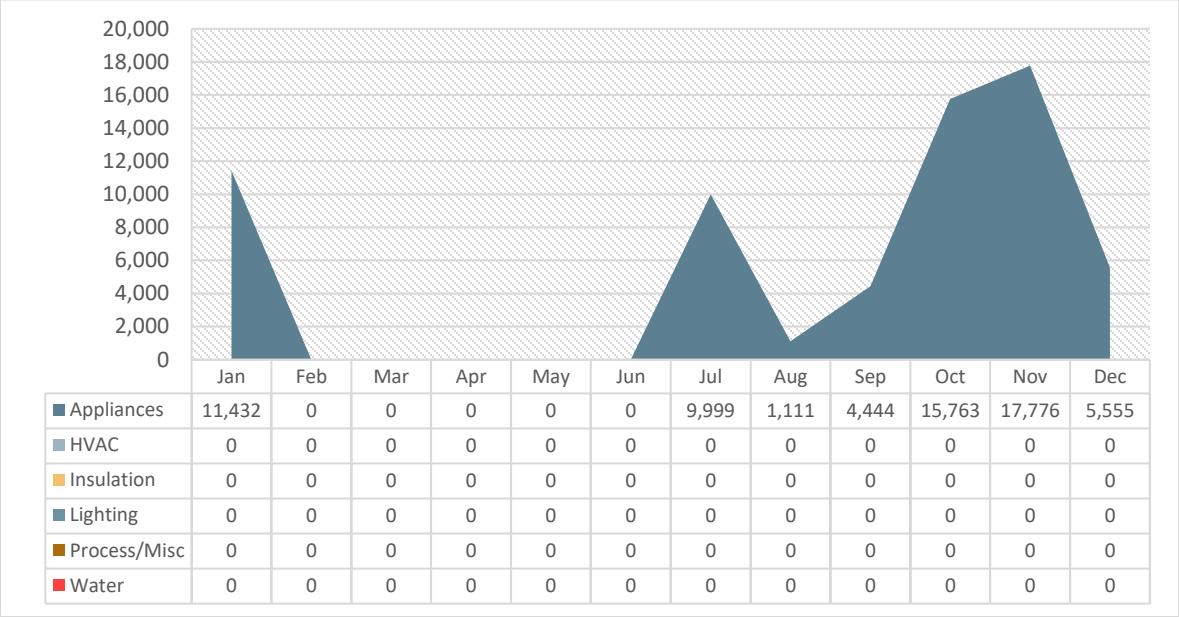


FIGURE 10-1 ENERGY SAVINGS (KWH) SUMMARY

Recycling refrigerators (81%) and replacing refrigerators (17%) were the high impact measures, comprising 98% of claimed savings.

10.2.2TIMING OF PROJECTS

The figure below shows *ex ante* energy savings (kWh) for AR&R by end use, by month.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Appliances	11,432	0	0	0	0	0	9,999	1,111	4,444	15,763	17,776	5,555
HVAC	0	0	0	0	0	0	0	0	0	0	0	0
Insulation	0	0	0	0	0	0	0	0	0	0	0	0
Lighting	0	0	0	0	0	0	0	0	0	0	0	0
Process/Misc	0	0	0	0	0	0	0	0	0	0	0	0
Water	0	0	0	0	0	0	0	0	0	0	0	0

FIGURE 10-2 *EX ANTE* SAVINGS BY END USE BY MONTH

10.2.3TRADE ALLIES

There were no reported trade allies in the AR&R pilot program.

10.2.4GOAL ACHIEVEMENT

Total verified savings and percentage of goals for the AR&R pilot program are summarized in Table 9-6.

TABLE 10-6 PY11 AR&R PILOT SUMMARY OF GOAL ACHIEVEMENT

Ex post Gross Energy Savings (kWh) Goal	% to kWh Goal	*Ex post* Gross Energy Savings (kWh)	*Ex post* Gross Savings (kW) Target	% to kW Target	*Ex post* Gross Savings (kW)
1,481,900	5%	67,284	181.90	5%	8.59

10.3 EM&V Methodology

Impact savings were calculated using methods and inputs in the NO TRM V4.0. PY11 major savings components are refrigerator replacements and refrigerator recycling. Impact methodologies for the refrigerator replacement projects are the same as described for RLA, described in Section 6.3.1.

The following section discusses savings calculation methods for measures not covered.

10.3.1DEEMED SAVINGS CALCULATIONS

10.3.1.1 Freezer Recycling

Freezer recycling savings were calculated using the savings methodology from the NO TRM V4.0, section C.1.12.4. The following table outlines the methodology that the Evaluators adhered to.

TABLE 10-7 COEFFICIENTS FOR FREEZER RECYCLING SAVINGS

Independent Variable	Estimated Coefficient	Default Input	kWh Impact
Intercept	- 0.296	1	- 108.04
Age (years)	0.039	17.10	243.42
Pre-1990	0.486	0.081	14.37
Size (cubic feet)	0.104	15.9	603.56
Freezer Chest	0.122	0.119	5.30
Side-by-Side	0.957	0.323	112.83
Unconditioned x CDD	- 0.002	0.741 * 3,470	- 5.14
Unconditioned x HDD	0.024	0.741 * 1,058	18.82
Total Unit Energy Consumption			772
Part-Use Adjustment			85.5%
Default kWh Savings			660

$$Savings_{kWh} = \begin{bmatrix} -0.296 + (Age \times 0.039) + (Pre_{1990} \times 0.486) + (Size \times 0.104) \\ +(Freezer\ Chest \times 0.122) + (Unconditioned_{CDD} \times -0.002) \\ +(Unconditioned_{HDD} \times 0.024) \end{bmatrix} \times 365.25 \times 0.855$$

Where:

Age = Age of retired unit
Pre_{1990} = Pre-1990 dummy (= 1 if manufactured pre-1990, else 0)
$Size$ = Capacity (cubic feet) of retired unit
$Freezer\ Chest$ = Freezer chest dummy (= 1 if unit has freezer chest, else 0)
0.855 = Part-use, accounting for units that are not running all year = 85.5%

$$Reductions_{kW} = \frac{Savings_{kWh}}{8{,}760} \times CF$$

Where: CF = Coincidence factor = 1.065 for freezers

10.3.1.2 Refrigerator Recycling

Refrigerator recycling savings were calculated using the savings methodology from the NO TRM V4.0, section C.1.12.4. The following table outlines the methodology that the Evaluators adhered to.

TABLE 10-8 COEFFICIENTS FOR REFRIGERATOR RECYCLING SAVINGS

Independent Variable	Estimated Coefficient	Default Input	kWh Impact
Intercept	0.750	1	273.75
Age (years)	0.032	17.10	199.73
Pre-1990	1.140	0.081	33.70
Size (cubic feet)	0.067	19.00	464.65
Single Door	- 1.085	0.039	- 15.44
Side-by-Side	0.957	0.323	112.83
Primary Usage	0.477	0.696	121.18
Unconditioned x CDD	0.007	0.259 * 3,470	6.29
Unconditioned x HDD	- 0.016	0.259 * 1,058	- 4.38
Total Unit Energy Consumption			1,192
Part-Use Adjustment			93.2%
Default kWh Savings			1,111

$$Savings_{kWh} = \begin{bmatrix} 0.75 + (Age \times 0.032) + (Pre_{1990} \times 1.140) + (Size \times 0.067) \\ +(Single\ Door \times -1.085) + (\text{Side} - \text{by} - \text{Side} \times 0.957) \\ +(Primary\ Usage \times 0.477) + (Unconditioned_{CDD} \times 0.007) \\ +(Unconditioned_{HDD} \times -0.016) \end{bmatrix} \times 365.25 \times 0.932$$

Where:

Age = Age of retired unit

Pre_{1990} = Pre-1990 dummy (= 1 if manufactured pre-1990, else 0)

$Size$ = Capacity (cubic feet) of retired unit

$Single\ Door$ = Single door dummy (= 1 if one door, else 0)

$Side - by - side$ = Side-by-side dummy (= 1 if side-by-side, else 0)

$Primary\ Usage$ = Primary usage type dummy (= 1 if Primary, else 0)

$Unconditioned_{CDD}$ = Weather interaction effect, New Orleans CDD base 65 °F = 3,470

$Unconditioned_{HDD}$= Weather interaction effect, New Orleans CDD base 65 °F = 1,058

0.932 = Part-use, accounting for units that are not running all year = 93.2%

$$Reductions_{kW} = \frac{Savings_{kWh}}{8{,}760} \times CF$$

Where: CF = Coincidence factor = 1.082 for refrigerators

10.4 Evaluation Findings

10.4.1 GROSS IMPACT FINDINGS

10.4.1.1 Freezer Recycling

Expected and verified savings for the PY11 AR&R Pilot recycled freezers are summarized below.

TABLE 10-9 PY11 AR&R PILOT PROGRAM EXPECTED AND VERIFIED RECYCLED FREEZER SAVINGS

Ex ante Gross Energy Savings (kWh)	*Ex post* Gross Energy Savings (kWh)	Realization Rate kWh	*Ex ante* Gross Demand Reductions (kW)	*Ex post* Gross Demand Reductions (kW)	Realization Rate kW
1,320	1,321	100.11%	0.16	0.16	100.41%

10.4.1.2 Refrigerator Recycling

Expected and verified savings for the PY11 AR&R Pilot recycled freezers are summarized below.

TABLE 10-10 PY11 AR&R PILOT PROGRAM EXPECTED AND VERIFIED RECYCLED REFRIGERATOR SAVINGS

Ex ante Gross Energy Savings (kWh)	*Ex post* Gross Energy Savings (kWh)	Realization Rate kWh	*Ex ante* Gross Demand Reductions (kW)	*Ex post* Gross Demand Reductions (kW)	Realization Rate kW
53,328	53,375	100.09%	0.57	6.59	1150.15%

10.4.1.3 Refrigerator Replacement

ENERGY STAR Refrigerator savings were calculated using the deemed savings from the NO TRM V4.0, section C.1.4.1. After verifying model configurations and features, deemed savings were assigned to each unit using TRM.

Expected and verified savings for PY11 AR&R pilot refrigerators are summarized below.

TABLE 10-11 AR&R PILOT PROGRAM EXPECTED AND VERIFIED REPLACED REFRIGERATOR SAVINGS

Ex ante Gross Energy Savings (kWh)	*Ex post* Gross Energy Savings (kWh)	Realization Rate kWh	*Ex ante* Gross Demand Reductions (kW)	*Ex post* Gross Demand Reductions (kW)	Realization Rate kW
11,432	12,587	110.10%	1.75	1.83	104.76%

10.4.2 NET IMPACT FINDINGS

The Evaluators performed literature reviews to determine NTG for the measure offerings in the AR&R Pilot. The following tables show the literature review results for freezer recycling, refrigerator recycling, and refrigerator replacement, respectively.

TABLE 10-12 AR&R PILOT FREE-RIDERSHIP FINDINGS FOR FREEZER RECYCLING

Program Year	State	Free-ridership	Spillover	NTG
2020	MA	44%	0%	56%
2020	IL	36%	0%	64%
Average		**40.0%**	**0.0%**	**60.0%**

TABLE 10-13 AR&R PILOT FREE-RIDERSHIP FINDINGS FOR REFRIGERATOR RECYCLING

Program Year	State	Free-ridership	Spillover	NTG
2020	MA	56%	0%	44%
2020	IL	29%	0%	71%
Average		**42.5%**	**0.0%**	**57.5%**

TABLE 10-14 AR&R PILOT FREE-RIDERSHIP FINDINGS FOR FREEZER RECYCLING

Program Year	State	Free-ridership	Spillover	NTG
2019	IL	35%	0%	65%
2020	DC	58%	3%	45%
Average		**46.5%**	**1.5%**	**55.0%**

Results for overall verified net savings are shown by measure in Section 10.1 Summary.

10.4.3 PROCESS FINDINGS

The Evaluators did not conduct a process evaluation in PY11 of the program. Process activities were focused on C&I programs in PY11.

10.5 Data Tracking Review

The Evaluators reviewed the tracking data provided and found the following issues. The following parameters were missing or incomplete for AR&R.

- **Recycling company information**: If applicable, any companies that assist in recycling the units.
- **Participant information**: some key elements in participant contact information was missing in the data, such as phone numbers, emails.
- **Measure-level parameters required for savings calculations:** Although there were some measure fields missing for some of the measure offerings, make and model numbers were provided for the Evaluators to look up pertinent measure information.

There were no supplemental data available for this pilot program.

10.6 Key Findings and Conclusions

The following summarizes the key findings and conclusions for the PY11 evaluation.

- **The program performed well for its first year in implementation, achieving 101.8% of program *ex ante* gross energy savings (kWh).** The overall participation of the program consisted of 67.6% of refrigerator replacement projects, accounting for 17.7% of expected program savings. The recycled refrigerator projects consisted of 32.4% of participation, accounting for 82.4% of expected savings. Finally, the recycled freezers consisted of 1.4% of participation, accounting for 2.0% of expected program savings.
- **There were a few data inconsistencies in the tracking data that affected the expected kW reductions of the refrigerator recycling measure.** There is an erroneous TRM deemed kW reduction value for the recycled refrigerator measure. The erroneous value in the TRM is 0.0137

kW, however the actual calculated value should be 0.137 kW. Due to the difference, the realization rate of the kW reduction for this measure is 1,003%.

10.7 Recommendations

The following summarizes key recommendations after completing the program evaluation.

- ***Consider aggregating all residential program data together to address macro-level database inconsistencies.*** *The review of program tracking data involved looking at two separate Excel workbooks with inconsistent sizes and inconsistent heading titles for the same data point. One of the workbooks had missing data points required for calculation inputs while the other workbook had inconsistencies in overall program total ex ante kWh and incentives. The Evaluators suggest aggregating all the residential data into one workbook, with a focus on providing all the required fields for all measure calculations.*

11 BEHAVIORAL PROGRAM

11.1 Summary

The tables below report *ex ante* gross, *ex post* gross, *ex post* net energy savings (kWh) (both annual and lifetime), demand reductions (kW), participation, and incentive spend, by cohort, where applicable.

TABLE 11-1 PY11 BEHAVIORAL ENERGY SAVINGS (KWH)

Cohort	*Ex ante* Gross Savings (kWh)	Realization Rate (kWh)	*Ex post* Gross Savings (kWh)	NTG	*Ex post* Net Savings (kWh)
Initial Group	1,876,489	100%	1,876,489	100%	1,876,489
Supplemental Group	-	N/A	-	100%	-
Third Group	1,032,607	100%	1,032,607	100%	1,032,607
Neighbor Compare – ADM	-	N/A	-	100%	-
Neighbor Compare – New	-	N/A	-	100%	-
Neighbor Compare – Original	711,412	100%	711,412	100%	711,412
Neighbor Compare – Print	955,891	100%	955,891	100%	955,891
Self-Compare – New	-	N/A	-	100%	-
Self-Compare – Original	-	N/A	-	100%	-
Total	**4,576,398**	**100%**	**4,576,398**	**100%**	**4,576,398**

Sums may differ due to rounding.

TABLE 11-2 PY11 BEHAVIORAL DEMAND REDUCTIONS (KW)

Cohort	*Ex ante* Gross Demand (kW)	Realization Rate (kW)	*Ex post* Gross Demand (kW)	NTG	*Ex post* Net Demand (kW)
Initial Group	N/A	N/A	307.61	100%	307.61
Supplemental Group	N/A	N/A	N/A	100%	N/A
Third Group	N/A	N/A	169.27	100%	169.27
Neighbor Compare – ADM	N/A	N/A	N/A	100%	N/A
Neighbor Compare – New	N/A	N/A	N/A	100%	N/A
Neighbor Compare – Original	N/A	N/A	116.62	100%	116.62
Neighbor Compare – Print	N/A	N/A	156.70	100%	156.70
Self-Compare – New	N/A	N/A	N/A	100%	N/A
Self-Compare – Original	N/A	N/A	N/A	100%	N/A
Total	**N/A**	**N/A**	**750.19**	**100%**	**750.19**

Sums may differ due to rounding.

TABLE 11-3 PY11 BEHAVIORAL LIFETIME SAVINGS SUMMARY

Cohort	EUL	*Ex post* Gross Lifetime Energy Savings (kWh)	*Ex post* Net Lifetime Energy Savings (kWh)
Initial Group	1	1,876,489	1,876,489
Supplemental Group	1	-	-
Third Group	1	1,032,607	1,032,607
Neighbor Compare – ADM	1	-	-
Neighbor Compare – New	1	-	-
Neighbor Compare – Original	1	711,412	711,412
Neighbor Compare – Print	1	955,891	955,891
Self-Compare – New	1	-	-
Self-Compare – Original	1	-	-
Total	**1**	**4,576,398**	**4,576,398**

Sums may differ due to rounding.

TABLE 11-4 PY11 BEHAVIORAL PARTICIPATION AND INCENTIVE SUMMARY

Cohort	Participation (Count of Participant Households)	Incentive Spend ($)
Initial Group	13,458	$0
Supplemental Group	11,835	$0
Third Group	18,226	$0
Neighbor Compare – ADM	28,346	$0
Neighbor Compare – New	6,431	$0
Neighbor Compare – Original	2,712	$0
Neighbor Compare – Print	5,788	$0
Self-Compare – New	5,180	$0
Self-Compare – Original	3,679	$0
Initial Group	13,458	$0
Total	**95,655**	**$0**

Sums may differ due to rounding.

11.2 Program Description

The Energy Smart Behavioral program ("Behavioral") is intended to use social norming to leverage energy savings; this is a long-known behavioral science tenet that individuals desire to be at a similar or better level than their peers, and thus, the report drives high users to reduce their energy consumption. The offering was implemented by Franklin Energy Services ("Franklin") and administered by APTIM.

The program provides tailored reports to residential customers that include:

- Comparisons of customers' current energy use to their past use;
- Comparison of energy use to similar homes in the area; and
- Tips on how customers can reduce their energy use as well as information on other Energy Smart offerings.

During PY10 the Evaluators performed measurements of kWh savings and kW reductions but did not complete more than a brief process evaluation. Evaluators conducted comprehensive process evaluations of the program during program years eight and nine. Participants expressed high levels of satisfaction with the overall program experience. Due to these reasons, in the initial review of the PY10 program the Evaluators concluded that the program did not warrant more than a brief review. The Evaluators plan to conduct a process evaluation during the next program cycle or after major changes to the program. Entergy had defined the PY11 program goal of 21,700,00 kWh for the Behavioral Program.

11.3 EM&V Methodology

The impact evaluation approach for this program is as follows:

- The remaining control groups for each treatment group were tested for validity as a statistical match for the treatment households in the baseline year;
- Cohorts in which a valid counterfactual group does not exist were matched to an ad-hoc control group created via propensity score matching;
- Energy savings were estimated via regression modeling;
- Double counted savings were removed; and
- Demand (kW) savings were estimated from the validated energy savings.

Reports were delivered starting May 4, 2018, for the Initial group, July 16, 2018 for the Second group, and December 27, 2018 for the Third group. A summary of data used in this analysis is provided in Table 11-5.

TABLE 11-5 ACCELERATED INNOVATIONS COHORTS

Cohort	*Treatment Households*	*Control Households*	*Intervention Date*
Initial Group	13,458	5,697	May 2018
Supplemental Group	11,835	5,357	Jul 2018
Third Group	18,226	N/A	Dec 2018 - Jan 2019
Total	**43,520**	**11,054**	**-**

Sums may differ due to rounding.

In addition, Franklin implemented an additional six cohorts since the transfer of the program implementation from Accelerated Innovations to Franklin Energy Services. The following table summarizes the new cohorts implemented during PY10.

TABLE 11-6 FRANKLIN COHORTS

Cohort	*Treatment Households*	*Control Households*	*Intervention Date*
Neighbor Compare – ADM	35,000	10,000	March 1, 2021
Neighbor Compare – New	4,705	1,267	October 29, 2020
Neighbor Compare – Original	33,023	5,199	July 9, 2020
Neighbor Compare – Print	7,547	1,586	October 29, 2020
Self-Compare – New	4,753	1,372	October 29, 2020
Self-Compare – Original	17,191	3,786	July 10, 2020
Total	**102,219**	**23,210**	-

The following customers remained in each cohort after filtering for customers that were already present in the Initial, Supplemental, and Third group cohorts.

TABLE 11-7 EVALUATION COHORTS

Cohort	*Treatment Households*	*Control Households*	*Intervention Date*
Initial Group	13,458	5,697	May 2018
Supplemental Group	11,835	5,357	Jul 2018
Third Group	18,226	N/A	Dec 2018 - Jan 2019
Neighbor Compare – ADM	28,346	8,247	March 1, 2021
Neighbor Compare – New	6,431	722	October 29, 2020
Neighbor Compare – Original	2,712	2,712	July 9, 2020
Neighbor Compare – Print	5,788	1,462	October 29, 2020
Self-Compare – New	5,180	1,061	October 29, 2020
Self-Compare – Original	3,679	3,679	July 10, 2020
Total	**95,655**	**28,937**	-

This led to a total of 95,655 treatment customers for the Behavioral Program. The Evaluators attempted to provide savings estimates for each cohort. All cohorts except the Neighbor compare – ADM cohort had the full 12 months of post-period data to include in the analysis. For the Neighbor compare – ADM cohort, the Evaluators estimated partial year savings (April 2021 through December 2021).

11.3.1 DATA PROVIDED

Entergy provided the following data to support the analysis:

- Pre- and post-treatment monthly electric billing data for all customers in the Entergy service territory. The data started on December 1, 2016, and ended on December 31, 2021;

- Participants that received reports through the 2021 program year;
- Participant and nonparticipant account active and account inactive dates; and,
- Program tracking data for participants, including date of installation, and verified kWh savings for each measure installed.

The above data was sufficient for the Evaluators to conduct the evaluation activities summarized in the following sections. The Evaluators conducted the analysis in line with the steps provided in Section 3.4.2.9, where further details are summarized.

11.4 Evaluation Findings

This section details the level of program activity for 2021, the reported and verified gross savings that resulted from that activity.

The program-level savings are calculated by multiplying the average annual household impact estimate by the weighted number of active program participants in the treatment group and after removing double counted savings, by program year.

The Evaluators calculated the percent savings per home dividing the average annual energy savings estimated in the treatment group by the average annual energy consumption from the control group for each program year. That value is then adjusted for uplift from downstream measures. This methodology is presented in the UMP Chapter 17 Residential Behavior Protocol[21].

11.4.1 DATA PREPARATION AND CLEANING

The Evaluators prepared and cleaned billing data provided by Entergy. The Evaluators employed the following cleaning steps for each cohort:

- Filter for customers currently treated in 2021
- Remove negative bills (no occurrences)
- Remove bills with 0 days duration (less than 0.1% of bills)
- Remove bills from customers in which account billing data does not overlap with intervention date
- Filter for post-period after January 1, 2021, and pre-period for 1 year prior to intervention date
- Remove customers from analysis if intervention date is not similar to median intervention date (within 45 days)
- Remove bills with less than 10 days duration or greater than 90 days duration
- Remove outlier bills (bills with greater than 200 kWh consumed per day) (0.2% occurred)
- Remove bills from customers with insufficient data (less than 9 months pre-period data or less than 9 months post-period data)
- Remove accounts with multiple addresses

[21] https://energy.gov/sites/prod/files/2015/02/f19/UMPChapter17-residential-behavior.pdf

After conducting the above cleaning steps, the Evaluators conducted validity testing. The results of validity testing are displayed below.

11.4.2 VALIDITY TESTING

For reliable estimation of savings effects, it is ideal to have a randomized control trial (RCT). In this experimental design, a group of eligible customers are randomly assigned to treatment or control groups. The offering was a randomized control trial (RCT), however, due to changes in program design, the previously defined RCT groups were altered. The Evaluators retained the original cohort assignments for each customer, regardless of whether the customer eventually received treatment (more than 75% of each the Initial and Second control groups were reassigned to the Third treatment group and a portion of the remaining control group was reassigned to treatment cohorts created by Franklin).

Although this method likely portrays deflated savings, it is the only viable method for providing statistically significant savings. Therefore, the Evaluators elected to use this method for the Initial, Second, and Third groups. For the Franklin cohorts, the Evaluators verified control group validity. In cases where the control group was not a sufficient match, the Evaluators employed propensity score matching and verified the counterfactual groups with monthly t-tests.

The remaining control groups' alteration was tested for statistically significant differences in usage between the treatment and control groups for each of the 12 pre-period months. The control groups were validated in prior evaluations of this program, however due to treatment and control groups decay, there is a possibility of the groups ceasing to be a statistical match. Validity testing was completed to determine if propensity score matching is required to create an ad-hoc, quasi-experimental control group for any of the cohorts.

Table 11-8 summarizes the total number of households from the raw data provided and total number of households utilized in the analysis.

TABLE 11-8 TREATMENT AND CONTROL GROUP TOTALS

	Raw		After Franklin Restrictions		Analysis	
Cohort	Treatment	Control	Treatment	Control	Treatment	Control
Initial Group	26,169	9,975	15,472	9,975	13,458	5,697
Supplemental Group	25,045	9,967	15,181	9,967	11,835	5,357
Third Group	61,379	265,987	29,552	-	18,226	-

*A subset of customers was used in analysis to retain validity in comparison groups

When the implementation of the offering was transferred from AI to Franklin, a large portion of treatment customers had treatment halted due to duplicate or lack or email addresses as well as insufficient usage history and square footage data necessary to produce the Home Utility Reports (HURs). Therefore, seen in the table above is a large drop between the raw number of customers selected at the onset of each cohort and the number of treatment customers after Franklin restrictions. The Evaluators estimated savings displayed in the customers that continued treatment through the

transfer of implementors. The Evaluators note that the usage history and square footage data will no longer be necessary for producing HURs in the future program years. In addition, the lack of valid email addresses is being resolved on a continual basis. Therefore, the Evaluators expect the number of treatment customers within these original cohorts to increase as these errors become reconciled.

The table below displays the results of the control group validation for each cohort.

TABLE 11-9 VALIDITY TESTING RESULTS

Cohort	Valid Control Group	PSM
Initial Group	✓	
Supplemental Group	✓	
Third Group		✓
Neighbor Compare – ADM	✓	
Neighbor Compare – New	✓	
Neighbor Compare – Original	✓	
Neighbor Compare – Print	✓	
Self-Compare – New		✓
Self-Compare – Original		✓

The Evaluators found the Initial group retained a statistically valid control group after rerandomizing control group customers. The Supplemental group and all neighbor compare groups also retained a statistically valid control group. The Third Group and both self-compare groups did not have a randomly assigned control group. Therefore, the Evaluators employed propensity score matching to create a valid counterfactual group for the Third group and self compare groups, as displayed in the table above. These subsets created by the Evaluators passed the validity testing for each month in the pre-period.

Using these validated cohorts, the Evaluators then followed through with the evaluation methodologies provided in Section 3.4.2.9.

11.4.3 PROPENSITY SCORE MATCHING

The Evaluators created a valid post-hoc control group for the Third group, the Self Compare New group, and the Self Compare – Original group because they were not designed with a valid counterfactual group or because the control group assigned did not pass validity testing. Quasi-experimental methods are required when the control group has not been randomly assigned as it would be in a RCT. All other cohorts retained counterfactual group validity as displayed through validity testing in the section above.

The Evaluators created a statistically similar control group using propensity score matching (PSM), a method that allows the Evaluators to find the most similar household based on the customers' billed consumption trends in the pre-period, specifically covariates for average summer, winter, fall, and spring pre-period usage were used and verified with statistical difference testing.

A propensity score is a metric that summarizes several dimensions of household characteristics into a single metric that can be used to group similar households. To create a post-hoc control group, the

Evaluators compiled billing data of all control participants from all cohorts to compare against treatment households via quasi-experimental methods. This allowed the Evaluators to select from a large group of similar households that have not received home energy reports. With this information, the Evaluators matched the treatment group to a similar control group on the following variables:

- Pre-period spring usage
- Pre-period summer usage
- Pre-period fall usage
- Pre-period winter usage

After matching, a t-test was conducted for each month in the pre-period to help determine the success of PSM.

The Evaluators employed propensity score matching using the nearest match algorithm at a three-to-one matching ratio for the Third group and a one-to-one matching ratio for the self-compare groups. The matching ratio defines the number of control customers to be matched to one treatment customer. In addition, the Evaluators allowed replacement of customers, essentially allowing the algorithm to select a control customer for more than one unique treatment customer.

The following figures display the density of each variable employed in propensity score matching, after conducting matching. After propensity score matching, the density plots display similar distributions for energy consumption within each season.

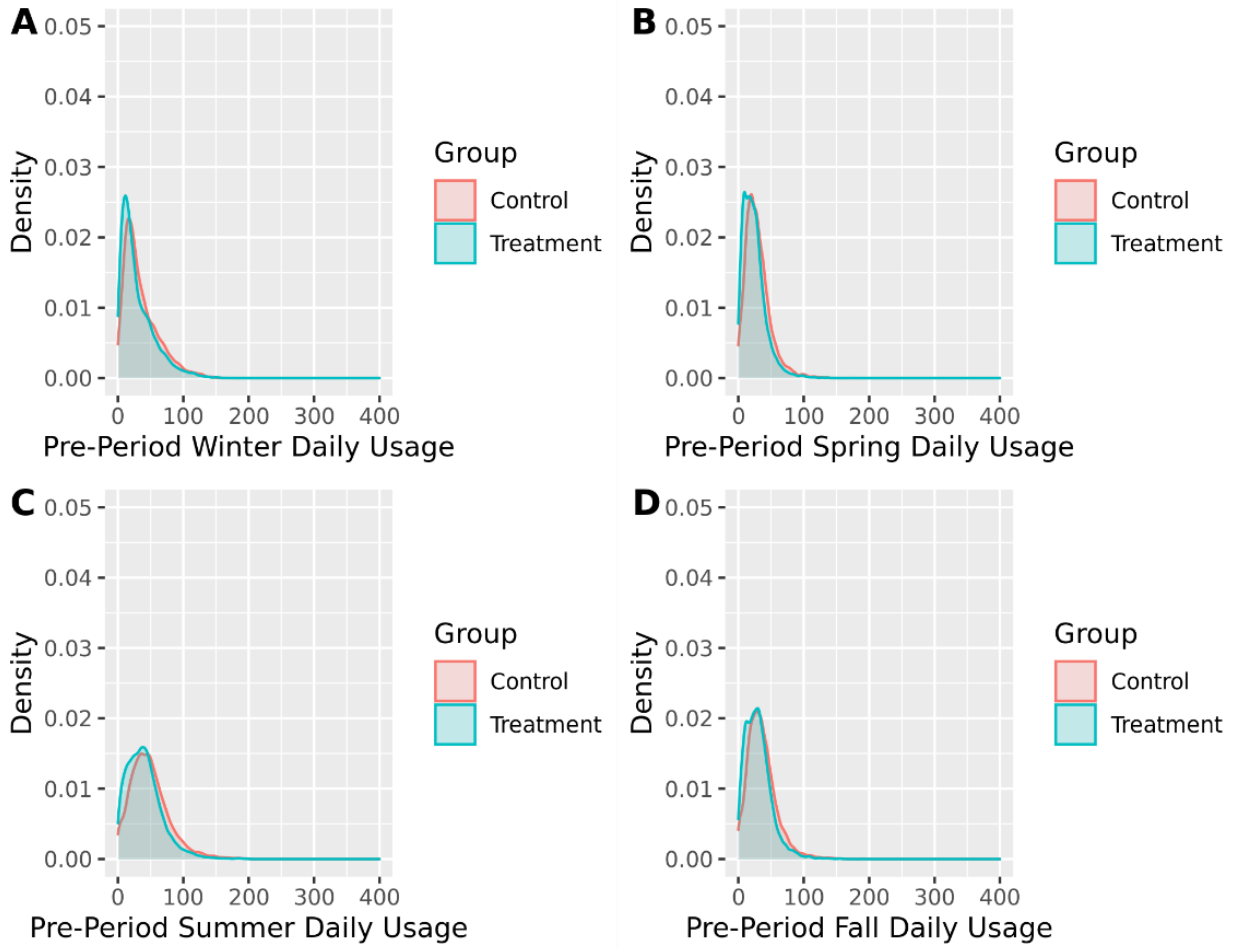


FIGURE 11-1 Third Group Pre-Period Average Daily Usage Density Plot After Propensity Score Matching

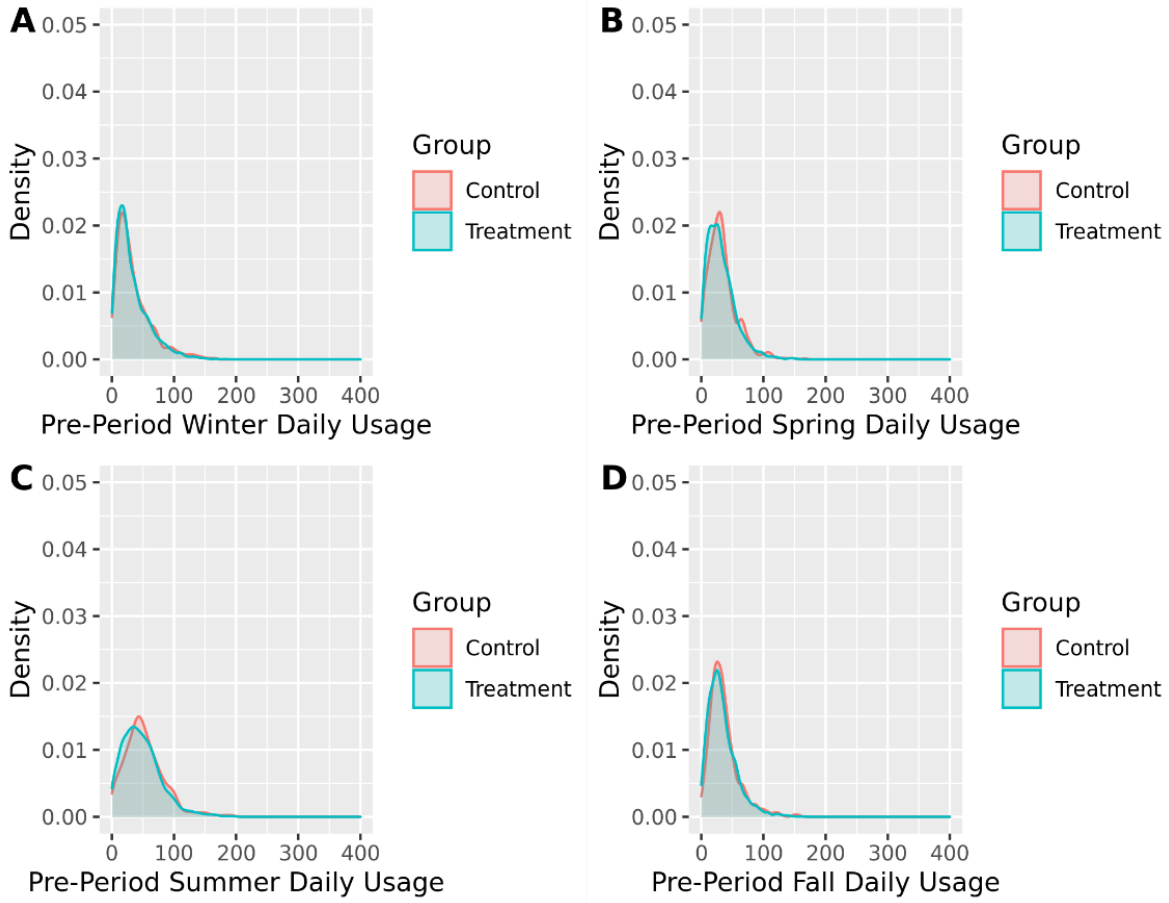


FIGURE 11-2 SELF COMPARE - NEW PRE-PERIOD AVERAGE DAILY USAGE DENSITY PLOT AFTER PROPENSITY SCORE MATCHING

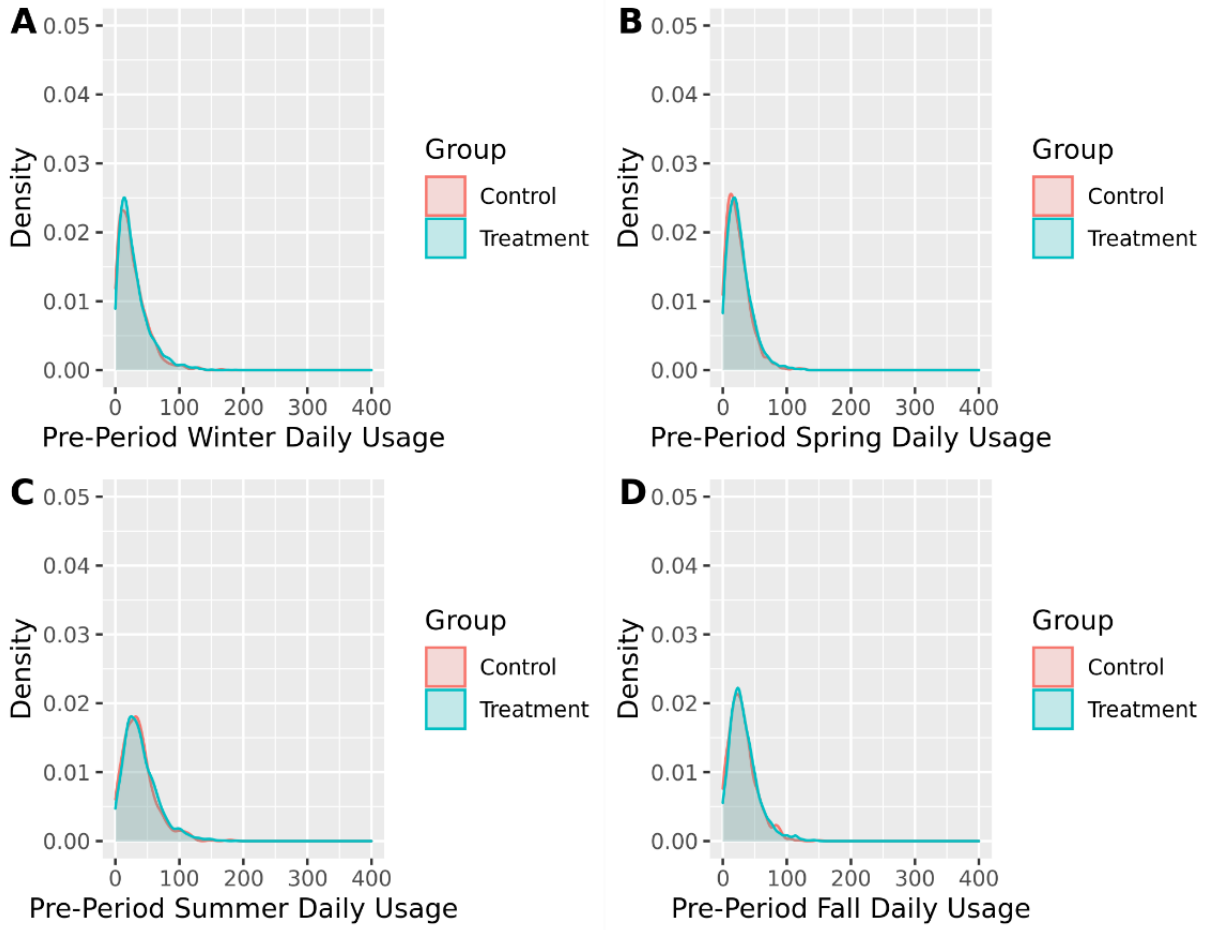


FIGURE 11-3 SELF COMPARE - ORIGINAL PRE-PERIOD AVERAGE DAILY USAGE DENSITY PLOT AFTER PROPENSITY SCORE MATCHING

The following tables provide the results for t-testing, which helps determine the success of matching. The test measures whether there are statistically significant differences in average daily kWh usage between the treatment and control groups in the pre-period by month. Statistically significant differences occur when the P-Value is less than 0.05 at the 95% significance level. As displayed in the table below, the P-Value is much greater than 0.05 for all 12 pre-period months. This result further indicates propensity score matching performed satisfactorily, as there was at maximum one instance for a rejection of the null hypothesis for any of the pre-period months. Therefore, the Evaluators accept these matched group as viable matches for each the Third group, Self-Compare – New group, and Self Compare – Original group.

TABLE 11-10 THIRD GROUP VALIDITY TESTING RESULTS

Pre-Period Month	Treatment Group Average Daily Usage (kWh/day)	Control Group Average Daily Usage (kWh/day)	Average Daily Usage Difference (kWh/day)	P-value	Statistically Significant Difference
Dec 2017	33.60	33.79	-0.19	0.8305	-
Jan 2018	37.00	38.06	-1.06	0.0177	*
Feb 2018	22.58	22.72	-0.15	0.5322	-
Mar 2018	19.43	19.70	-0.28	0.1533	-
Apr 2018	19.69	19.86	-0.17	0.3782	-
May 2018	32.97	33.00	-0.03	0.9134	-
Jun 2018	39.76	39.53	0.22	0.5137	-
Jul 2018	42.54	42.32	0.22	0.5413	-
Aug 2018	39.15	38.68	0.47	0.1573	-
Sep 2018	37.67	37.56	0.12	0.7195	-
Oct 2019	27.15	27.25	-0.10	0.6739	-
Nov 2019	26.43	26.29	0.13	0.6305	-

TABLE 11-11 SELF COMPARE - NEW VALIDITY TESTING RESULTS

Pre-Period Month	Treatment Group Average Daily Usage (kWh/day)	Control Group Average Daily Usage (kWh/day)	Average Daily Usage Difference (kWh/day)	P-value	Statistically Significant Difference
Oct 2019	30.37	31.78	-1.41	0.2939	-
Nov 2019	31.46	32.28	-0.82	0.4733	-
Dec 2019	34.59	34.47	0.13	0.9223	-
Jan 2020	32.92	33.67	-0.75	0.5411	-
Feb 2020	30.52	30.27	0.25	0.8245	-
Mar 2020	31.99	31.99	0.00	0.9983	-
Apr 2020	28.44	27.77	0.67	0.4346	-
May 2020	36.07	36.06	0.01	0.9912	-
Jun 2020	45.89	45.47	0.43	0.7342	-
Jul 2020	48.85	48.58	0.27	0.8318	-
Aug 2020	49.85	49.32	0.53	0.6798	-
Sep 2020	39.12	38.30	0.83	0.4466	-

TABLE 11-12 SELF COMPARE - ORIGINAL VALIDITY TESTING RESULTS

Pre-Period Month	Treatment Group Average Daily Usage (kWh/day)	Control Group Average Daily Usage (kWh/day)	Average Daily Usage Difference (kWh/day)	P-value	Statistically Significant Difference
Jul 2019	57.44	80.77	-23.33	0.0106	*
Aug 2019	41.35	41.19	0.16	0.9085	-
Sep 2019	41.23	39.23	2.00	0.0736	-
Oct 2019	42.08	40.37	1.71	0.1606	-
Nov 2019	29.47	29.00	0.47	0.5984	-
Dec 2019	27.52	27.22	0.30	0.7521	-
Jan 2020	29.48	28.81	0.67	0.5161	-
Feb 2020	28.95	28.88	0.08	0.9398	-
Mar 2020	27.74	27.99	-0.25	0.8196	-
Apr 2020	27.20	28.50	-1.30	0.1826	-
May 2020	24.21	23.96	0.25	0.7421	-
Jun 2020	29.28	29.19	0.09	0.9168	-

After propensity score matching for the above cohorts, the Evaluators continued with linear regression modeling to evaluate average household savings across the cohorts. The results of the linear regression modeling are summarized in the section below.

11.4.4LINEAR REGRESSION RESULTS

This section details the regression results of each of the evaluated cohorts. The Initial, Supplemental, and Neighbor Compare groups were evaluated with the remaining RCT groups. The Third group and self-compare groups were evaluated with the matched control group created via propensity score matching.

As discussed in the evaluation approach section, savings are determined through the equation summarized in Equation 1 2. Model output for each cohort is further summarized in Appendix D.

Per-home results and percent savings are presented for each of the analyzed cohorts. Joint savings attributable to Energy Smart downstream programs were calculated and removed to avoid double counting.

The Evaluators found four of the nine cohorts to display statistically significant savings. In addition, the majority of the models displayed ideal fitness, as displayed by adjusted R-squared values of 0.60 and above. The Evaluators summarize the model results for each cohort in the table below.

TABLE 11-13 SELF COMPARE - ORIGINAL VALIDITY TESTING RESULTS

Pre-Period Month	Treatment Group Average Daily Usage (kWh/day)	Control Group Average Daily Usage (kWh/day)	Average Daily Usage Difference (kWh/day)	P-value
Jul 2019	57.44	80.77	-23.33	0.0106
Aug 2019	41.35	41.19	0.16	0.9085
Sep 2019	41.23	39.23	2.00	0.0736
Oct 2019	42.08	40.37	1.71	0.1606
Nov 2019	29.47	29.00	0.47	0.5984
Dec 2019	27.52	27.22	0.30	0.7521
Jan 2020	29.48	28.81	0.67	0.5161
Feb 2020	28.95	28.88	0.08	0.9398
Mar 2020	27.74	27.99	-0.25	0.8196
Apr 2020	27.20	28.50	-1.30	0.1826
May 2020	24.21	23.96	0.25	0.7421
Jun 2020	29.28	29.19	0.09	0.9168

The regression output displays statistically significant savings if the treatment coefficient is negative and if the p-value for the treatment coefficient is less than 0.05. As displayed, the following four cohorts meet these requirements: Initial group, Third group, Neighbor Compare – Original, and Neighbor Compare – Print.

The Supplemental group, Neighbor Compare – ADM group, and Self Compare – Original group do not demonstrate energy consumption differences between the treatment group and the control group, as demonstrated by the p-value above 0.05. This means that the null hypothesis that the treatment group and control group are similar cannot be rejected. Thus, the Evaluators are unable to verify savings for these cohorts through the Behavioral Program.

In addition, the Neighbor Compare – New and Self Compare – New cohorts demonstrate increased consumption in the treatment group that are statistically significant. This means that the treatment group demonstrated negative savings. Thus, the Evaluators are unable to verify savings for these cohorts through the Behavioral Program.

The treatment coefficients for cohorts in which statistically significant savings were displayed were multiplied by the total number of days in the evaluation period (365.25 days for all cohorts except the Neighbor Compare – ADM group, which was implemented in March 2021). The following table summarizes the average annual household savings and percent annual household savings for each cohort that displayed statistically significant savings, prior to double counting analysis adjustments.

TABLE 11-14 UNADJUSTED SAVINGS BY COHORT

Cohort	Unadjusted Household Savings	Average Annual Household Usage	Percent Annual Household Unadjusted Savings
Initial Group	137	21,458	0.64%
Supplemental Group	-	10,889	-
Third Group	59	11,357	0.52%
Neighbor Compare – ADM	-	11,441	-
Neighbor Compare – New	-	17,549	-
Neighbor Compare – Original	263	14,590	1.80%
Neighbor Compare – Print	168	13,614	1.23%
Self-Compare – New	-	13,348	-
Self-Compare – Original	-	11,660	-

The average household savings for each cohort were then extrapolated to the total number of customers treated in PY11, weighted by number of days during the evaluation period. The following table summarizes the program-level savings resulting from regression model analysis, prior to double counting adjustments.

TABLE 11-15 DOUBLE COUNTED SAVINGS BY COHORT

Cohort	Unadjusted Household Savings	Weighted Number of Customers in PY11	Unadjusted PY11 kWh Savings
Initial Group	137	13,458	1,845,556
Supplemental Group	-	11,835	-
Third Group	59	18,226	1,069,749
Neighbor Compare – ADM	-	28,346	-
Neighbor Compare – New	-	6,431	-
Neighbor Compare – Original	263	2,712	712,739
Neighbor Compare – Print	168	5,788	971,956
Self-Compare – New	-	5,180	-
Self-Compare – Original	-	3,679	-
Total		**95,655**	**4,599,999**

The program displays a total of 4,599,999 kWh verified savings across 95,655 customers in PY11. Four of the nine cohorts demonstrated statistically significant, positive energy savings. The Evaluators were able to verify savings for 40% of the treated households in PY11. The remaining cohorts were unable to provide valid energy savings demonstrated through monthly energy consumption.

11.4.5 DOUBLE COUNTED SAVINGS RESULTS

Participants in both the treatment and control groups participate in other Energy Smart energy efficiency programs. The double counted savings, defined in the methodology, whether positive or negative, are subtracted from the cohort's gross savings estimates from the regression analysis to get

total verified savings. This section summarizes the results of the double counting analysis for downstream programs.

Entergy delivered tracking data for the following programs:

- Income-Qualified Weatherization Program
- AC Tune-Up Program
- Home Performance with ENERGY STAR Program
- Residential Lighting and Appliances Program
- Multifamily Program

The Evaluators identified and summarized the average treatment customer, average control customer, and average incremental savings attributed to the above residential programs for each cohort. The table below summarizes the double counting savings to be subtracted from each cohort's annual program savings. The double counted savings are not applicable for cohorts in which no verified savings could be estimated.

TABLE 11-16 HOUSEHOLD-LEVEL ADJUSTED SAVINGS BY COHORT

Cohort	Treatment Savings per Household (kWh per Household)	Control Savings per Household (kWh per Household)	Double Counted Savings per Household (kWh per Household)	Total Double Counted Savings (kWh)
Initial Group	5.44	7.74	-2.30	-30,933
Supplemental Group	4.63	2.16	2.46	N/A
Third Group	5.44	3.40	2.04	37,142
Neighbor Compare – ADM	2.69	1.72	0.97	N/A
Neighbor Compare – New	7.04	9.17	-2.13	N/A
Neighbor Compare – Original	0.49	0.00	0.49	1,327
Neighbor Compare – Print	7.94	5.16	2.78	16,065
Self-Compare – New	4.28	0.21	4.07	N/A
Self-Compare – Original	0.62	0.00	0.62	N/A
Total	**4.35**	**3.39**	**0.96**	**23,600**

The results are separated by cohort. PY11 displays a total of 23,600 kWh in double counted savings. The double counted savings represented in the table above are removed from each cohort's regression model savings estimate. The adjusted household-level savings for each cohort are summarized in the tables below.

TABLE 11-17 PROGRAM-LEVEL ADJUSTED SAVINGS BY COHORT

Cohort	Adjusted Household Savings (kWh per Household)	Average Annual Household Usage (kWh per year)	Percent Annual Household Adjusted Savings	Weighted Number of Customers in PY11
Initial Group	139	21,458	0.65%	13,458
Supplemental Group	-	10,889	-	11,835
Third Group	57	11,357	0.50%	18,226
Neighbor Compare – ADM	-	11,441	-	28,346
Neighbor Compare – New	-	17,549	-	6,431
Neighbor Compare – Original	262	14,590	1.80%	2,712
Neighbor Compare – Print	165	13,614	1.21%	5,788
Self-Compare – New	-	13,348	-	5,180
Self-Compare – Original	-	11,660	-	3,679
Total	**-**	**-**	**-**	**95,655**

The Evaluators estimated demand reduction by dividing the annual energy savings by integrating hourly load factors with monthly estimated energy savings for each group for both the annual program year and the extended program year.

The following table displays the resulting demand savings for each group in which statistically significant energy savings was estimated.

TABLE 11-18 DEMAND REDUCTIONS BY COHORT

Cohort	Adjusted PY11 kW Savings
Initial Group	307.61
Supplemental Group	N/A
Third Group	169.27
Neighbor Compare – ADM	N/A
Neighbor Compare – New	N/A
Neighbor Compare – Original	116.62
Neighbor Compare – Print	156.70
Self-Compare – New	N/A
Self-Compare – Original	N/A
Total	**750.19**

The Behavioral Program displayed 750.19 kW reductions in PY11 resulting from energy savings demonstrated by the Initial, Third, Neighbor Compare – Original, and Neighbor Compare – Print groups.

11.4.6VERIFIED SAVINGS

The table below summarizes the verified gross and net energy savings. The Behavioral Program NTG ratio is 100% due to the nature of the program. Overall verified gross and net savings were 4,576,398 kWh and 750.19 kW between January 1, 2021, and December 31, 2021.

TABLE 11-19 ENERGY AND DEMAND REDUCTIONS BY COHORT

Cohort	Weighted Number of Customers in PY11	Verified PY11 kWh Savings	Verified PY11 kW Savings	Percent Annual Household Adjusted Savings
Initial Group	13,458	1,876,489	307.61	0.65%
Supplemental Group	11,835	-	0.00	-
Third Group	18,226	1,032,607	169.27	0.50%
Neighbor Compare – ADM	28,346	-	0.00	-
Neighbor Compare – New	6,431	-	0.00	-
Neighbor Compare – Original	2,712	711,412	116.62	1.80%
Neighbor Compare – Print	5,788	955,891	156.70	1.21%
Self-Compare – New	5,180	-	0.00	-
Self-Compare – Original	3,679	-	0.00	-
Total	**95,655**	**4,576,398**	**750.19**	**-**

Four of the nine groups displayed statistically significant, positive savings.

The Initial, Third, Neighbor Compare – Original, and Neighbor Compare – Print groups display an average household annual savings of 0.65%, 0.50%, 1.80%, and 0.21%, respectively. Typically, behavioral energy report programs display a range between 0.5% and 2.5% annual household savings. However, these groups displayed deflated savings due to a combination of the following implications:

- Lack of RCT experimental design.
- Changes in implementation which led to the treatment of 75% of the control group.
- Several data disruptions in customer email occurred during PY2020 and PY2021 which disabled implementors from sending reports to a large number of customers in the 2020 and 2021 evaluation periods.
- Inability to send reports to any customers between May 2021 and October 2021, potentially leading to a decrease in treatment effect during the 2021 evaluation year.

The Neighbor Compare – ADM cohort did not display statistically significant savings likely due to recent implementation. Behavioral programs typically display low savings in the first few years of implementation, as the behavioral changes require several months before displaying observable differences in energy savings. The Evaluators project to see statistically significant savings for this cohort in the PY12 evaluation.

The Supplemental group and Self Compare – Original group also do not demonstrate energy consumption differences between the treatment group and the control group. Thus, the Evaluators are unable to verify savings for these cohorts through the Behavioral Program. In previous evaluations, the Supplemental group displayed typical behavioral program savings. However, due to the treatment of a large portion of the RCT control group, the treatment and control group display similar post-period consumption behaviors. Through the recommendation of the Evaluators, the implementors had halted treatment of these control group customers in February 2022. The Evaluators project that as treatment

continues for the treatment group and as treatment halts for the control group, the energy consumption differences between the groups will become statistically significant throughout the year. The Evaluators project to see statistically significant savings for this cohort in the PY12 or PY13 evaluation for the Supplemental group.

The Self-Compare – Original group does not demonstrate energy consumption differences between the treatment and control group, likely due to a lower number of energy reports being sent to households than a typical year. As mentioned previously, a lower number of reports were sent to customers during 2020 and 2021 due to data disruptions.

Finally, the Neighbor Compare – New and Self Compare – New cohorts demonstrate increased consumption in the treatment group that are statistically significant. This means that the treatment group demonstrated negative savings. Thus, the Evaluators are unable to verify savings for these cohorts through the Behavioral Program. Although these cohorts were matched to valid counterfactual groups, the differences between the treatment group and control group display negative savings. The Evaluators are unable to hypothesize the source of these results, as the Evaluators are unable to validate the RCT creation for these cohorts. It is likely that the treatment and control groups contained inherent differences in behaviors before and after treatment. These results are atypical of behavioral program evaluations in which an RCT design was implemented at the outset of a cohort. The Evaluators recommend that for all future cohorts of the Behavioral Program, a third-party evaluator randomly select treatment and control groups via RCT design.

The Evaluators would like to emphasize that the Behavioral Program PY11 results are atypical due to disruption of randomized control trial cohort assignment and reduced mailed and emailed reports to customers due to data disruptions. For future program years and program planning, the Evaluators estimate a range between 0.5% and 2.5% annual household savings would better align with typical year savings.

11.5 Key Findings and Conclusions

This section presents the key findings of the evaluation for the Behavioral Program.

- The Evaluators estimated Behavioral Program savings for Entergy through billing analysis of cohorts. The Evaluators found positive annual savings that is statistically significant savings for four of the nine cohorts in the 2021 calendar year evaluation. The Evaluators verified program savings of 4,576,398 kWh for PY11 and verified demand reductions of 750.19 kW.
- The regression analysis resulted in unadjusted program savings of 4,599,999 kWh for PY11. The Evaluators estimated downstream double counted savings at 23,600 for PY11. The Evaluators removed this double counted savings from the regression results, leading to total verified, adjusted program savings of 4,576,398 kWh.
- The Initial, Third, Neighbor Compare – Original, and Neighbor Compare – Print groups display an average household annual savings of 0.65%, 0.50%, 1.80%, and 0.21%, respectively. Typically, behavioral energy report programs display a range between 0.5% and 2.5% annual household savings. The Behavioral Program displayed lower than typical behavioral program savings.

- These groups displayed deflated savings due to changes in implementation which led to the treatment of 75% of the control group, data disruptions in customer emails which disabled implementors from sending reports to a large number of customers, and inability to send reports to any customers between May 2021 and October 2021, potentially leading to a decrease in treatment effect during the 2021 evaluation year.
- The Evaluators project that the Supplemental group, the Neighbor Compare – ADM group, and the Self Compare – Original group will demonstrate statistically significant savings in PY12 or PY13, as the number of reports sent to treatment customers increases and as the control groups no longer receive treatment.
- The Evaluators are unable to estimate positive savings for the Neighbor Compare – New and Self Compare – New cohorts. These cohorts were not designed with a proper RCT counterfactual group. The Evaluators attempted to match valid counterfactual groups and although the ad-hoc counterfactual groups passed validity testing, the regression results were unrealistic and demonstrate inherent differences within the groups. The Evaluators recommend that all future cohorts align with RCT designs and are randomly selected by a third party evaluator.
- The Evaluators emphasize that the Behavioral Program PY11 results are atypical due to disruption of randomized control trial cohort assignment and reduced mailed and emailed reports to customers due to data disruptions. For future program years and program planning, the Evaluators estimate a range between 0.5% and 2.5% annual household savings would better align with typical year savings.

11.6 Recommendations

This section presents the recommendations for the Behavioral Program.

- **The Evaluators recommend that the implementors continue to halt treatment of all control group customers.** *This will enable the Evaluators to employ the RCT designs created at program outset, which allow the Evaluators to estimate verified savings as recommended by the NREL Behavioral Protocol.*
- **The Evaluators recommend that the implementors correct data disruptions to allow treatment of all customers assigned to a treatment cohort.** *This will allow behavioral changes to accumulate, leading to observable changes in energy consumption.*
- **The Evaluators recommend that the implementors consult third party evaluators to select all future cohorts.** *The Evaluators also recommend that all future cohorts align to NREL Behavioral Protocol RCT experimental design. This will alleviate the need to employ propensity score matching and will ensure that treatment and control groups are equivalent, thus allowing proper and accurate measurement of treatment effect in the post-period.*

12 EASYCOOL DIRECT LOAD CONTROL

12.1 Summary

The tables below report ex ante gross, ex post gross, ex post net energy savings (kWh) (both annual and lifetime), demand reductions (kW), participation, and incentive spend, by measure, where applicable.

TABLE 12-1 PY11 EASYCOOL DLC ENERGY SAVINGS (KWH)

Measure	*Ex ante* Gross Savings (kWh)	Realization Rate (kWh)	*Ex post* Gross Savings (kWh)	NTG	*Ex post* Net Savings (kWh)
Event (x 1,266)	0	N/A	0	N/A	0
Total	**0**	**N/A**	**0**	**N/A**	**0**

Sums may differ due to rounding.

TABLE 12-2 PY11 EASYCOOL DLC DEMAND REDUCTIONS (KW)

Measure	*Ex ante* Gross Demand (kW)	Realization Rate (kW)	*Ex post* Gross Demand (kW)	NTG	*Ex post* Net Demand (kW)
Event (x 1,266)	0.00	N/A	859.78	100%	859.78
Total	**0.00**	**N/A**	**859.78**	**100%**	**859.78**

Sums may differ due to rounding.

TABLE 12-3 PY11 EASYCOOL DLC LIFETIME SAVINGS SUMMARY

Measure	EUL	*Ex post* Gross Lifetime Energy Savings (kWh)	*Ex post* Net Lifetime Energy Savings (kWh)
Event (x 1,266)	1	0	0
Total	**1**	**0**	**0**

Sums may differ due to rounding.

TABLE 12-4 PY11 EASYCOOL DLC PARTICIPATION AND INCENTIVE SUMMARY

Measure	Participation (Count of Measures)	Incentive Spend ($)
Event (x 1,266)	1,370	$54,965
Total	**1,370**	**$54,965**

Sums may differ due to rounding.

12.2 Program Description

The EasyCool - Direct Load Control (EasyCool DLC) offering is comprised of remote-control switches installed on residential air conditioners or heat pump units. Control switches were installed on these units to run events. The control strategies employed were fixed cycling. In such a strategy, a duty cycle is selected a priori, and all participants have their air conditioner limited to a maximum of this duty cycle[22].

The program offered $40 to customers for participating for the year.

12.2.1 PROGRAM CHANGES

During PY10 program implementors began a three-year process of transitioning from the existing switch-based offering to a thermostat-based demand reduction offering.

There were no additional reported changes to this program in PY11.

12.2.2 TIMING OF PROJECTS

All projects occurred in February.

12.2.3 TRADE ALLIES

There were no reported trade allies in this program.

12.2.4 GOAL ACHIEVEMENT

The table below summarizes the programs' performance against goal.

TABLE 12-5 EASYCOOL DLC PERFORMANCE TOWARDS GOAL

Ex post Gross Energy Savings (kWh) Goal	% to kWh Goal	*Ex post* Gross Energy Savings (kWh)	*Ex post* Gross Savings (kW) Target	% to kW Target	*Ex post* Gross Savings (kW)
0	N/A	0	622.60	138%	859.78

12.3 EM&V Methodology

The Evaluators employed the following approach to complete impact evaluation activities for the program. The Evaluator followed the Calculated Baseline approach outlined in the Midcontinent Independent System Operator, Inc. (MISO) Business Practices Manual (BPM)[23]. The following impact evaluation steps were taken to determine the suitability of the MISO Calculated Baseline approach:

- Developed an Unadjusted Consumption (UC) Baseline, a Symmetric Multiplicative Adjustment (SMA) Baseline, and a Weather Sensitive Adjustment (WSA) Baseline for each program participant. Loads were calculated utilizing 1-hour AMI data.

[22] For example, a 33% duty cycle cap would limit controlled air conditioners to running for 20 minutes in an event hour.

[23] **Error! Reference source not found.**MISO documentation: https://www.misoenergy.org/legal/business-practice-manuals

- Determined days that will serve as proxy days for testing the suitability of the baseline approach. Proxy days represent days like demand response event days in terms of load shape and temperature profiles.
- Estimated bias (uncertainty) and error on proxy days for each model to assess baseline performance. Bias is assessed by examining the average percent error of the baseline predictions relative to the actual usage on proxy days. In a similar manner, error is assessed through various metrics such as Root Mean Squared Error (RRMSE) using baseline predictions and actual usage on proxy days.
- Selected the baseline model with the lowest absolute bias.

12.3.1 GROSS IMPACT METHODOLOGIES

In the evaluation of demand response programs, energy savings are estimated by comparing a participant's load shape during a demand response event with a baseline load shape. This baseline load is assumed to be a good estimate of the counterfactual load—that is, the load that would have manifested had there not been an event called that day.

12.3.1.1 Data Sources

Data used for this evaluation include program tracking data that identifies which customers participated in the program and contains data fields such as hourly usage, hourly interval meter data (AMI) for each customer participating in the program, and a full schedule of DR program events, including the time of the event.

12.3.1.2 MISO Calculated Baseline Approach (Customer Baselines)

The following details the general requirements for the MISO Calculated Baseline Approach. The Evaluators developed Customer Baselines (CBLs) in accordance with this approach. For a demand resource, the Consumption Baseline is a profile of hourly demand based on an averaged sample of historical data which may be adjusted for factors that reflect specific, on-the-day conditions, such as temperature.

The default consumption baseline is designed as follows:

- Separate hourly demand profiles for non-holiday weekdays and for weekends/holidays
- The "weekday" hourly profile is based on the average of the ten (10), but not less than five (5), most recent weekdays that are not holidays or other non-standard "event" days
- The "weekend/holiday" hourly profile is based on the average of the four (4), but not less than two (2), most recent weekend days or holidays that are not "event" days
- An "event" day is one during which there was, for the resource in question, a real- time energy or ancillary services dispatch, or a scheduled outage
- The maximum look-back window is limited to 45 days
- If the 45-day window contains insufficient days to meet the minimum number of days described above, the profiles are constructed based on the available days within the 45-day window that qualify, supplemented by the largest (MW) matching "event" day(s) values for that resource within that same window as necessary to obtain the minimum number of values.

Adjustment mechanisms to the default Consumption Baseline include:

- Symmetric Multiplicative Adjustment (SMA)
  - Adjusts each baseline hourly value (MW) during the event up or down by the ratio of
  - (a) the sum of hourly demands for the three hours beginning four hours prior to the event and (b) the sum of those same three hourly baseline demands
  - The adjustment is limited to a change in any individual baseline hour of plus or minus 20 percent.
  - If multiple events occur during the same day, the SMA is calculated only for the first event, but applied to all events that day.
- Weather Sensitive Adjustment (WSA)
  - Adjusts each baseline hourly value (MW) up or down by a Weather Adjustment Factor
  - The Weather Adjustment Factor is determined by a mathematical relationship derived through a regression analysis that considers the DRR load and historical hourly temperature data.

12.3.1.3 Evaluators MISO Models

The following CBL models were developed for each customer in accordance with MISO protocols.

For a 5-of-10 (or 5-of-5) unadjusted baseline, the Evaluators examine the load data from the most recent ten (or five) non-event, non-holiday weekdays relative to the event day and calculate the mean demand usage values of the five highest load days. This baseline is then adjusted for the SMA and WSA models utilizing the method described in Section 12.3.1.2.

TABLE 12-6 EVALUATORS' MISO CBL MODELS

Model Type	Baseline Days	SMA	WSA
Unadjusted	5-of-10	No	No
SMA-Adjusted	5-of-10	Yes	No
WSA-Adjusted	5-of-10	No	Yes
Unadjusted	5-of-5	No	No
SMA-Adjusted	5-of-5	Yes	No
WSA-Adjusted	5-of-5	No	Yes

12.3.1.4 Baseline and Proxy Day Development

The Evaluators defined proxy days as the top eight non-event, non-holiday, non-weekend days with the highest loads across all summer months. In addition, proxy days must display a maximum temperature of greater than or equal to the minimum temperature observed during normal curtailment hours during the events. The Evaluators used these defined proxy days to determine the ability of CBL models to predict actual usage for each customer.

12.3.2 NET IMPACT METHODOLOGIES

In demand response programs, it is typically assumed that there are neither spillover nor free-ridership effects (customers are not expected to curtail without participating). Although customers can find

workarounds to make up for lost productivity due to demand response events, they are compensated only if they reduce their load during the peak demand window, the primary program goal. As such, the net-to-gross ratio for this program is assumed to be 100%.

12.4 Evaluation Findings

TABLE 12-7 EVENT DATES AND TIMES

Event Dates	Event Times (CDT)
6/10/2021	1400-1800
7/23/2021	1400-1800
7/28/2021	1500-1800
8/23/2021	1600-1800

12.4.1LOAD SHAPES AND MODEL PERFORMANCE

The figures below are average load shapes for each program on proxy and event days and depict actual kW and baseline kW for the selected baseline model. The figures show that baseline kW is a good match for actual kW during the hours of curtailment on the majority of proxy days.

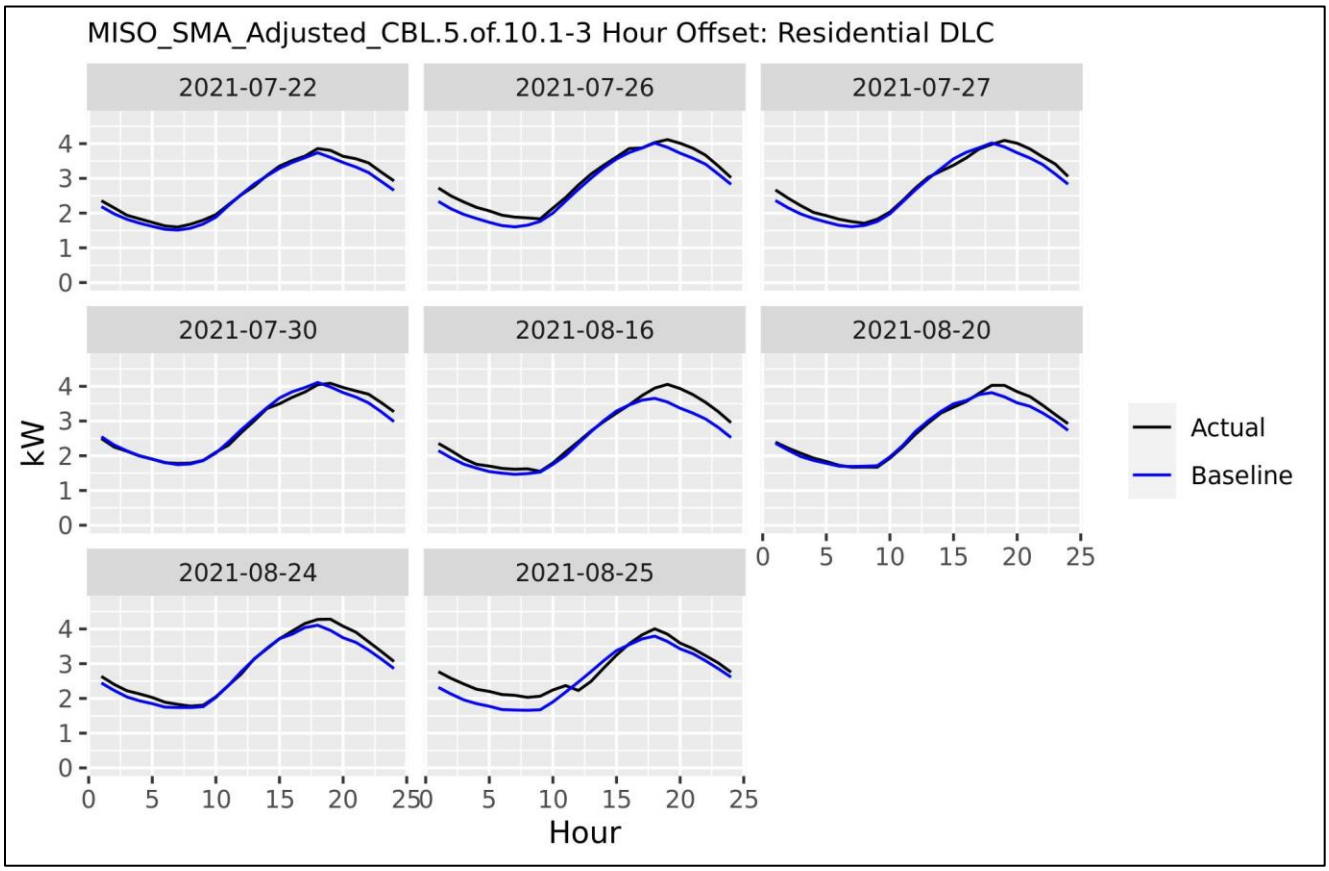


FIGURE 12-1 EASYCOOL DLC PROXY DAY LOAD SHAPES

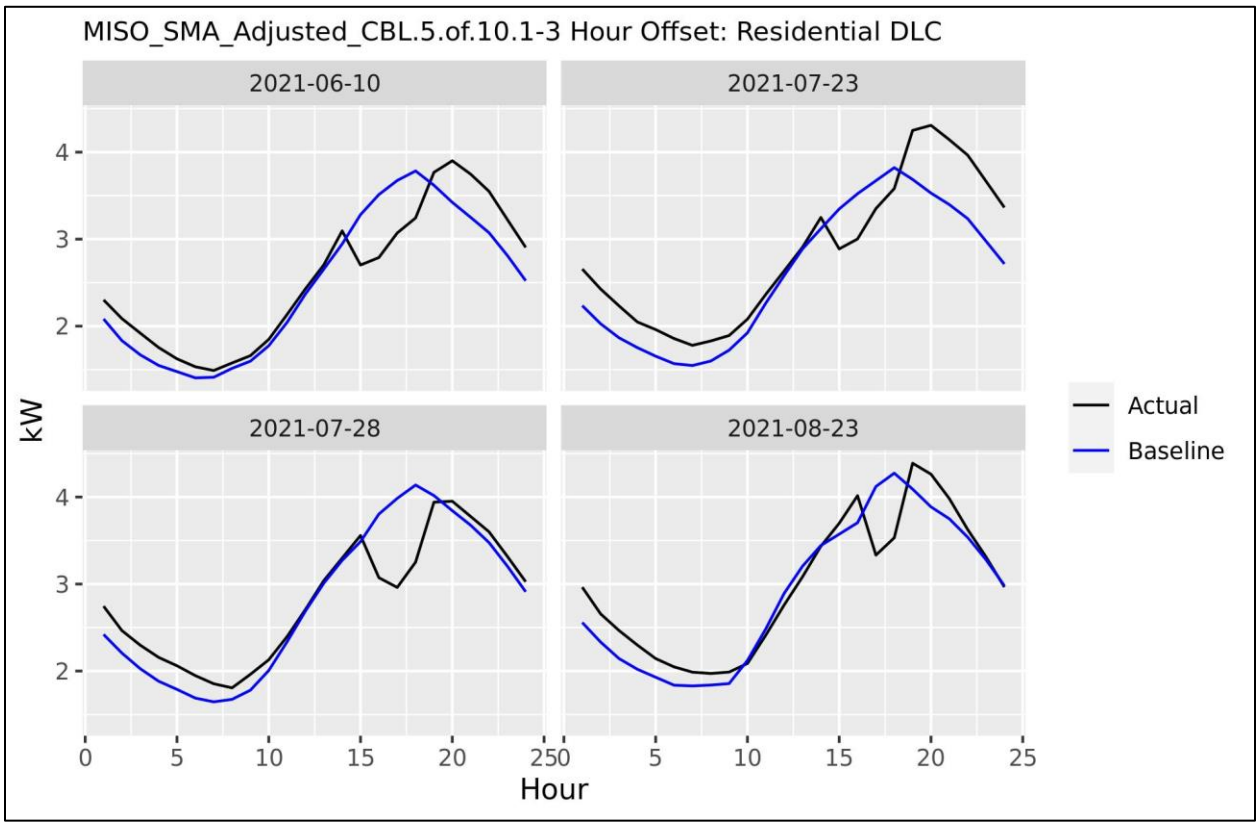


FIGURE 12-2 EASYCOOL DLC EVENT DAY LOAD SHAPES

The Evaluators estimated bias and error for the Evaluators MISO models across all sites and when applied on a site-specific basis and selected for the model with the lowest bias. As shown in the table below, the MISO SMA Adjusted CBL 5-of-10 model performed the best and had the lowest bias and error (RRMSE) for the Residential DLC program.

TABLE 12-8 MODEL FIT AND BIAS

Model	Follow MISO Protocols	RRMSE	RMSE	Bias	Best Fit Model (Lowest Bias/Error)
MISO_SMA_Adjusted_CBL.5.of.10	X	0.032	0.120	-0.39%	X
MISO_Unadjusted_CBL.5.of.10	X	0.050	0.187	-1.36%	
MISO_WSA_Adjusted_CBL.5.of.5	X	0.069	0.258	-1.50%	
MISO_SMA_Adjusted_CBL.5.of.5	X	0.109	0.407	-9.01%	
MISO_WSA_Adjusted_CBL.5.of.10	X	0.102	0.379	9.03%	
MISO_Unadjusted_CBL.5.of.5	X	0.150	0.560	-12.95%	

12.4.2 GROSS IMPACT FINDINGS

Using results from the CBLs, the Evaluators calculated the PY11 kW reduction. Results are shown below in the table below.

TABLE 12-9 TOTAL EASYCOOL DLC DEMAND REDUCTION RESULTS

Average Savings per Event per Unit (kW)	Average Savings per Event per Participant (kW)	Total Participating Systems[24]	Number of Participants	Total Program kW Reduction
0.524898	0.627579	1,638	1,370	859.78

The overall verified kW reduction is 859.78.

12.4.3 NET IMPACT FINDINGS

For demand response programs, net savings equals gross savings.

TABLE 12-10 TOTAL EASYCOOL DLC DEMAND REDUCTION RESULTS

Ex post Gross Demand Reduction (kW)	Net-to-Gross Ratio	*Ex post* Net Demand Reduction (kW)
859.78	100%	859.78

All program results can be found in tables in Section 12.1 Summary.

12.4.4 PROCESS FINDINGS

There were no process evaluation activities or findings in PY11.

12.4.5 DATA TRACKING REVIEW

The Evaluators reviewed the tracking data and found no issues. Advanced metering infrastructure (AMI) data was provided which allowed the Evaluators to complete the billing (CBL) analysis.

12.5 Key Findings and Conclusions

There were no key findings or conclusions for this program.

12.6 Recommendations

There were no recommendations for this program.

[24] Many program participants had had devices controlling multiple AC/HP units. This number is the total number of controlled ACs/HPs. This count also reflects the removal of 24 devices that were unenrolled before the first event.

13 EASYCOOL BRING YOUR OWN THERMOSTAT

13.1 Summary

The tables below report *ex ante* gross, *ex post* gross, *ex post* net energy savings (kWh) (both annual and lifetime), demand reductions (kW), participation, and incentive spend, by measure, where applicable.

TABLE 13-1 PY11 EASYCOOL BYOT ENERGY SAVINGS (KWH)

Measure	*Ex ante* Gross Savings (kWh)	Realization Rate (kWh)	*Ex post* Gross Savings (kWh)	NTG	*Ex post* Net Savings (kWh)
Event (x 2,068)	0	N/A	0	N/A	0
Total	**0**	**N/A**	**0**	**N/A**	**0**

Sums may differ due to rounding.

TABLE 13-2 PY11 EASYCOOL BYOT DEMAND REDUCTIONS (KW)

Measure	*Ex ante* Gross Demand (kW)	Realization Rate (kW)	*Ex post* Gross Demand (kW)	NTG	*Ex post* Net Demand (kW)
Event (x 2,068)	0.00	N/A	1,295.84	100%	1,295.84
Total	**0.00**	**N/A**	**1,295.84**	**100%**	**1,295.84**

Sums may differ due to rounding.

TABLE 13-3 PY11 EASYCOOL BYOT LIFETIME SAVINGS SUMMARY

Measure	EUL	*Ex post* Gross Lifetime Energy Savings (kWh)	*Ex post* Net Lifetime Energy Savings (kWh)
Event (x 2,068)	1	0	0
Total	**1**	**0**	**0**

Sums may differ due to rounding.

TABLE 13-4 PY11 EASYCOOL BYOT PARTICIPATION AND INCENTIVE SUMMARY

Measure	Participation (Count of Measures)	Incentive Spend ($)
Event (x 2,068)	2,078	$126,985
Total	**2,078**	**$126,985**

Sums may differ due to rounding.

13.2 Program Description

The EasyCool Bring Your Own Thermostat (EasyCool BYOT) offering uses a Distributed Energy Resource Management System (DERMS) to enroll, monitor, and to schedule load control events to reduce electricity consumption during periods of high demand. The DERMS system increases the temperature setting by a small amount on customer thermostats. These events may occur between June 1st and September 30th and are limited to a maximum of 15 adjustments per year. These events typically last no more than four hours and occur between noon and 8 p.m. To manage customer comfort, the system will pre-cool the home in advance of the event.

The offering works with a wide range of thermostats including those manufactured by ecobee, Honeywell, Nest, Alarm.com, and Emerson. A complete list of qualifying thermostats is published on the program website.

Customers enroll in the offering by visiting a web-based portal. To qualify customers must be a residential ENO customer, have an internet connected thermostat that controls central air conditioning, and agree to the terms and conditions. Customers may receive a $25 incentive for enrolling and $40 for each year they participate in the offering. Customers may unenroll by sending an email communication or they may opt-out of events using the web portal.

The program was first introduced in PY10.

13.2.1 PROGRAM CHANGES

There were no reported changes to this program in PY11.

13.2.2 TIMING OF PROJECTS

All projects occurred in February.

13.2.3 TRADE ALLIES

There were no reported trade allies in this program.

13.2.4 GOAL ACHIEVEMENT

The table below summarizes the programs' performance against goal.

TABLE 13-5 EASYCOOL BYOT PERFORMANCE TOWARDS GOAL

Ex post Gross Energy Savings (kWh) Goal	% to kWh Goal	*Ex post* Gross Energy Savings (kWh)	*Ex post* Gross Savings (kW) Target	% to kW Target	*Ex post* Gross Savings (kW)
0	N/A	0	2,871.00	45%	1,295.84

13.3 EM&V Methodology

The Evaluators employed the following approach to complete impact evaluation activities for the program. The Evaluator followed the Calculated Baseline approach outlined in the Midcontinent Independent System Operator, Inc. (MISO) Business Practices Manual (BPM)[25]. The following impact evaluation steps were taken to determine the suitability of the MISO Calculated Baseline approach:

- Developed an Unadjusted Consumption (UC) Baseline, a Symmetric Multiplicative Adjustment (SMA) Baseline, and a Weather Sensitive Adjustment (WSA) Baseline for each program participant. Loads were calculated utilizing 1-hour AMI data.
- Determined days that will serve as proxy days for testing the suitability of the baseline approach. Proxy days represent days like demand response event days in terms of load shape and temperature profiles.
- Estimated bias (uncertainty) and error on proxy days for each model to assess baseline performance. Bias is assessed by examining the average percent error of the baseline predictions relative to the actual usage on proxy days. In a similar manner, error is assessed through various metrics such as Root Mean Squared Error (RRMSE) using baseline predictions and actual usage on proxy days.
- Selected the baseline model with the lowest absolute bias.

13.3.1 GROSS IMPACT METHODOLOGIES

In the evaluation of demand response programs, energy savings are estimated by comparing a participant's load shape during a demand response event with a baseline load shape. This baseline load is assumed to be a good estimate of the counterfactual load—that is, the load that would have manifested had there not been an event called that day.

13.3.1.1 Data Sources

Data used for this evaluation include program tracking data that identifies which customers participated in the program and contains data fields such as hourly usage, hourly interval meter data (AMI) for each customer participating in the program, and a full schedule of DR program events, including the time of the event.

13.3.1.2 MISO Calculated Baseline Approach (Customer Baselines)

The following details the general requirements for the MISO Calculated Baseline Approach. The Evaluators developed Customer Baselines (CBLs) in accordance with this approach. For a demand resource, the Consumption Baseline is a profile of hourly demand based on an averaged sample of historical data which may be adjusted for factors that reflect specific, on-the-day conditions, such as temperature.

[25] *Ibid.*

The default consumption baseline is designed as follows:

- Separate hourly demand profiles for non-holiday weekdays and for weekends/holidays
- The “weekday” hourly profile is based on the average of the ten (10), but not less than five (5), most recent weekdays that are not holidays or other non-standard “event” days
- The “weekend/holiday” hourly profile is based on the average of the four (4), but not less than two (2), most recent weekend days or holidays that are not “event” days
- An “event” day is one during which there was, for the resource in question, a real- time energy or ancillary services dispatch, or a scheduled outage
- The maximum look-back window is limited to 45 days
- If the 45-day window contains insufficient days to meet the minimum number of days described above, the profiles are constructed based on the available days within the 45-day window that qualify, supplemented by the largest (MW) matching “event” day(s) values for that resource within that same window as necessary to obtain the minimum number of values.

Adjustment mechanisms to the default Consumption Baseline include:

- Symmetric Multiplicative Adjustment (SMA)
    - Adjusts each baseline hourly value (MW) during the event up or down by the ratio of
    - (a) the sum of hourly demands for the three hours beginning four hours prior to the event and (b) the sum of those same three hourly baseline demands
    - The adjustment is limited to a change in any individual baseline hour of plus or minus 20 percent.
    - If multiple events occur during the same day, the SMA is calculated only for the first event, but applied to all events that day.
- Weather Sensitive Adjustment (WSA)
    - Adjusts each baseline hourly value (MW) up or down by a Weather Adjustment Factor
    - The Weather Adjustment Factor is determined by a mathematical relationship derived through a regression analysis that considers the DRR load and historical hourly temperature data.

13.3.1.3 Evaluators MISO Models

The following CBL models were developed for each customer in accordance with MISO protocols.

For a 5-of-10 (or 5-of-5) unadjusted baseline, the Evaluators examine the load data from the most recent ten (or five) non-event, non-holiday weekdays relative to the event day and calculate the mean demand usage values of the five highest load days. This baseline is then adjusted for the SMA and WSA models utilizing the method described in Section 12.3.1.2.

TABLE 13-6 EVALUATORS' MISO CBL MODELS

Model Type	Baseline Days	SMA	WSA
Unadjusted	5-of-10	No	No
SMA-Adjusted	5-of-10	Yes	No
WSA-Adjusted	5-of-10	No	Yes
Unadjusted	5-of-5	No	No
SMA-Adjusted	5-of-5	Yes	No
WSA-Adjusted	5-of-5	No	Yes

13.3.1.4 Baseline and Proxy Day Development

The Evaluators defined proxy days as the top eight non-event, non-holiday, non-weekend days with the highest loads across all summer months. In addition, proxy days must display a maximum temperature of greater than or equal to the minimum temperature observed during normal curtailment hours during the events. The Evaluators used these defined proxy days to determine the ability of CBL models to predict actual usage for each customer.

13.3.2 NET IMPACT METHODOLOGIES

In demand response programs, it is typically assumed that there are neither spillover nor free-ridership effects (customers are not expected to curtail without participating). Although customers can find workarounds to make up for lost productivity due to demand response events, they are compensated only if they reduce their load during the peak demand window, the primary program goal. As such, the net-to-gross ratio for this program is assumed to be 100%.

13.4 Evaluation Findings

TABLE 13-7 EVENT DATES AND TIMES

Event Dates	Event Times (CDT)
6/10/2021	1400-1800
7/23/2021	1400-1800
7/28/2021	1500-1800
8/23/2021	1600-1800

13.4.1 LOAD SHAPES AND MODEL PERFORMANCE

The figures below are average load shapes for each program on proxy and event days and depict actual kW and baseline kW for the selected baseline model. The figures show that baseline kW is a good match for actual kW during the hours of curtailment on the majority of proxy days.

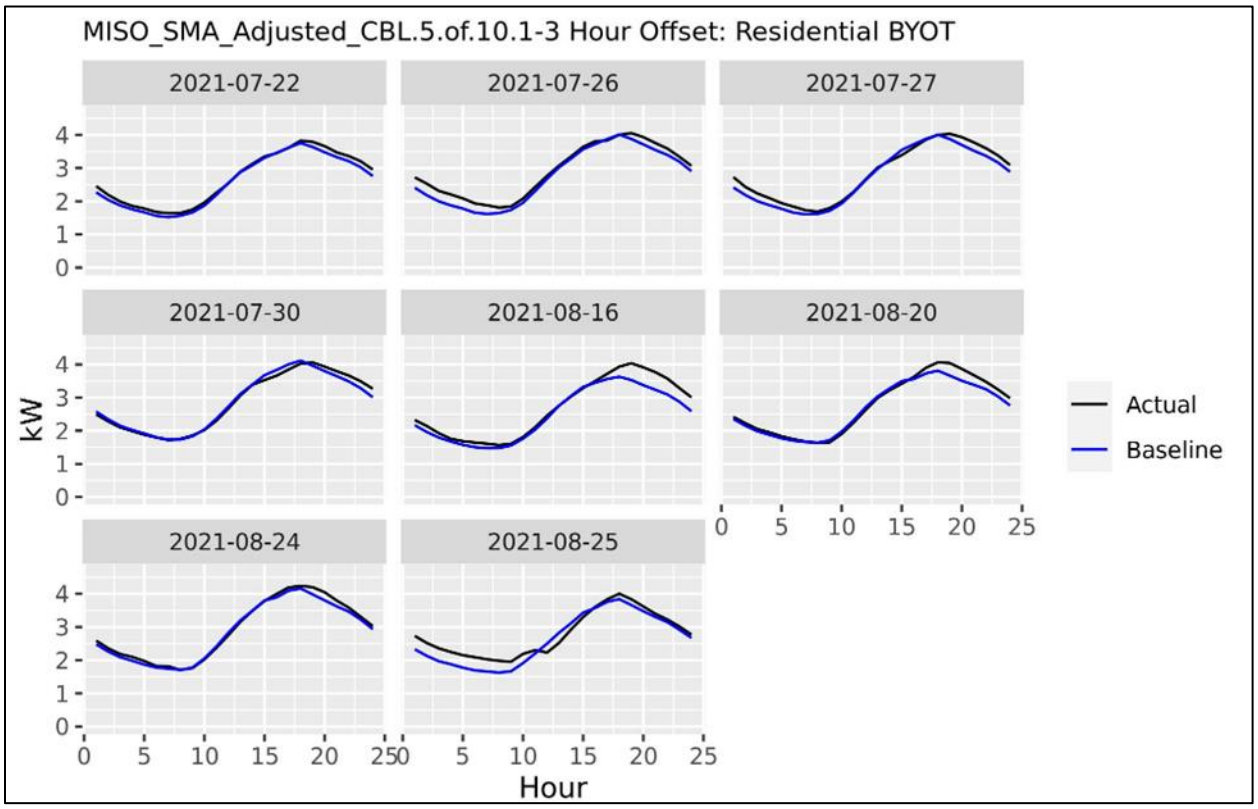


FIGURE 13-1 EASYCOOL BYOT PROXY DAY LOAD SHAPES

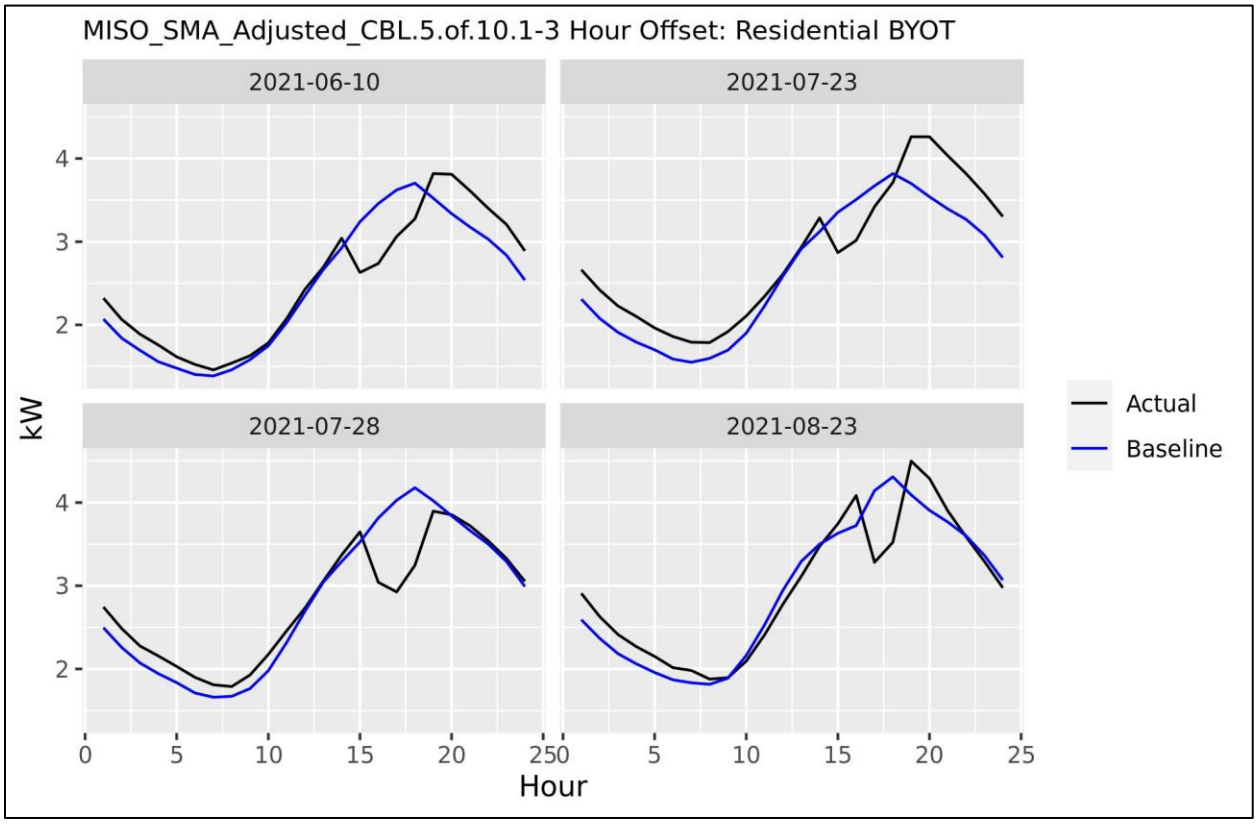


FIGURE 13-2 EASYCOOL BYOT EVENT DAY LOAD SHAPES

The Evaluators estimated bias and error for the Evaluators MISO models across all sites and when applied on a site-specific basis and selected for the model with the lowest bias. As shown in the table below, the MISO SMA Adjusted CBL 5-of-10 model performed the best and had the lowest bias and error (RRMSE) for the Residential BYOT program.

TABLE 13-8 MODEL FIT AND BIAS

Model	Follow MISO Protocols	RRMSE	RMSE	Bias	Best Fit Model (Lowest Bias/Error)
MISO_SMA_Adjusted_CBL.5.of.10	X	0.031	0.117	-0.43%	X
MISO_Unadjusted_CBL.5.of.10	X	0.050	0.186	-1.60%	
MISO_WSA_Adjusted_CBL.5.of.5	X	0.070	0.260	-1.93%	
MISO_WSA_Adjusted_CBL.5.of.10	X	0.100	0.375	8.86%	
MISO_SMA_Adjusted_CBL.5.of.5	X	0.111	0.414	-9.28%	
MISO_Unadjusted_CBL.5.of.5	X	0.155	0.580	-13.50%	

13.4.2 GROSS IMPACT FINDINGS

Using results from the CBLs, the Evaluators calculated the PY11 kW reduction. Results are shown below in the table below.

TABLE 13-9 TOTAL GROSS EASYCOOL BYOT DEMAND REDUCTIONS

Average Savings per Event per Unit (kW)	Average Savings per Event per Participant (kW)	Total Participating Systems[26]	Number of Participants	Total Program kW Reduction
0.493655	0.623602	2,625	2,078	1,295.84

The overall verified kW reduction is 1,295.84 kW.

13.4.3 NET IMPACT FINDINGS

For demand response programs, net savings equals gross savings.

TABLE 13-10 TOTAL EASYCOOL BYOT NET DEMAND REDUCTION RESULTS

Gross kW Reduction	Net-to-Gross Ratio	Net Demand Reduction
1,295.84	100%	1,295.84

Program results can be found in tables in Section 13.1 Summary.

13.4.4 PROCESS FINDINGS

There were no process evaluation activities or findings in PY11.

13.4.5 DATA TRACKING REVIEW

The Evaluators reviewed the tracking data and found no issues. Advanced metering infrastructure (AMI) data was provided which allowed the Evaluators to complete the billing (CBL) analysis.

13.5 Key Findings and Conclusions

There were no key findings or conclusions for this program.

13.6 Recommendations

There were no recommendations for this program.

[26] Many program participants had had devices controlling multiple AC/HP units. This number is the total number of controlled ACs/HPs. This count also reflects the removal of 24 devices that were unenrolled before the first event.

14 SMALL C&I SOLUTIONS

14.1 Summary

The tables below report *ex ante* gross, *ex post* gross, *ex post* net energy savings (kWh) (both annual and lifetime), demand reductions (kW), participation, and incentive spend, by measure, where applicable. Additionally, the tables above represent evaluation findings for each measure, whereas the analysis described in this chapter summarize the findings of the evaluation by type (e.g., OLM, kits, etc.) and by stratum.

TABLE 14-1 PY11 SMALL C&I SOLUTIONS ENERGY SAVINGS (KWH)

Measure	*Ex ante* Gross Savings (kWh)	Realization Rate (kWh)	*Ex post* Gross Savings (kWh)	NTG	*Ex post* Net Savings (kWh)
Custom - LED	125,820	84%	106,226	98%	104,102
Prescriptive - LED	533,931	96%	512,606	100%	512,606
Prescriptive - TA Incentive	0	N/A	0	N/A	0
Prescriptive - Restaurant Small Business Kit	197,335	57%	112,099	80%	89,679
Prescriptive - Office Small Business Kit	282,328	54%	151,063	87%	131,424
Prescriptive - Retail Small Business Kits	328,213	N/A	191,506	85%	162,780
Prescriptive - Smart Thermostats	2,129	71%	1,505	42%	632
Prescriptive - Screw-Based LED	127,357	89%	113,965	100%	113,965
Prescriptive - Lighting Controls	7,246	91%	6,623	100%	6,623
Prescriptive - Refrigeration	125,033	N/A	99,091	42%	41,618
Prescriptive - OLM Smart Thermostats	149,184	76%	113,054	74%	83,660
Prescriptive - OLM Shower Heads	2,386	85%	2,037	100%	2,037
Prescriptive - OLM Advanced Power Strips	1,224	55%	678	64%	434
Prescriptive - OLM Screw Based LED	77,900	72%	55,979	62%	34,707
Prescriptive - OLM Aerators	76,046	80%	60,856	67%	40,774
Custom - Custom	0	N/A	0	N/A	0
Prescriptive - OLM Exit Sign	820	100%	819	64%	524
Custom - Chiller	91,058	100%	91,058	77%	70,115
Custom - HVAC	702	100%	702	77%	541
Prescriptive - AC Tune Up	10,876	79%	8,592	42%	3,609
Prescriptive - Duct Sealing	6,963	N/A	5,501	42%	2,310
Prescriptive - Ida Recovery Fund	0	N/A	0	N/A	0
Prescriptive - Convection Oven	1,988	79%	1,570	42%	659
Prescriptive - HVAC	13,056	70%	9,163	42%	3,848
Prescriptive - BMS	10,650	50%	5,325	42%	2,237
Prescriptive - OLM LED	737,086	32%	236,037	62%	146,343
Total	**2,909,328**	**65%**	**1,886,054**	**69%**	**1,555,227**

Sums may differ due to rounding.

TABLE 14-2 PY11 SMALL C&I SOLUTIONS DEMAND REDUCTIONS (KW)

Measure	*Ex ante* Gross Demand (kW)	Realization Rate (kW)	*Ex post* Gross Demand (kW)	NTG	*Ex post* Net Demand (kW)
Custom - LED	15.65	97%	15.16	98%	14.86
Prescriptive - LED	77.62	97%	75.18	100%	75.18
Prescriptive - TA Incentive	0.00	N/A	0.00	N/A	0.00
Prescriptive - Restaurant Small Business Kit	36.78	57%	20.80	80%	16.64
Prescriptive - Office Small Business Kit	77.12	53%	41.17	87%	35.82
Prescriptive - Retail Small Business Kits	91.81	58%	53.05	85%	45.09
Prescriptive - Smart Thermostats	0.00	N/A	0.00	42%	0.00
Prescriptive - Screw-Based LED	19.05	116%	22.15	100%	22.15
Prescriptive - Lighting Controls	0.83	87%	0.72	100%	0.72
Prescriptive - Refrigeration	14.35	N/A	11.29	42%	4.74
Prescriptive - OLM Smart Thermostats	0.00	N/A	0.00	74%	0.00
Prescriptive - OLM Shower Heads	103.68	85%	87.71	100%	87.71
Prescriptive - OLM Advanced Power Strips	0.00	N/A	0.00	64%	0.00
Prescriptive - OLM Screw Based LED	13.30	75%	9.99	62%	6.20
Prescriptive - OLM Aerators	16.20	N/A	12.76	67%	8.55
Custom - Custom	0.00	N/A	0.00	N/A	0.00
Prescriptive - OLM Exit Sign	0.12	98%	0.11	64%	0.07
Custom - Chiller	46.76	N/A	46.76	77%	36.00
Custom - HVAC	0.00	N/A	0.00	77%	0.00
Prescriptive - AC Tune Up	3.66	79%	2.89	42%	1.22
Prescriptive - Duct Sealing	5.68	N/A	4.49	42%	1.89
Prescriptive - Ida Recovery Fund	0.00	N/A	0.00	N/A	0.00
Prescriptive - Convection Oven	0.38	79%	0.30	42%	0.13
Prescriptive - HVAC	4.15	74%	3.05	42%	1.28
Prescriptive - BMS	0.00	N/A	0.00	42%	0.00
Prescriptive - OLM LED	107.93	32%	34.50	62%	21.39
Total	**635.07**	**70%**	**442.09**	**69%**	**379.63**

Sums may differ due to rounding.

TABLE 14-3 PY11 SMALL C&I SOLUTIONS LIFETIME SAVINGS SUMMARY

Measure	EUL	*Ex post* Gross Lifetime Energy Savings (kWh)	*Ex post* Net Lifetime Energy Savings (kWh)
Custom - LED	15	1,593,396	1,561,528
Prescriptive - LED	15	7,689,097	7,689,097
Prescriptive - TA Incentive	11	0	0
Prescriptive - Restaurant Small Business Kit	10	1,176,178	940,943
Prescriptive - Office Small Business Kit	10	1,572,792	1,368,329
Prescriptive - Retail Small Business Kits	13	2,560,170	2,176,144
Prescriptive - Smart Thermostats	11	16,557	6,954
Prescriptive - Screw-Based LED	9	1,025,687	1,025,687
Prescriptive - Lighting Controls	8	52,982	52,982
Prescriptive - Refrigeration	5	531,924	223,408
Prescriptive - OLM Smart Thermostats	11	1,243,590	920,257
Prescriptive - OLM Shower Heads	10	20,367	20,367
Prescriptive - OLM Advanced Power Strips	10	6,781	4,340
Prescriptive - OLM Screw Based LED	9	503,808	312,361
Prescriptive - OLM Aerators	10	608,564	407,738
Custom - Custom	1	0	0
Prescriptive - OLM Exit Sign	15	12,281	7,860
Custom - Chiller	20	1,821,164	1,402,296
Custom - HVAC	15	10,530	8,108
Prescriptive - AC Tune Up	10	85,920	36,087
Prescriptive - Duct Sealing	18	99,012	41,585
Prescriptive - Ida Recovery Fund	11	0	0
Prescriptive - Convection Oven	12	18,842	7,913
Prescriptive - HVAC	15	137,443	57,726
Prescriptive - BMS	8	42,600	17,892
Prescriptive - OLM LED	10	2,468,472	1,530,453
Total	**11**	**23,298,155**	**19,820,053**

Sums may differ due to rounding.

TABLE 14-4 PY11 SMALL C&I SOLUTIONS COUNT OF MEASURES AND INCENTIVE SPEND

Measure	Participation (Count of Measures)	Incentive Spend ($)
Custom - LED	14	$17,307
Prescriptive - LED	46	$58,711
Prescriptive - TA Incentive	72	$17,142
Prescriptive - Restaurant Small Business Kit	190	$446
Prescriptive - Office Small Business Kit	182	$2,738
Prescriptive - Retail Small Business Kits	232	$651
Prescriptive - Smart Thermostats	3	$555
Prescriptive - Screw-Based LED	17	$4,202
Prescriptive - Lighting Controls	5	$472
Prescriptive - Refrigeration	53	$15,130
Prescriptive - OLM Smart Thermostats	195	$44,891
Prescriptive - OLM Shower Heads	17	$340
Prescriptive - OLM Advanced Power Strips	10	$404
Prescriptive - OLM Screw Based LED	72	$2,245
Prescriptive - OLM Aerators	15	$473
Custom - Custom	9	$24,105
Prescriptive - OLM Exit Sign	2	$60
Custom - Chiller	2	$10,927
Custom - HVAC	1	$800
Prescriptive - AC Tune Up	3	$518
Prescriptive - Duct Sealing	2	$838
Prescriptive - Ida Recovery Fund	8	$109,024
Prescriptive - Convection Oven	1	$288
Prescriptive - HVAC	3	$1,900
Prescriptive - BMS	1	$1,680
Prescriptive - OLM LED	387	$48,456
Total	**1,542**	**$364,303**

Sums may differ due to rounding.

14.2 Program Description

Small Commercial & Industrial Solutions (Small C&I Solutions) program provides higher incentives to small business owners to help overcome the first-cost barrier that small businesses face in adopting energy efficiency improvements. By offering enhanced financial incentives, the program generates significant cost-effective energy savings for small businesses using added market-segmented strategies that encourage the adoption of diverse efficiency measures in target sub-sectors.

The incentives provided are summarized below in Table 14-5.

TABLE 14-5 SMALL C&I SOLUTIONS SUMMARY OF OFFERING INCENTIVES

Measure	Incentive
Prescriptive	$ per unit
Custom Lighting	$0.12 per kWh Saved
Custom Non-Lighting	$0.12 per kWh Saved

The offering is designed to provide small business owners with energy efficiency information and develop awareness of energy and non-energy benefits of energy efficiency. The information helps small business customers invest in energy efficient technologies and help overcome high “first costs.” It is intended to increase the awareness of the latest energy efficient technologies available to small business customers. Through the offering, a network of trade allies was developed that work specifically with small business customers. The offerings provide the tools and training for trade allies to quantify the energy savings and incentives for small business customers.

14.2.1 PROGRAM CHANGES

There were no reported changes in PY11.

14.2.2 PROGRAM ACTIVITY

In PY11, the offering had an expected energy savings of 2,909,328 kWh and an expected peak demand reduction of 635.07 kW. The expected savings are the result of three distinct delivery channels within the program, traditional retrofits (traditional), items purchased from the Energy Smart Online Market (OLM) Place and the distribution of Small Business Energy Efficiency Kits (kits). The count of participants and the expected savings from each channel is found in Table 14-6.

TABLE 14-6 SMALL C&I SOLUTIONS SAVINGS EXPECTATION BY DELIVERY CHANNEL

Delivery Channel	Count of Project Components	*Ex ante* Gross Energy Savings (kWh)	*Ex ante* Gross Demand Reductions (kW)
Traditional	240	1,056,808	188.14
OLM	698	1,044,645	241.22
Kits	604	807,875	205.71
Total	**1,542**	**2,909,328**	**635.07**

TABLE 14-7 SMALL C&I SOLUTIONS SAVINGS EXPECTATION BY PROJECT COMPONENT

Participation Path	Project Component	# of Project Components	*Ex ante* Gross Energy Savings (kWh)	*Ex ante* Gross Demand Reductions (kW)
Traditional	Prescriptive	214	839,228	126
	Custom	26	217,580	62
Office Kit	Prescriptive	182	282,328	77
Restaurant Kit	Prescriptive	190	197,335	37
Retail Kit	Prescriptive	232	328,213	92
OLM	Prescriptive	698	1,044,645	241
Total		**1,542**	**2,909,328**	**635**

In PY11, the savings were largely made up of kits and OLM items, these two participant paths accounted for 63.68% of the total expected energy savings. The measure counts below are off compared to the tables above as line items with no expected energy savings were included (incentive bonuses and a Hurricane Ida relief fund to increase incentives to customers).

TABLE 14-8 SMALL C&I SOLUTIONS SAVINGS EXPECTATION BY MEASURE TYPE

Project Component	Count of Measures	*Ex ante* Gross Energy Savings (kWh)	Expected kW Savings	Percentage of Savings Contribution
Lighting	77	787,108	112.32	27.1%
Refrigeration	53	125,033	14.35	4.3%
HVAC	7	115,466	50.91	4.0%
Lighting Controls	5	7,246	0.83	0.3%
AC Tune Up	3	10,876	3.66	0.4%
Smart Thermostats	3	2,129	0.00	0.1%
Convection Oven	1	1,988	0.3800	0.1%
Duct Sealing	2	6,963	5.68	0.2%
Kits	604	807,875	205.71	27.8%
OLM	698	1,044,645	241.22	35.9%
Total	**1,453**	**2,909,328**	**635.07**	**100.0%**

Expected energy savings and the month in which the project was closed out are shown in Figure 15-1 below.

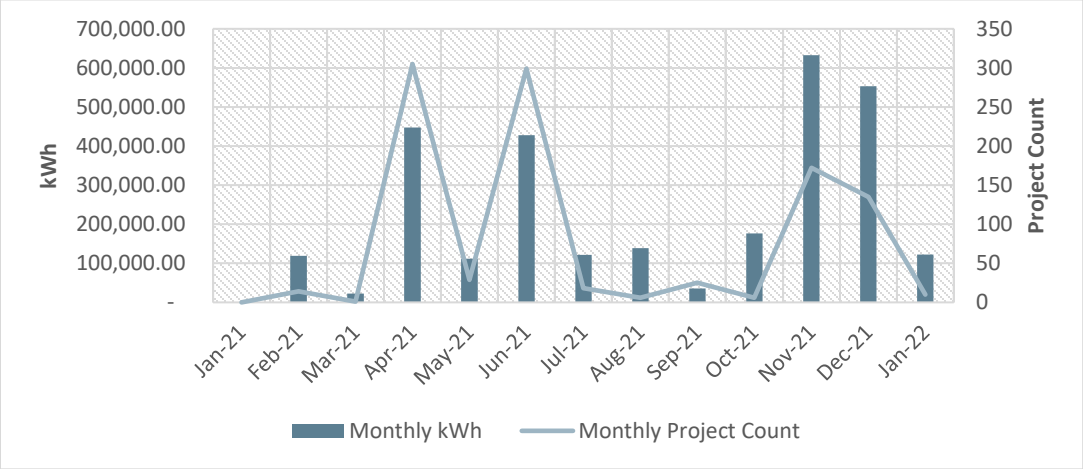


FIGURE 14-1 SMALL C&I SOLUTIONS MONTHLY PROGRAM PARTICIPATION

In PY11, 40.75% of the Small C&I Program expected savings were claimed in November and December of the PY11 program year. Compared to previous program years, PY11 saw a large increase in the number of projects completed while seeing a decrease in *ex ante* gross energy savings.

TABLE 14-9 SMALL C&I SOLUTIONS PARTICIPATION SUMMARY COMPARISON

Project Year	# Projects	*Ex ante* Gross kWh	kWh per Project
PY5	191	4,011,430	21,002
PY6	156	3,152,283	20,207
PY7 (nominal)	46	2,264,029	49,218
PY7 (normalized)	61	3,018,705	49,487
PY8	130	7,374,272	56,725
PY9 (nominal)	144	8,258,263	57,349
PY9 (normalized)	97	6,577,262	67,807
PY10 (nominal)[27]	117	3,590,542	30,567
PY10 (normalized)	156	4,768,495	30,567
PY11	1020	2,909,328	635.07

14.2.3 GOAL ACHIEVEMENT

The total verified savings and percentage of goals for the program are summarized in Table 14-10 below.

[27] Counts of both 'calendar' and 'normalized' and their respective kWh savings refer to traditional projects and do not include kits or online purchases.

TABLE 14-10 SMALL C&I SOLUTIONS SUMMARY OF GOAL ACHIEVEMENT

Ex post Gross Energy Savings (kWh) Goal	% to kWh Goal	*Ex post* Gross Energy Savings (kWh)	*Ex post* Gross Savings (kW) Target	% to kW Target	*Ex post* Gross Savings (kW)
8,120,295	23%	1,886,054	1,715.89	26%	442.09

14.3 EM&V Methodology

Evaluation of the offering requires the following:

- Stratified Random Sampling (as detailed in section Stratified Sampling by selecting large saving sites with certainty).
- The Evaluators conducted two on site visits for small C&I projects in PY11.
- Where custom project hours were used, publicly-available facility hours or phone calls were made to project contacts to verify schedules.
- Gross savings were estimated using proven techniques, including engineering calculations using industry standards and verification of computer simulations developed by program trade allies to determine energy savings.
- Interviewing of program participants and trade allies.

To approach the impact evaluation, data was collected through review of program materials and on-site inspections were performed to inform savings calculations. Based on data provided by staff, sample designs were developed for the impact evaluation.

The on-site inspections were used to help verify installations and to determine any changes to the operating parameters since the measures were first installed. The Evaluators verified that TRM lighting hours of operation had been correctly assigned by space type. Projects were deemed analyzed using the methods described in the NO TRM V4.0, section D.6.2 and 3, Lighting Efficiency and Lighting Controls. Specific algorithms for lighting savings and an explanation of deemed inputs are below.

14.3.1 METHODOLOGY FOR TRADITIONAL PROJECTS

14.3.1.1 Lighting Savings Calculations

$$kWh_{savings} = \sum \left(\left[N_{fixt(i)} \times \frac{W_{fixt(i)}}{1000} \right]_{pre} - \left[N_{fixt(i)} \times \frac{W_{fixt(i)}}{1000} \right]_{post} \right) \times AOH \times IEF_E$$

$$kW_{savings} = \sum \left(\left[N_{fixt(i)} \times \frac{W_{fixt(i)}}{1000} \right]_{pre} - \left[N_{fixt(i)} \times \frac{W_{fixt(i)}}{1000} \right]_{post} \right) \times CF \times IEF_D$$

Where:

Nfixt(i), pre = Pre-retrofit number of fixtures of type i

Nfixt(i), post = Post-retrofit number of fixtures of type i

Wfixt(i), pre = Rated wattage of pre-retrofit fixtures of type i (Standard Wattage Table, Appendix E pages C-323 to C-475)

Wfixt(i), post = Rated wattage of post-retrofit fixtures of type i (Appendix E)

CF = Peak demand coincidence factor (TRM Table 227, pages C-294 to C-295)

AOH = Annual operating hours for specified space type (TRM Table 227, pages C-294 to C-295)

IEFD = Interactive effects factor for demand savings (TRM Table 228, page C-296)

IEFE = Interactive effects factor for energy savings (TRM Table 228, page C-296)

14.3.1.2 Small C&I Offering Sample Design

Sampling for evaluation of the Small C&I Solutions program was developed using the Stratified Random Sampling procedure detailed in section Stratified Sampling. This procedure provides 90% confidence and +/- 10% precision with a significantly reduced sample than simple random sampling would require by selecting the highest saving facilities with certainty, thereby minimizing the variance that non-sampled sites can contribute to the overall results.

The participant population for the offering was divided into four strata. The strata boundaries, sample frames and sample statistics are in Table 14-11 below.

TABLE 14-11 SMALL C&I SOLUTIONS PROGRAM SAMPLE DESIGN

	Stratum 1	Stratum 2	Stratum 3	Stratum 4	Totals
Strata boundaries (kWh)	< 5,000	5,001 - 20,000	20,001 - 50,000	> 50,001	
Number of projects	44	24	17	5	**90**
Total kWh savings	115,576	201,793	540,233	329,571	**1,187,172**
Average kWh Savings	2,627	8,408	31,778	65,914	**19,680**
Standard deviation of kWh savings	1,184	3,467	8,994	21,947	**9,262**
Coefficient of variation	0.45	0.41	0.28	0.33	**0.47**
Final design sample	7	7	8	3	**25**

TABLE 14-12 EXPECTED SAVINGS FOR SAMPLED/NON-SAMPLED PROJECTS BY STRATUM

Stratum	Sample Expected Savings	Total Expected Savings
1	8,478	115,576
2	17,538	201,793
3	245,147	540,233
4	171,871	329,571
Total	**443,033**	**1,187,172**

The achieved sampling precision was ±8.9% at 90% confidence.

14.3.2 METHODOLOGY FOR KITS

Savings for lighting and water heating measures in the kits was assessed using the NO TRM V4.0.

TABLE 14-13 APPLICABLE TRM SECTIONS

Measure	TRM Section
LED A-Lamps	D.6
Low-Flow Faucet Aerators 1.0 GPM	D.2.2
Low-Flow Faucet Aerators 1.5 GPM	D.2.3
Advanced Power Strips	D.7.6
LED 'Exit' sign	D.6

To determine in-service rates (ISRs) the Evaluators surveyed kit recipients. The tables below show responses and ISRs.

TABLE 14-14 ISRS FOR OFFICE KIT MEASURES

Measure	ISR	Responses
LEDs	50%	4
Aerator 1.0	20%	5
Aerator 1.5	20%	5
APS	67%	3
LED 'Exit' signs	20%	5

TABLE 14-15 ISRS FOR RETAIL KIT MEASURES

Measure	ISR	Responses
LEDs	44%	19
Aerator 1.0	29%	7
LED 'Exit' signs	22%	9

TABLE 14-16 ISRS FOR RESTAURANT KIT MEASURES

Measure	ISR	Responses
LEDs	75%	4
Aerator 1.0	50%	3
Aerator 1.5	38%	4
LED 'Exit' signs	25%	4

Savings for businesses with gas water heating were not claimed for hot water measures, staff tracked the water heating type for each kit delivered and included this data in tracking provided to the Evaluators. In addition to asking questions related to in-service rates, the Evaluators also confirmed each businesses' water heating type during surveys. No discrepancies were found.

14.4 Evaluation Findings

14.4.1GROSS IMPACT FINDINGS

14.4.1.1 Traditional Project Realization

The Evaluators reviewed all project documentation, including invoices, spec sheets and site photos to verify the installation of the equipment. Energy and demand reduction calculations were reviewed to verify that they were consistent with the TRM and that all inputs were appropriate. Changes and corrections between *ex ante* and *ex post* savings estimates were documented and realization rates based on verified savings were developed for each site. The realization rates for sites within each stratum were then applied to the non-sampled sites within their respective stratum.

TABLE 14-17 EXPECTED AND VERIFIED SAVINGS BY SAMPLED PROJECT

Project ID(s)	Facility Type	*Ex ante* Gross Energy Savings (kWh)	*Ex post* Gross Energy Savings (kWh)	Realization Rate
CIP_214	Outdoor	33,364	33,602	101%
CIP_200	Retail: Enclosed Mall	58,305	53,792	92%
CIP_153	Warehouse: Non-refrigerated	25,492	24,865	98%
CIP_143	Retail: Strip Shopping & Non-enclosed Mall	17,538	17,538	100%
CIP_075	Retail: Enclosed Mall	22,630	22,630	100%
CIP_215	Retail: Strip Shopping & Non-enclosed Mall	51,560	57,360	111%
CIP_295	Retail: Excluding Malls & Strip Centers	2,160	2,160	100%
CIP_256	Outdoor	23,631	23,631	100%
CIP_228	Food Service: Fast Food	24,131	26,708	111%
CIP_241	Warehouse: Non-refrigerated	62,006	9,823	16%
CIP_339	Food Service: Sit-down Restaurant	1,988	1,933	97%
CIP_349	Outdoor	47,175	44,360	94%
CIP_359	Food Service: Fast Food	31,575	28,686	91%
CIP_361	Retail: Excluding Malls & Strip Centers	4,330	4,330	100%
CIP_371	Education: College, University, Vocational, Day Care, and K-12 w/ Summer Session	37,150	37,150	100%
Total		**443,033**	**379,456**	**388,568**

TABLE 14-18 SUMMARY OF KWH SAVINGS BY SAMPLE STRATUM

Stratum	Sample *Ex ante* Gross Energy Savings (kWh)	Sample *Ex post* Gross Energy Savings (kWh)	Stratum Realization Rate
1	8,478	8,423	99%
2	17,538	17,538	100%
3	245,147	241,632	99%
4	171,871	120,975	70%

14.4.1.2 Causes of Sub-100% Realization

Some sampled projects used annual hours of lighting operation and peak CFs that were not correct for the space type. Verified savings calculations reflect hours of use and peak CFs specific to the type of space the lamps were installed in, resulting in slightly different verified savings estimates. The table below shows projects with a realization rate that is ±10% from 100% and the cause of the variance in savings.

TABLE 14-19 CAUSES OF VARIANCE IN PROJECT SAVINGS

Project ID(s)	*Expected kWh Savings*	*Verified kWh Savings*	*Realization Rate*	*Causes of Variance in Savings*
CIP_228	24,131	26,708	111%	The evaluator used TRM deemed HOU for the lighting fixtures and the baseline fixture wattage identified in the implementer calculator.
CIP_241	62,006	9,823	16%	The evaluator used the AHRI spec sheet and TRM methodology to calculate savings for this project. It is not clear where the savings values from the implementer came from.
CIP_215	51,560	57,360	111%	Fixture wattages updated to reflect what was shown on Invoice. TRM prescribed values used along with baseline wattage values found in implementer calculator.

14.4.1.3 Realization of Traditional Projects

Using the realization rates presented in Table 14-18, the Evaluators extrapolated results from sampled sites to non-sampled sites in developing offering-level savings estimates. Table 14-20 presents results by stratum.

TABLE 14-20 REALIZATION BY STRATUM

Strat.	# Sites	*Ex ante* Gross Energy Savings (kWh)	*Ex post* Gross Energy Savings (kWh)	RR kWh	*Ex ante* Gross Demand Reductions (kW)	*Ex post* Gross Demand Reductions (kW)	RR kW
1	21	59,297	58,915.79	99%	8.29	8.19	99%
2	18	149,465	149,469.26	100%	30.35	30.35	100%
3	16	518,003	510,574.86	99%	69.10	62.56	91%
4	5	329,571	231,975.72	70%	80.39	66.24	82%
Total	**60**	**1,056,336**	**950,936**	**90%**	**188.13**	**167.35**	**89%**

14.4.1.4 Energy Efficiency Kit Realization

Savings for kits were analyzed separately from the stratified sample of traditional projects. Since the expected energy savings were reported out in the tracking data at the kit level, the verified energy savings are reported at the kit level and not at the measure level, the results are as followed.

TABLE 14-21 BUSINESS KIT REALIZATION BY COMPONENT

Measure Kit	*Ex ante* Gross Energy Savings (kWh)	*Ex post* Gross Energy Savings (kWh)	RR kWh	*Ex ante* Gross Demand Reductions (kW)	*Ex post* Gross Demand Reductions (kW)	RR kW
Office Kits	282,328	151,063	53.51%	77.12	41.17	53.39%
Retail Kits	328,213	191,506	58.35%	91.81	53.05	57.78%
Restaurant Kits	197,335	112,099	56.81%	36.78	20.80	56.56%
Totals:	**807,875**	**454,668**	**56.28%**	**206**	**115**	**55.91%**

TABLE 14-22 KIT REALIZATION BY BUSINESS TYPE AND WATER HEATING FUEL MIX

Kit Type	Count Distributed	*Ex ante* Gross Energy Savings (kWh)	*Ex post* Gross Energy Savings (kWh)	RR kWh	*Ex ante* Gross Demand Reductions (kW)	*Ex post* Gross Demand Reductions (kW)	RR kW
Office - ER	118	261,016	139,659	53.51%	73.99	39.50	53.39%
Office - gas	64	21,312	11,403	53.51%	3.14	1.67	53.39%
Retail - ER	150	283,170	165,225	58.35%	82.05	47.41	57.78%
Retail - gas	82	45,043	26,282	58.35%	9.76	5.64	57.78%
Restaurant - ER	96	145,315	82,548	56.81%	28.32	16.02	56.56%
Restaurant - gas	94	52,020	29,551	56.81%	8.46	4.79	56.56%
Totals:	**604**	**807,875**	**454,668**	**56.28%**	**205.71**	**115.0226**	**55.91%**

Verified savings differs from the expected estimates because the verified ISRs are lower than those used in the ex-ante estimations.

14.4.1.5 Online Marketplace Realization

Savings from the OLM were analyzed separately from the stratified sample of traditional projects and kits. Results are as follows.

TABLE 14-23 OLM PURCHASES SAVINGS BY MEASURE

Measure	*Ex ante* Gross Energy Savings (kWh)	*Ex post* Gross Energy Savings (kWh)	RR kWh	*Ex ante* Gross Demand Reductions (kW)	*Ex post* Gross Demand Reductions (kW)	RR kW
Advanced Power Strips	1,224	678	55.40%	0.00	0.00	N/A
Low-Flow Sink Aerators	76,046	60,856	80.03%	16.20	12.76	78.74%
Low-Flow Shower Heads	2,386	2,037	85.35%	103.68	87.71	84.59%
Screw Based LED	77,900	55,979	71.86%	13.30	9.99	75.14%
LED Fixtures	737,086	236,037	32.02%	107.93	34.50	31.97%
LED Exit Signs	820	819	99.85%	0.12	0.11	98.10%
Smart Thermostats	149,184	113,054	75.78%	0.00	0.00	N/A
Totals:	**1,044,645**	**469,459**	**44.94%**	**241.22**	**145.07**	**60.14%**

TABLE 14-24 VERIFIED SAVINGS

Project Type	*Ex ante* Gross Energy Savings (kWh)	*Ex post* Gross Energy Savings (kWh)	RR kWh	*Ex ante* Gross Demand Reductions (kW)	*Ex post* Gross Demand Reductions (kW)	RR kW
Traditional Projects	1,056,808	961,927	91.02%	188.14	181.99	96.73%
Energy Savings Kits	807,875	454,668	56.28%	205.71	115.02	55.91%
OLM	1,044,645	469,459	44.94%	241.22	145.07	60.14%
Total	**2,909,328**	**1,886,054**	**64.83%**	**635.07**	**442.09**	**69.61%**

The overall verified energy savings is 1,886,054 kWh and the peak demand reduction is 442.09 kW resulting in realization rates of 64.83% and 69.61% respectively.

14.4.1.6 Avoided Replacement Costs

The Evaluators have added the benefits of avoided replacement costs (ARC). The table below summarize the ARC by measure in Small C&I Solutions.

Information on methodology can be found in Section 3.4.1.3 Avoided Replacement Costs.

TABLE 14-25 SUMMARY OF ARC FOR SMALL C&I SOLUTIONS

Measure	*Ex post* Gross ARCs ($)	*Ex post* Net ARCs ($)	NPV ARCs ($)
Custom - LED	$12,819	$12,562	$12,562
Prescriptive - LED	$82,555	$82,555	$82,555
Prescriptive - TA Incentive	$0	$0	$0
Prescriptive - Restaurant Small Business Kit	$0	$0	$0
Prescriptive - Office Small Business Kit	$0	$0	$0
Prescriptive - Retail Small Business Kits	$0	$0	$0
Prescriptive - Smart Thermostats	$0	$0	$0
Prescriptive - Screw-Based LED	$1,570	$659	$659
Prescriptive - Lighting Controls	$0	$0	$0
Prescriptive - Refrigeration	$0	$0	$0
Prescriptive - OLM Smart Thermostats	$0	$0	$0
Prescriptive - OLM Shower Heads	$0	$0	$0
Prescriptive - OLM Advanced Power Strips	$0	$0	$0
Prescriptive - OLM Screw Based LED	$714	$607	$607
Prescriptive - OLM Aerators	$0	$0	$0
Custom - Custom	$0	$0	$0
Prescriptive - OLM Exit Sign	$0	$0	$0
Custom - Chiller	$0	$0	$0
Custom - HVAC	$0	$0	$0
Prescriptive - AC Tune Up	$0	$0	$0
Prescriptive - Duct Sealing	$0	$0	$0
Prescriptive - Ida Recovery Fund	$0	$0	$0
Prescriptive - Convection Oven	$0	$0	$0
Prescriptive - HVAC	$0	$0	$0
Prescriptive - BMS	$0	$0	$0
Prescriptive - OLM LED	$1,233	$765	$765
Total	**$98,891**	**$97,148**	**$97,148**

Sums may differ due to rounding.

14.4.2 NET IMPACT FINDINGS

Participant survey responses were used to estimate the net energy impacts for the Small C&I offering. The methodology used is described in detail below.

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 energy efficient [Measure/Equipment] at the location without the financial incentive from the Program?" Customers that answer "No" to this question are asked to confirm that they would not have allocated funds to the project without the incentive. If a customer confirms that they would not have allocated the funds if the incentives were not available, the 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 were:

- 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, rules were applied to develop binary variables indicating whether or not a participant's behavior showed free-ridership.

The first factor requires 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 (Definition 1):

- The respondent answers "yes" to the following two questions: "Did you have plans to install energy efficient [Measure/Equipment] at the location before deciding to participate in the program?" and "Would you have gone ahead with this planned project if you had not received the rebate through the program?"
- The respondent answers "definitely would have installed" to the following question: "If the rebates from the program had not been available, how likely is it that you would have installed energy efficient [Measure/Equipment] at the location anyway?"
- The respondent answers "no, program did not affect timing of purchase and installation" to the following question: "Did you purchase and install energy efficient [Measure/Equipment] earlier than you otherwise would have without the program?"
- The respondent answers "no, program did not affect level of efficiency chosen for equipment" in response to the following question: "Did you choose equipment that was more energy efficient than you would have chosen had you not participated in the program?"

The second, less restrictive criteria indicating customer plans and intentions that likely signify free-ridership are as follows (Definition 2):

- The respondent answers "yes" to the following two questions: "Did you have plans to install energy efficient [Measure/Equipment] at the location before participating in the program?" and "Would you have gone ahead with this planned installation 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 rebates from the program had not been available,

how likely is it that you would have installed energy efficient [Measure/Equipment] at the location anyway?"

- Either the respondent answers "no, program did not affect timing of purchase and installation" to the following question: "Did you purchase and install energy efficient [Measure/Equipment] 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, program did not affect level of efficiency chosen for equipment" in response to the following question: "Did you choose equipment that was more energy efficient than you would have chosen had you not participated in the program?"

The second factor requires determining if a customer reported that a recommendation from a 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 answers "very important" to the following question: "How important was previous experience with the program in making your decision to install energy efficient [Measure/Equipment] at the location?"
- The respondent answers "probably would not have" or "definitely would not have" to the following question: "If the program representative had not recommended [Measure/Equipment], how likely is it that you would have installed it anyway?"

The third factor requires determining if a participant in the program indicates 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 answers "yes" to the following question: "Before participating in the Program, had you installed any equipment or measure similar to energy efficient [Measure/Equipment] at the location?"
- The respondent answers "yes" to the following question: "Has your organization purchased any significant energy efficient equipment in the last three years at the location?" and answered "yes" to the question: "Did you install any of that equipment without applying for a financial incentive through an energy efficiency program?"

The four sets of rules described above 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 are 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 below shows these values.

TABLE 14-26 FREE-RIDERSHIP SCORES FOR COMBINATIONS OF INDICATOR VARIABLE RESPONSES

Indicator Variables				*Free-ridership Score*
Had Plans and Intentions to Install Measure without Program? (Definition 1)	*Had Plans and Intentions to Install Measure without Program? (Definition 2)*	*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	67%
Y	N/A	Y	N	67%
N	Y	N	Y	67%
N	N	N	Y	33%
N	Y	N	N	33%
N	Y	Y	N	0%
N	N	N	N	0%
N	N	Y	N	0%
N	N	Y	Y	0%

14.4.2.1 Participant Spillover Assessment

Program participants may implement additional energy saving measures without receiving a program incentive because of their participation in the program. The energy savings resulting from these additional measures constitute program participant spillover effects.

To assess participant spillover savings, survey respondents were asked whether they implemented any additional energy saving measures for which they did not receive a program incentive. Respondents that indicated that they did install additional measures were asked two questions to assess whether the savings are attributable to the program. Specifically, respondents were asked:

"How important was your experience with the <PROGRAM> in your decision to implement this Measure, using a scale of 0 to 10, where 0 is not at all important and 10 is extremely important?"

"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?"

The energy savings associated with the measure are considered attributable to the program if the average of the rating for the first question, and 10 – the rating for the second question, is greater than seven, the savings are counted as attributable to the program.

14.4.2.2 Net Savings Results

Net savings by measure can be found in Section 14.1 Summary.

14.4.3 PROCESS FINDINGS

The Evaluators conducted staff interviews and administered small business kits and small commercial solutions participant surveys. The following section summarizes the findings from interviews and surveys.

14.4.3.1 Program Management and Delivery

14.4.3.2 Staff Interviews

The following section summarizes the key findings from in-depth interviews with two Commercial and Industrial ENOs program staff and two APTIM staff. These in-depth staff interviews aimed to learn more about program design and operations and the successes and challenges experienced during 2021 (PY11). Interviews lasted approximately 60 minutes and were conducted using the Microsoft Teams platform. The evaluators recorded all interviews with permission from the participants. The following narrative summarizes the interviews that are specific to Small C&I Solutions.

Small Business Solutions had significant challenges in PY11. The challenges of the pandemic and Hurricane Ida have severely impacted ENO's Small C&I Solutions offering. In response to low participation rates, ENO staff brought external marketing and outreach teams to help promote the program. Common marketing tactics included door-door visits, bill inserts, digital and social media marketing, ENO-sponsored trade ally training, as well as television, radio, and newspaper ads. Additionally, program staff introduced a "summer bonus," which involved a 25% increase in the incentive amount for various measures. Although program staff acknowledges that they likely will not meet their goals, they maintain that it was not a lack of creativity or effort but rather due to other external factors.

Small Business Kits were utilized as a marketing and outreach tool in PY11. The small business kits include a variety of self-install measures that have an estimated 1,500 kWh in savings. Customers have the option of selecting a kit that best fits their business type: office, retail, or restaurant; Table summarizes the measures included in each kit option. Door-to-door outreach and the Small Business Energy Efficiency Kit distribution have been an enhancement to the program.

TABLE 14-27 MEASURE INCLUDED IN EACH KIT

Measure in Retail Kit	Measure in Office Kit	Measures in Restaurant Kit
2 standard LED light bulbs	2 LED light bulbs	3 LED light bulbs
2 LED exit light retrofit kits	2 LED exit light retrofit kits	2 LED exit light retrofit kits
2 directional/spot LEDs	X	X
1 low-flow bathroom aerators	2 low-flow bathroom aerators	2 low-flow bathroom aerators
X	1 low-flow kitchen aerator	2 low-flow kitchen aerators
X	1 Advanced Power Strip	X

OLM engagement is low. The online marketplace ("Energy Smart Small Business Store") experienced some challenges throughout the program year. Not only was the launch delayed, but program staff indicated they struggled to increase site traffic and engagement. Despite various outreach strategies and the availability of free measures, getting customers to visit the website remained a challenge. ENO's marketing team also promoted the site through various avenues, including bill inserts, TV interviews, and other advertisements. Program staff marketed the online marketplace through a Black Friday and Cyber Monday campaign and enhanced marketing plans for early 2022. Program staff believes the online marketplace has a lot of potential, acknowledging that this was its first full year in operation. Program staff hopes engagement will increase over time as the website becomes more ubiquitous among customers.

14.4.3.3 Online Marketplace Participant Survey Results

14.4.3.3.1 *Methodology*

The Evaluators conducted a participant survey of customers who purchased energy efficient products through the Small Business Store to gain insight into customer satisfaction. The Evaluators contacted a total of 111 customers through email to complete the online survey, of which 27 completed the survey. The precision of the survey is +/- 8.5% at the 10% level of confidence.

TABLE 14-28 EMAIL CAMPAIGN AND RESPONSE RATE

Metric	Total
Number of Customers contacted by email	111
Undeliverable emails	4
Completed	27
Incentives paid	$175
Response rate	24%

14.4.3.3.2 *Energy Efficient Products*

Customers can choose discounted or free energy efficient products through the online marketplace. Among the customers who completed the survey, the majority received a smart thermostat, followed by those who purchased LED lighting, low-flow sink aerators, or showerheads (see Table). No respondents completed the survey who had received an advanced power strip or LED exit sign.

TABLE 14-29 PRODUCTS PURCHASED THROUGH THE ONLINE MARKETPLACE

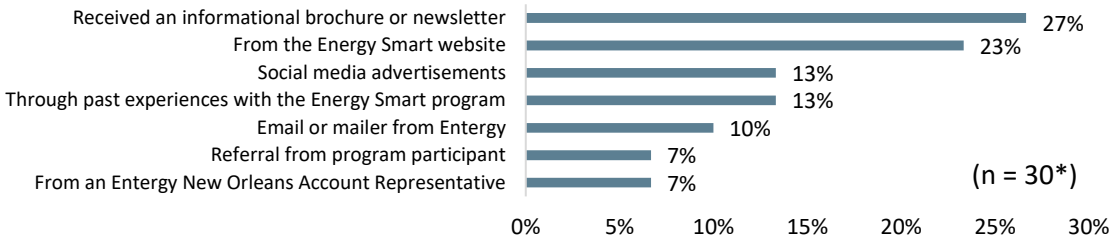
Measure	Count	Percentage of Survey Respondents (n = 27)
Smart thermostats	21	78%
LED light bulbs	6	22%
Low-flow sink aerators	3	11%
Low-flow showerheads	1	4%
Advanced power strips	0	0%
LED exit signs	0	0%

14.4.3.3.3 *Program Awareness and Influence*

Most survey respondents learned about the online marketplace through an informational brochure or newsletter (27%), followed by 23% who learned about it from the Energy Smart website (see

*The number of respondents is greater than 27 because participants had the option of choosing more than one option.

FIGURE).



*The number of respondents is greater than 27 because participants had the option of choosing more than one option.

FIGURE 14-2 HOW CUSTOMERS LEARNED OF THE ONLINE MARKETPLACE

Many survey respondents (57%) did not plan to purchase a smart thermostat before learning they could receive a free or discounted thermostat through the online marketplace. About half of customers surveyed did not have plans to purchase LED lighting, 67% did not have plans to purchase low-flow sink aerators, and none had plans to purchase low-flow showerheads. This finding suggests that the online marketplace influenced customers to receive these energy efficient products.

14.4.3.3.4 *Satisfaction with the Online Marketplace*

Generally, customers were satisfied with the Energy Smart Business Store and the energy-efficient products they received. Some respondents offered feedback on how to improve the OLM. One customer suggested offering soft white light bulbs, and another stated the bulbs they received burned out “a lot.” Additionally, one person commented that the check-out process was “glitchy” and did not allow them to process their order. Another customer was interested in a direct install option for their smart thermostat as they did not have experience with electrical wiring.

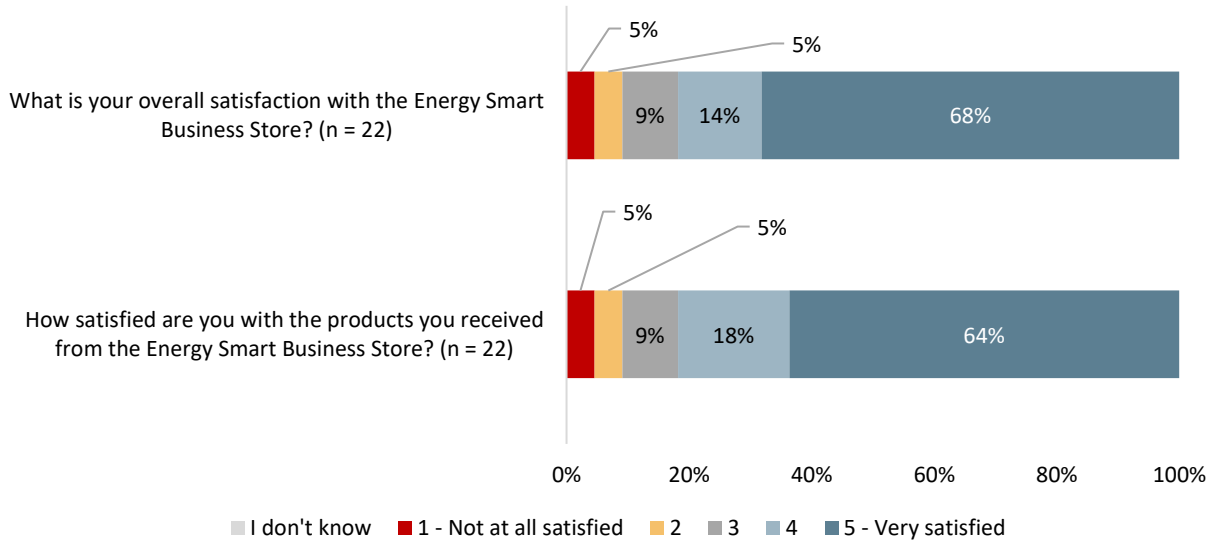


FIGURE 14-3 CUSTOMER SATISFACTION WITH THE OLM AND ENERGY EFFICIENT PRODUCTS

14.4.3.4 Participant Survey Results

14.4.3.4.1 *Methodology*

The Evaluators conducted a survey to gain insight into customer satisfaction with the small business kits, which include a combination of LED lighting, LED light exit retrofits, advanced power strip, and faucet aerators. Hundreds of program participants were initially contacted to complete the online survey. Of the total emails sent (including reminders), over a third of respondents opened the emails (34% for office kits, 36% for retail kits, and 38% for restaurant kits). The Evaluators also conducted phone surveys to follow up with the participants who had not responded to emails. A $25 incentive was offered to customers who completed the survey. Further details of the survey campaign can be found below (see Table). It should be noted that the Evaluators called customers who reported that they were unfamiliar with kits or did not recall receiving a kit at their business. The precision of the office kit survey is +/- 21.8% at the 10% level of confidence. The precision of the restaurant kit survey is +/- 18.3% at the 10% level of confidence. The precision of the retail kit survey is +/- 13.9% at the 10% level of confidence.

TABLE 14-30 EMAIL CAMPAIGN AND RESPONSE RATE

Metric	Office	Retail	Restaurant
Initially contacted	121	175	142
Undeliverable emails	31	20	32
Call attempts	55	76	64
Answered call attempts	24	42	19
Refused survey	9	8	3
Customer who did not recall receiving a kit	10	17	7
Percentage who did not recall	42%	40%	32%
Total incentives paid	$75	$50	$125
Completed the survey	5	12	7

14.4.3.4.2 *Experience with Small Business Kits*

Of the three respondents who recalled receiving the office kit, only one had participated in other Energy Smart offerings back in 2020 before receiving the kits. No respondent participated in other Energy Smart offerings after receiving the kits.

Of the eleven respondents who recalled receiving the retail kit, three had participated in other Energy Smart offerings back in 2019 before receiving the kits, and two did not remember when. One respondent stated they also participated in the Online Marketplace program after participating in the Small C&I Solutions.

Of the four respondents who recalled receiving the restaurant kit, 50% participated in other Energy Smart offerings in 2020 or 2019 before receiving the kits. After participating in the Small C&I Solutions, one person also stated they participated in the smart thermostats program.

Small business kit participants varied in response to the measures they installed at their facilities. The following section summarizes measure installation by type of small business.

14.4.3.4.3 *Office Kits*

Office kit participants had yet to install most of the items in the kits (see Figure). The top items currently installed were the two LED lightbulbs (67%). Respondents who installed the advanced power strip have nothing plugged into the primary outlet. Only one person of the three who installed the measures indicated the installation guide was helpful (33%), while the other two were unsure (67%).

Respondents who installed the LED retrofit, bathroom aerator, and advanced power strip were not using the measures before receiving them in the kit. Only the person who installed the kitchen aerator had used a low-flow kitchen aerator before receiving one in the kit.

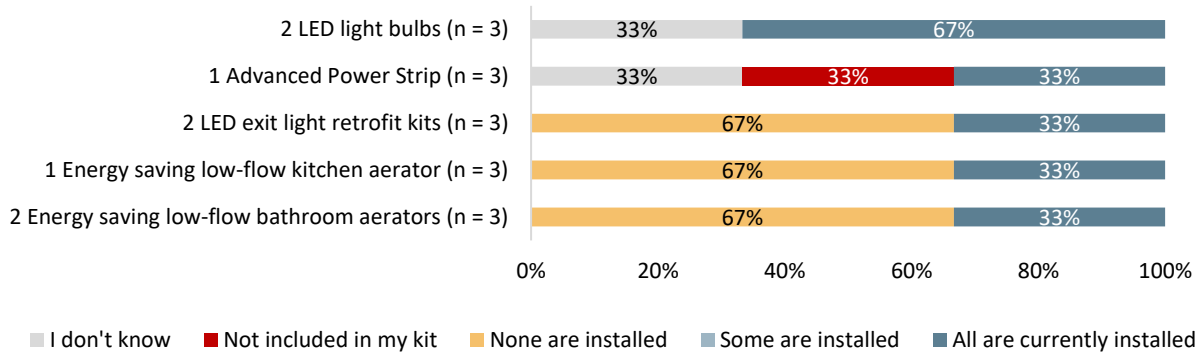


FIGURE 14-4 INSTALLATION BY SMALL BUSINESS- OFFICES

The respondents who explained why they had not installed the items gave various reasons. For example, one person who did not install the kitchen aerator stated they did not have a kitchen, and one person who did not install the LED exit light retrofit stated they could not use the measure in their building (see Table).

TABLE 14-31 REASONS FOR NOT INSTALLING ITEMS – OFFICES

Responses	Low-flow bathroom aerators (n = 3)	Low-flow kitchen aerator (n = 2)	LED exit light retrofits (n = 2)
Do not like the device(s)	0%	0%	0%
I have not had time to install it	0%	0%	0%
Need help / don't know how to install it	0%	0%	50%
I gave it to someone else	33%	0%	0%
It doesn't fit/doesn't have a place to install it	66%	50%	0%
Other	0%	50%	50%

14.4.3.4.4 *Retail Kits*

Most of the retail kit recipients stated they installed at least one of the measures. Sixty-three percent of respondents installed LED light bulbs, 36% installed directional/spot LEDs, 27% installed the LED exit light retrofit, and 18% installed low flow bathroom aerator.

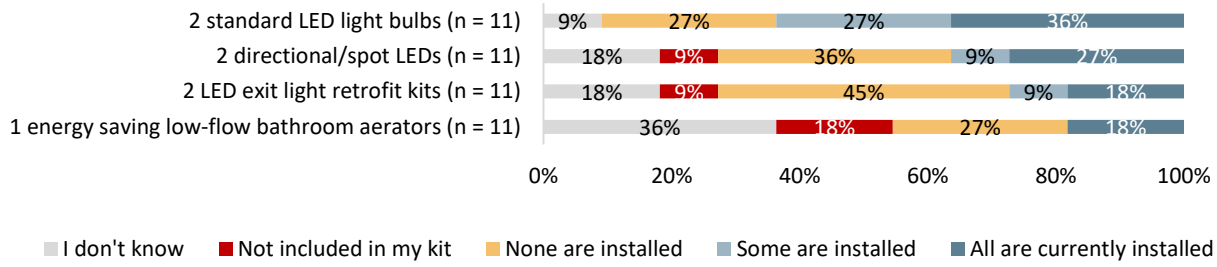


FIGURE 14-5 INSTALLATION BY SMALL BUSINESS- RETAIL STORES

Of the three people who installed LED bulbs, all indicated they installed one of the three bulbs they received in the kit. One person who installed the directional LED was unsure how many had been installed. Of the six people who installed the LED retrofit lighting, one person installed the two LED retrofit lights from the kit, while five were unsure how many had been installed. Two respondents stated they installed the low-flow bathroom aerator. Finally, 36% of the respondents stated they found the installation guide helpful, compared to 64% who were unsure.

Some of the survey participants who received the kits stated they were using low-flow bathroom aerators (n = 1) or LED retrofit lighting (n = 2) before getting the kits.

The table below summarizes the main reasons participants gave for not installing the measures. Many respondents who stated "other" could not recall why they had not installed the measures(s).

TABLE 14-32 REASONS FOR NOT INSTALLING ITEMS- RETAIL

Responses	LED light bulbs (n = 6)	LED exit light retrofits (n = 6)	Directional / Spot LEDs Lighting (n = 5)
Do not like the light or appearance of the bulbs	17%	0%	0%
I have not had time to install it	0%	17%	20%
Need help	17%	0%	0%
Waiting for bulbs to burn out	17%	33%	0%
I don't have a place to install it	17%	0%	20%
Other	33%	50%	60%

14.4.3.4.5 *Restaurant Kits*

Customers who received the restaurant kit also varied in the measures they installed in their restaurants. For example, four respondents installed the LED light bulbs, a quarter of respondents installed LED retrofit, 50% installed kitchen aerator(s), and 50% installed bathroom aerator(s).

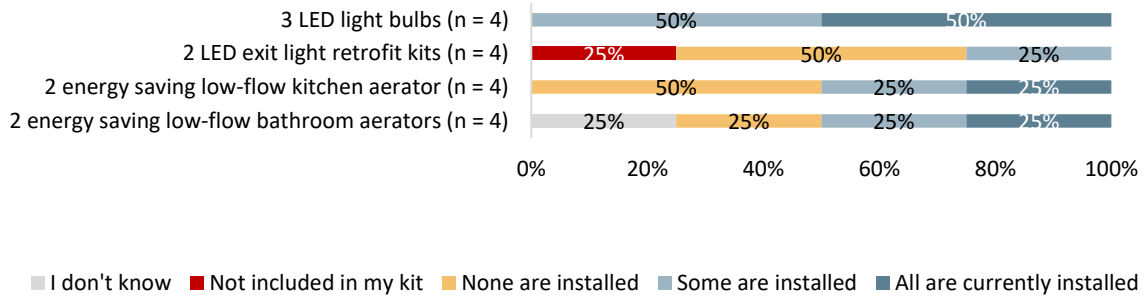


FIGURE 14-6 INSTALLATION BY SMALL BUSINESS- RESTAURANTS

Of the two people who installed LED bulbs, one installed two of the three bulbs, and the other customer installed one. The people who installed either the bathroom or faucet aerator installed one of the two offered in the kits. Finally, one person who installed the LED retrofit lights stated they installed both measures received in the kits. Fifty percent of the respondents stated they found the installation guide helpful, compared to 25% who did not, and another 25% who were unsure.

Some survey participants who received the kits stated they were not using low-flow faucet aerators (n = 2) or LED retrofit lighting (n = 1) before getting the kits. Additionally, they stated they had never heard of these energy efficiency measures. One respondent had heard of low-flow bathroom faucet aerators.

The table summarizes the main reasons participants gave for not installing the measures. Many respondents stated they had not set aside time to install the measure(s).

TABLE 14-33 REASONS FOR NOT INSTALLING ITEMS – RESTAURANT

Responses	LED light bulbs (n = 2)	LED exit light retrofits (n = 3)	Energy saving low-flow bathroom aerators (n = 2)
I do not like the measure	50%	33%	0%
I have not had time to install it	50%	33%	100%
Need help / don't know how to install it	NA	0	0%
I gave it to someone else	0%	0	0%
I don't have a place to install it	NA	33%	0%

14.4.3.4.6 *Future Participation*

At the time of the survey, some respondents indicated they would like to be contacted about future energy efficiency opportunities by the Energy Smart offers.

TABLE 14-34 INTEREST IN FUTURE ENERGY EFFICIENCY OPPORTUNITIES

Response	Percentage of respondents with Offices (n = 5)	Percentage of respondents with retail stores (n = 12)	Percentage of respondents with restaurants (n = 7)
Yes	40%	42%	57%
No	60%	58%	43%

14.4.3.4.7 *Firmographics*

Most small businesses use electricity as their primary heating source or facility.

TABLE 14-35 PRIMARY FUEL TYPE FOR HEATING BUILDING

Response	Percentage of respondents with Offices (n = 5)	Percentage of respondents with retail stores (n = 12)	Percentage of respondents with restaurants (n = 7)
Electric	80%	83%	43%
Gas	20%	17%	43%
I don't know	0%	0%	14%

Although many of the respondents only have one location for their business, some respondents did indicate they had several locations (see Table).

TABLE 14-36 NUMBER OF BUSINESS LOCATIONS BY BUSINESS TYPE

Response	Office kit participants (n = 5)	Retail kit participants (n = 10)	Restaurant kit participants (n = 6)
The average number of locations	5	1	9
The minimum number of locations indicated	1	1	1
The maximum number of locations indicated	11	2	35

14.4.3.5 Small Commercial Solutions Participant Feedback

The Evaluators conducted a participant survey to gain insight into customer satisfaction regarding the Small Commercial Solutions program. Fifty-nine program participants were contacted to complete the online survey through an email and additional phone calls were made to 20 customers. A $25 incentive was offered to customers who completed the survey. A total of seven participants completed the survey. The precision of the survey is +/-17.7% at the 10% level of confidence.

TABLE 14-37 EMAIL CAMPAIGN AND RESPONSE RATE

Metric	Total
Number of customers contacted by email	59
Undeliverable emails	4
Number of customers contacted by phone	20
Completed	7
Incentives paid	$200
Response rate	12%

Among the survey respondents, three were the owners, three were managers, and one was the president/CEO. A total of 71% (n = 5) reported not completing any other significant energy efficiency projects in the last three years besides the one completed through the program, and 86% (n=6) did not have plans to install the equipment prior to deciding to participate.

TABLE 14-38 ROLE/POSITION WITH COMPANY

Response	Percent of Respondents (n=7)
Proprietor/Owner	43%
Manager	43%
President/CEO	14%

More than half of the customers surveyed indicated they had specific policies requiring that energy efficiency should be considered when purchasing equipment, a person responsible for monitoring energy usage, defined energy savings goals, or carbon reducing goals.

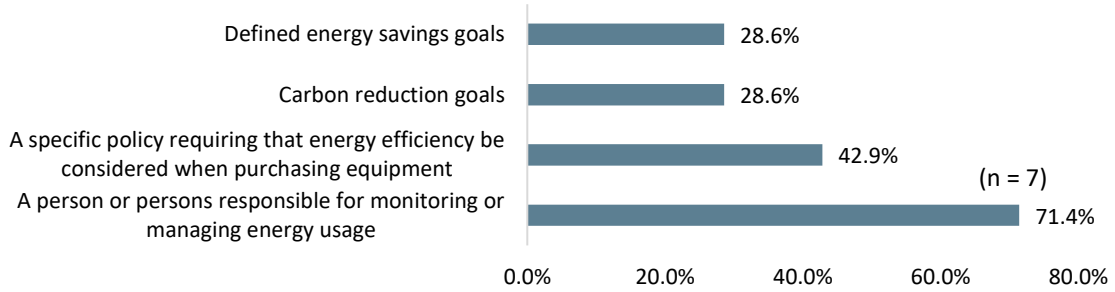


FIGURE 14-7 NUMBER OF COMPANIES WITH ENERGY EFFICIENCY POLICIES

14.4.3.5.1 *How Customers Learned of the Program*

Two respondents learned about the program through an informational brochure. Other respondents learned about it through social media, email blast, friends or colleagues, another program representative, from ENO customer service representative.

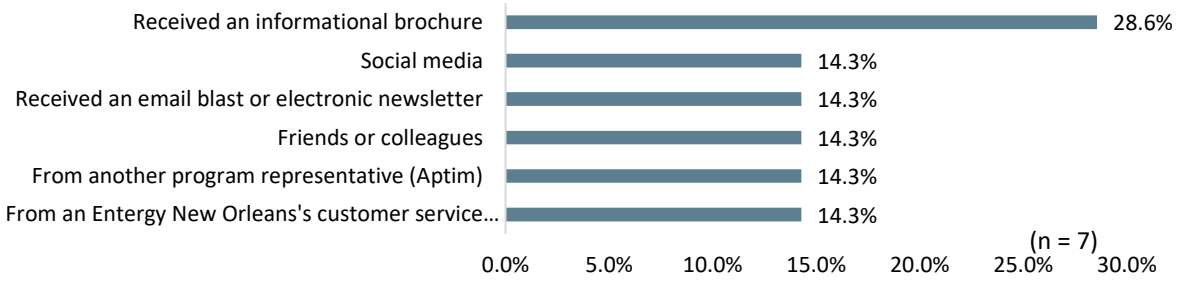


FIGURE 14-8 SOURCE OF PROGRAM AWARENESS

14.4.3.5.2 *Technical Services and Trade Allies*

Two of the surveyed participants indicated they received application assistance; one respondent received a facility assessment and one received calculation assistance. All three respondents who received technical assistance via a facility assessment or calculation assistance were recommended a commercial project upgrade. One respondent indicated they would not have made the upgrades had they not been recommended, while two respondents indicated they were somewhat likely to have made the upgrade despite the recommendation.

Three small business customers reported working with a trade ally through the entire project (e.g., design through installation). Two respondents reported that a trade ally who they had worked with before installed the equipment for their project.

TABLE 14-39 WHO INSTALLED THE QUALIFYING EQUIPMENT

Response	Percentage of Respondents (n = 7)
A trade ally registered with the Energy Smart program	43%
A trade ally who we have worked with before	29%
My own staff	14%
A new trade ally that someone else recommended	14%

Three participants stated it was an easy decision when their trade ally first approached them about participating in the Small Commercial Solutions offering, while three others had concerns regarding upfront coasts. Most surveyed participants agreed that the trade ally they worked with could answer most questions, made recommendations that made sense for their business, and was professional. Four respondents indicated they would recommend the trade ally to others.

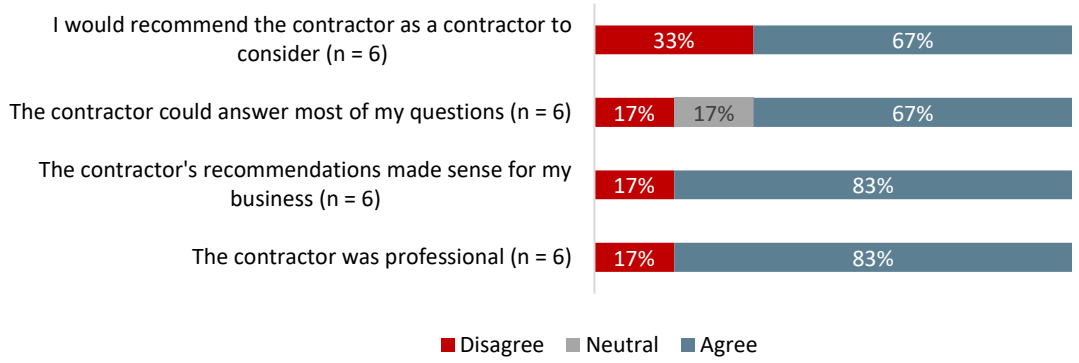


FIGURE 14-9 PARTICIPANT FEEDBACK ON TRADE ALLIES

All seven respondents reported they or someone from their company filled out the application to receive incentives; three also received assistance from a trade ally and one also received assistance from an APTIM representative.

All the surveyed Small C&I Solutions participants agreed that the overall application process was smooth. Additionally, four survey respondents agreed that the information on how to complete the application was clear and providing the required invoices or other supporting documentation was effortless. Three respondents thought the time it took to approve the application was acceptable and two thought that finding forms on the website was easy and that using the electronic application worksheets was easy. Respondents who did not think the time it took to approve the application was acceptable (n=3) nor easy recommended processing incentives faster.

Three respondents indicated the project cost about what they expected, and three others reported it cost more than what they had expected.

TABLE 14-40 PROJECT COST EXPECTATIONS

Response	*% of Respondents (n = 7)*
It was much less	0%
It was somewhat less	0%
It was what was expected	42%
It was somewhat more	0
It was much more	42%
Don't know	14%

14.4.3.5.3 *Motivations for Participating*

Reducing energy costs was the main motivation for participating in the program. All participants stated that they participated in the program to reduce their energy cost and four participants said to reduce energy use and power outages. Four respondents said they participated to replace old or outdated equipment and get a rebate from the program, others reported motivations included to improve equipment quality or performance, to reduce maintenance costs, to improve health and safety or indoor air quality, and to protect the environment.

TABLE 14-41 REASONS FOR COMPLETING THE PROJECT

Response	% of Respondents (n = 7)
To reduce energy costs	100%
To replace old or outdated equipment	57%
To get a rebate from the program	57%
To reduce energy use/power outages	57%
To reduce maintenance costs on downtime and associated expenses for the old equipment	29%
To improve equipment performance	29%
To improve the product quality	29%
To protect the environment	14%

**Responses add to greater than 100% because respondents could select multiple responses.*

14.4.3.5.4 *Participant Satisfaction*

Four survey respondents were very satisfied with the program; the remaining three participants did not respond to this question**.** Three respondents noted being very satisfied with the program staff that assisted them, their trade ally, the energy efficiency improvements, and the amount of time it took to complete the project. No respondents were dissatisfied with any of the components of the program they were questioned on.

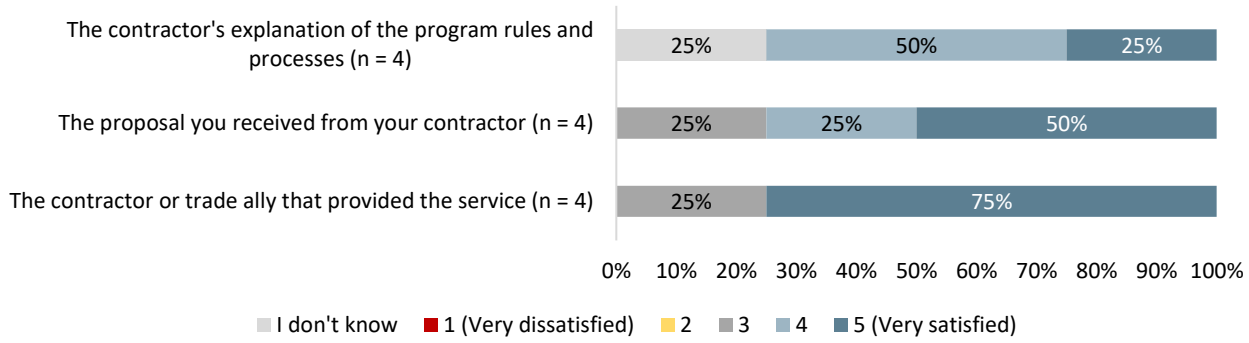


FIGURE 14-10 PARTICIPANT SATISFACTION WITH THE TRADE ALLIES AND TECHNICAL ASSISTANCE

Three of the four respondents were satisfied with the range of equipment that qualified for the offering and the equipment that was installed; all four respondents were satisfied with the energy efficiency improvements they made at their facility. Additionally, small business customers who participated in the program were satisfied with the amount of time it took to complete the project, the time between the audit and installation, and the steps to complete the project.

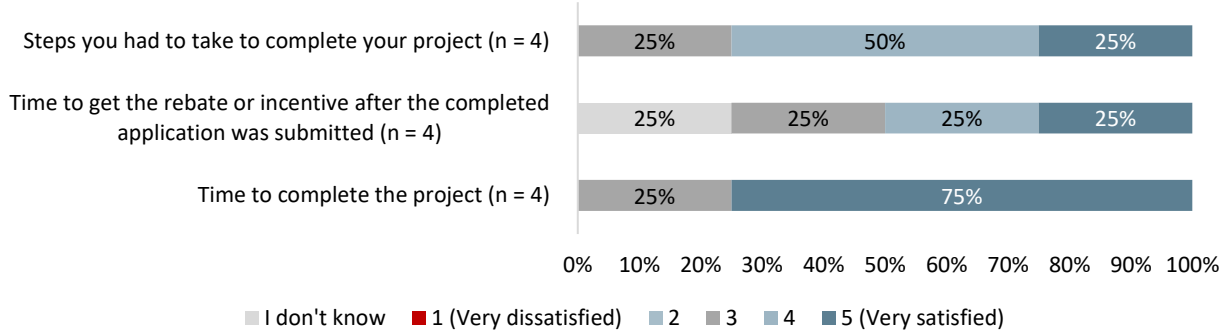


FIGURE 14-11 PARTICIPANT SATISFACTION WITH THE ASPECTS OF THE PROJECT

Almost all respondents were satisfied with ENO as their electric service provider. Two respondents indicated they were very satisfied with ENO as their electric service provider.

TABLE 14-42 SATISFACTION WITH ENOS

Response	Percentage of Respondents (n =7)
5 (Very satisfied)	29%
4	57%
3	14%
2	0%
1 (Very dissatisfied)	0%

Participants are likely to recommend the program to others. All respondents agreed that they would recommend the program to others. Additionally, six of the respondents (86%) agreed that they intend to initiate another energy efficiency improvement in the next 12 months.

14.4.3.5.5 *Firmographics*

About half of respondents (57%, n=4) stated that they own and occupy the property; three reported that they rent. All the respondents are billed directly by ENO. Two businesses were restaurants, one was religious, one was lodging, and one was commercial.

14.4.3.6 Program Literature Review

The evaluators conducted a literature review of small business energy efficiency programs. The purpose of this review was to gather insight and information on other small business programs to assess how program compared in terms of available measures, program design, and incentives. The review focused on program design, common challenges, and best practices. The review included a scan of information provided on utility's websites, as well as evaluation reports and conference proceedings.

14.4.3.6.1 *Method*

The following section describes the different aspects of the small business energy efficiency programs highlighted in this review. The Evaluators identified critical aspects of program design, delivery, end-use offerings, incentive levels, and marketing approaches used by the program staff. Below are some of the questions the evaluators asked when researching small business energy efficiency programs:

- **Program Design** – What are the programs' objectives led by utilities?
- **Program Delivery** – Who implements the program (i.e., consultant-led, trade ally driven, etc.)?
- **End-Use Offerings** – What measures are offered (prescriptive or custom) led by peer utilities?
- **Incentive Levels** – What is the range of incentives the peer utilities offer?
- **Marketing Approaches** – How do utilities approach their government or school customers

The following tables summarize the programs included in this review that run small business energy efficiency programs based on the best practices.

TABLE 14-43 SMALL BUSINESS PROGRAM BENCHMARK REVIEW

Best Practice	Program	Sponsor	Measures offered	Incentive levels
Streamline engagement	Small Business Direct Install (SBDI)[28]	NYSEG, NY	Lighting (LEDs, lamps, exit signs, dimmers/sensors), Refrigeration ECM, thermostats, showerheads, aerators, spray nozzles	Up to 60% of cost of recommended equipment[29]
Streamline engagement	Small Business Pathway[30]	AEP SWEPCO, AR	Lighting (LED, lamps, sensors, exit signs), refrigeration (door gaskets, strip curtains, anti-sweat heater controls, evaporator fan controls), ACTU	Up to $0.16/kWh saved Up to 90% of the project cost No cost upgrades for faucet aerators, door sweeps, weatherstripping ACTU: dependent on A/C size[31] $150 (5 tons and less) $180 (6 - 10 tons) $270 (10 - 15 tons) $400 (15 - 25 tons)
Streamline Engagement	Small Business Direct Install[32]	AEP SWEPCO, AR	Lighting (tube lights, bulbs, fixtures, exit signs, sensors, controls), refrigeration (anti-sweat heater controls), HVAC	$650 per peak kW reduced up to 90% of project cost (paid to trade ally)
Streamline Engagement	Small Business Kits[33]	ComEd	LED bulbs, Faucet aerators, Pre-rinse spray valves, Advanced power strips	Free
Provide energy usage data	Energy Tracker and Energy Expert[34]	PGE	Not applicable	Not applicable

[28] Na'im, A., Dolengo, J., Nevius, M., Barclay, D., & Rosenberg, N. (2017). *A tale of two channels: Assessing the effectiveness of a small business direct Install Program*. 2017 International Energy Program Evaluation Conference Baltimore. https://www.iepec.org/wp-content/uploads/2018/04/2017paper_naim_dolengo_nevius_barclay_rosenberg.pdf

[29] AVANGRID. (2022). *Small Business Direct Install*. https://www.nyseg.com/wps/portal/nyseg/saveenergy/businesssolutions/smallbusinessdirectinstall

[30] American Electric Power. (2020). *Small Business Pathway*. SWEPCO. https://swepcosavings.com/downloads/1219-SWEPAR-SB-1762344-2020-PowerToLower-Trifold_clean.pdf

[31] American Electric Power. (2022). *Commercial CoolSaver tune-up*. SWEPCO. http://www.swepcogridsmart.com/beta/arkansas/commercial-coolsaver.php

[32] American Electric Power. (2022). *Small Business Direct Install.* SWEPCO. http://swepcogridsmart.com/texas/small-business-direct-install.html

[33] Guidehouse. (2020). *ComEd small business kits impact evaluation report*. EcoMetric Consulting. https://ilsag.s3.amazonaws.com/ComEd-Small-Business-Kits-Program-CY2019-Impact-Evaluation-Report-2020-04-16-Final.pdf

[34] PGE. (n.d.). *Energy tracker use*. PGE. https://portlandgeneral.com/save-money/save-money-business/energy-tracker-business

Best Practice	Program	Sponsor	Measures offered	Incentive levels
Diversify measures	Business Energy Pro pilot[35]	NYSERG ConEd	Rebates based on kWh saved	Not available
Diversify measures	Virtual Energy Coaching Service[36]	Consumers Energy	Personalized coaching that connects businesses to best programs	Not applicable
Build partnerships	Small Business Solutions Program[37]	Entergy, MS	Recruit local trade allies (in 2019 90% of small business trade allies were locally owned businesses)	Not applicable
Financing opportunities	GoGreen Business Energy Financing Program[38]	CA Dept of Treasury: Available to IOU customers	Not applicable	Provides finance companies access to a loss reserve fund that covers up to 90% of losses on outstanding principal if small business borrowing customer defaults
Financing opportunities	Time of Use pricing[39]	PGE	Not applicable	Rates based on on/off peak pricing On Peak: $0.1488/kWh Mid Peak: $0.10312/kWh Off Peak: $0.07932/kWh

35 Holbrook, E. (2019, October 7). *New York pay-for-performance program offers energy savings packages for select businesses*. Environment + Energy Leader. https://www.environmentalleader.com/2019/08/new-york-pay-for-performance-program-offers-energy-savings-packages-for-select-businesses/

36 Franklin Energy. (2020, May 18). *Franklin Energy and consumers energy support small businesses during COVID-19 pandemic with virtual energy coaching.* https://www.franklinenergy.com/press-releases/support-small-businesses-during-covid-19

37 Zin, J. (2020, March 2). The Small Business Program with the One-Two Punch. ICF https://www.icf.com/insights/energy/small-business-energy-efficiency

38 California State Treasurer's Office. (2022). *GoGreen business energy financing*. CAEATFA. https://www.treasurer.ca.gov/caeatfa/cheef/sblp/index.asp

39 PGE. (n.d.). *Time of Use Pricing*. PGE. https://portlandgeneral.com/about/info/pricing-plans/time-of-use/time-of-use-pricing-business

14.4.3.6.2 *Program Design*

Utility companies' commercial and industrial energy efficiency portfolios often include small business offerings. Small businesses include retail stores, groceries, small offices, and other non-residential customers; to qualify for most small business programs, customers must have a peak electric load at or below 100 kW. According to a 2021 report from the U.S. Small Business Administration, small businesses make up 99.9% of all US businesses, with about 32.5 million small business across the country.[40] Moreover, a national poll found that energy costs are one of the top three expenses for more than one third of all small businesses.[41]

Due to their prevalence across the country, small businesses are targeted for their energy saving opportunities and potential. Typically, lighting and lighting control measures, such as LED lights, dimmers, and timers, are the most popular measures offered by electricity utilities, as these measures are cost effective and generate significant kWh and kW reductions. Small business programs may also offer incentives for other measures such as refrigeration, faucet aerators, smart thermostats, and other heating/cooling equipment. In general, small business programs fall into two main categories: prescriptive and custom. Prescriptive programs utilize a set of predetermined incentives for a variety of measures, while custom programs use incentives that are based off energy savings and project scope.[42] In general, prescriptive programs are more popular for small businesses as small businesses typically do not require the flexibility of custom projects.

Although small business targeted programs can result in appreciable energy savings for a utility and customers alike, a range of challenges exist that makes these programs difficult to operate. In general, the two most common challenges cited by utilities and small businesses are program awareness and financial barriers.[43,44,45,46] Frequently, small businesses are not aware of the programs offered by utility companies and/or they distrust the utility company. These problems are especially salient in rural and

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40 SBA Office of Advocacy. (2021). *United States 2021*. 2021 Small Business Profile. https://cdn.advocacy.sba.gov/wp-content/uploads/2021/08/30143721/Small-Business-Economic-Profile-TN.pdf

41 NFIB. (n.d.). Energy. https://www.nfib.com/advocacy/energy/

42 Focus on Energy. (2019). What is the difference between prescriptive and custom. Focus on Energy. https://support.focusonenergy.com/hc/en-us/articles/360030977672-What-Is-The-Difference-Between-Prescriptive-And-Custom-Incentives

43 SBA Office of Advocacy. (2021). *United States 2021*. 2021 Small Business Profile. https://cdn.advocacy.sba.gov/wp-content/uploads/2021/08/30143721/Small-Business-Economic-Profile-TN.pdf

44 NFIB. (n.d.). Energy. https://www.nfib.com/advocacy/energy/

45 Nowak, S. (2016). Big opportunities for small business: Successful practices of utility small commercial energy efficiency programs. https://www.aceee.org/sites/default/files/publications/researchreports/u1607.pdf

46 Clean Energy Resource Teams. (n.d.). Energy coaching for small businesses. CERTs. https://www.cleanenergyresourceteams.org/energy-coaching

other underserved communities.[47,48] Small business programs often focus on ways to better market their programs and target their desired audience. Moreover, even when small businesses are aware of and interested in the energy efficiency offerings of their utility company, they often lack the up-front capital necessary to invest in energy efficient products. Finding ways to overcome these upfront costs is beneficial to both the small businesses and utility companies as energy efficient programs not only save businesses money long-term but also greatly reduce energy use. For example, a report by the Department of Energy's Pacific Northwest National Laboratory and the National Renewable Energy Laboratory demonstrated that a 10% reduction in energy costs can improve small grocery stores profit margin by 16%.[49]

14.4.3.6.3 *Best Practices*

A variety of best practices exist to address the challenges utilities face when implementing small business energy efficiency programs. The following section outlines some key best practices as well as provides examples of existing programs in the table above. The programs listed have been recognized by the American Council for an Energy Efficient Economy (ACEEE)[50] and other organizations for their innovative strategies and techniques.

14.4.3.6.4 *Streamline Engagement*

Streamlining enrollment and specializing program offerings to meet client needs can help increase participation. The easier and more convenient it is for businesses to enroll in a program, the more likely they are to participate. One easy way to streamline enrollment is by having an established network of trade allies that customers are immediately connected with once they enroll or a direct install program in which the trade ally who performs the energy assessment also performs the recommended installations. In one study of a New York based Small Business Direct Install program, evaluators found that a small business direct install program resulted in minimal free-ridership (11%).[51]

Another way to streamline engagement is through small business kits. Typically, small business kit programs are opt-in; customers sign up to receive a kit and then self-install the applicable measures. Although the contents of small business kits can vary, they often include some combination of LED bulbs, faucet aerators, pre-rinse spray valves, and power strips. Evaluations of small business kit

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[47] Nowak, S. (2016). Big opportunities for small business: Successful practices of utility small commercial energy efficiency programs. https://www.aceee.org/sites/default/files/publications/researchreports/u1607.pdf

[48] Clean Energy Resource Teams. (n.d.). Energy coaching for small businesses. CERTs. https://www.cleanenergyresourceteams.org/energy-coaching

[49] U.S. Department of Energy. (2013, July 17). Energy department invests to save small buildings money by saving energy. Energy.gov. https://www.energy.gov/articles/energy-department-invests-save-small-buildings-money-saving-energy

[50] Nowak, S. (2016). Big opportunities for small business: Successful practices of utility small commercial energy efficiency programs. https://www.aceee.org/sites/default/files/publications/researchreports/u1607.pdf

[51] McClaren, M (2020, October 2). *Small Business Direct Install Program Process & Net-to-Gross Evaluation Draft Report*. Energy & Resource Solutions.

programs have demonstrated appreciable energy savings including 6,210,289 kWh across 65,808 distributed measures in Illinois.[52]

14.4.3.6.5 *Provide Energy Usage Data*

As mentioned earlier some small businesses are not aware of small business program offerings of their utility companies. Moreover, they often do not realize how much energy they are using and how easy it can be to save. One solution to this problem is through energy tracking smart meter programs. Smart meter programs provide customers automated detailed reports on their usage, often on demand via an online portal or app. It tells customers when and how they are using energy, providing month-to-month bill comparisons, as well as usage charts to help customers pinpoint high use times. Some companies even provide additional "energy expert" programs which provide detailed reports using meter data captured every 15 minutes to help customers track their usage more precisely.

14.4.3.6.6 *Diversify and Specialize Measures*

Additionally, utilities should segment the market, categorizing small businesses based on energy needs and offer customized approaches, measures, and communication strategies to fit their needs. Although lighting upgrades are an effective and easy way to reduce energy usage, programs need to incentivize more non-lighting measures. Other measure examples include smart thermostats, refrigeration, insulation, heat pumps, building automation, kitchen equipment, and HVAC equipment. Since these measures are more expensive and sometimes require additional engineering, it is critical to evaluate how to best provide rebates, incentives, or upstream discounts to entice more small businesses to implement more costly projects.

Pay-for-performance programs are great ways to diversify and specialize measures to meet customers' needs. Pay-for-performance programs involve a custom savings estimate for projects based on customer specific data and usage, which results in rebates based on kWh saved. Thus, unlike standard programs in which measure rebates are based on average usage across the customer base, pay-for-performance allows customers to focus on the measures that are most beneficial to them and their business. Frequently, pay-for-performance programs target large commercial customers as they often have higher energy saving potential than small business customers. However, some utilities have started piloting these programs among smaller businesses as well.[53]

Energy coaching programs are another novel way to provide customers specialized energy efficiency assistance. Typically, energy coaching programs involve an audit in which energy coaches analyze businesses average energy use, provides personalized recommendations for improvement, a detailed

[52] Guidehouse. (2020). *ComEd small business kits impact evaluation report*. EcoMetric Consulting. https://ilsag.s3.amazonaws.com/ComEd-Small-Business-Kits-Program-CY2019-Impact-Evaluation-Report-2020-04-16-Final.pdf

[53] Nowak, S. (2016). Big opportunities for small business: Successful practices of utility small commercial energy efficiency programs. https://www.aceee.org/sites/default/files/publications/researchreports/u1607.pdf

report with action items, and multiple follow-up consultations with you coach to check in your progress.[54]

14.4.3.6.7 *Build Partnerships*

Building partnerships is another way to increase awareness and engagement. Utility companies can build partnerships by working with local leaders, chambers of commerce, and small business advocacy organizations to gain trust within the community and establish program legitimacy. Community members are more likely to engage in energy efficiency programs if those programs are supported by their local and familiar neighborhood trade allies. [55] It is especially important to focus on promoting diverse trade allies and trade allies -- such as minority owned, LGBTQ+ owned, veteran owned, and woman owned small business – to help increase engagement across customers.[56] Communities of color often face higher energy burdens and increased barriers to access.[57]

Additionally, employing more account representative and project process managers in the field increases program visibility and provides additional technical support for small businesses who sometimes struggle with installs and maintenance. Having utility staff in the field, available to help customers through every step of the process, makes programs part of the community and more accessible.

Moreover, legislation like the Main Street Efficiency Act of 2021 can also increase partnerships between utility companies and communities. Aimed at making energy efficient enhancements more affordable and accessible to small businesses nationwide, if enacted, the Main Street Efficiency Act of 2021 would provide grants via the Department of Energy for demand side management programs.[58] Not only would these grants offer small businesses free or low-rate energy efficient equipment, but they would also help reduce the country's energy consumption, create jobs, and improve economic productivity. Although the national bill is not yet passed, state and local governments can create similar models to assist businesses in their jurisdiction.

14.4.3.6.8 *Financing Opportunities*

Almost all articles and reports on energy efficiency programs as it pertains to small businesses underscore the financial barriers small business face when deciding whether or not to upgrade to mor efficient equipment. Although most utilities offer various incentives and rebates for participation, for many small businesses these incentives and rebates do not go far enough to offset the cost of the

[54] Clean Energy Resource Teams. (n.d.). Energy coaching for small businesses. CERTs. https://www.cleanenergyresourceteams.org/energy-coaching

[55] Nowak, S. (2016). Big opportunities for small business: Successful practices of utility small commercial energy efficiency programs. https://www.aceee.org/sites/default/files/publications/researchreports/u1607.pdf

[56] Weston, C. (2021, August 25). Why does diversity, equity, and inclusion matter when it comes to energy efficiency? Efficiency Vermont. https://www.efficiencyvermont.com/blog/our-insights/why-does-diversity-equity-and-inclusion-matter-when-it-comes-to-energy-efficiency

[57] ACEEE. (2022). *Energy burden report*. ACEEE. https://www.aceee.org/energy-burden

[58] Alliance to Save Energy (n.d.) *Main Street Efficiency Act* https://www.ase.org/category/covid-19-response/main-street-efficiency-act

upgrade. If small business program budgets allow, experts recommend incentives cover 70-90% of project costs, making upgrades even more affordable and likely to be adopted.[59]

One effective technique to mitigating the upfront financial burden of energy efficient upgrades is through financing programs. A study of 17 utility sponsored financing programs across nine states found a relationship between high performing energy efficiency programs and bill financing opportunities; the relationship was particularly strong with zero-interest rate loans.[60] In addition to offering rebates that covered 50-80% of the cost of measures, these programs also provided financing opportunities so customers could slowly pay for the upgrades over time, eliminating high up-front out of pocket costs. In one pilot of this type of financing program in 2014, Pepco provided $1.46 million over 453 loans. [61] Another effective financing model is to provide fixed rate utility bills and time-of-use plans. Fixed rate bills allow businesses to better budget and do not result in additional bills during peak usage times, while time-of-use plans provide discounted rates for small businesses who are most active during off-peak times.

14.4.3.7 Hurricane Ida and COVID-19 Pandemic Impacts

14.4.3.7.1 *Pandemic Impact on Businesses who Received Small Business Kits*

Survey respondents shared how the coronavirus pandemic affected their small businesses. To some degree, almost all respondents were impacted by the pandemic.

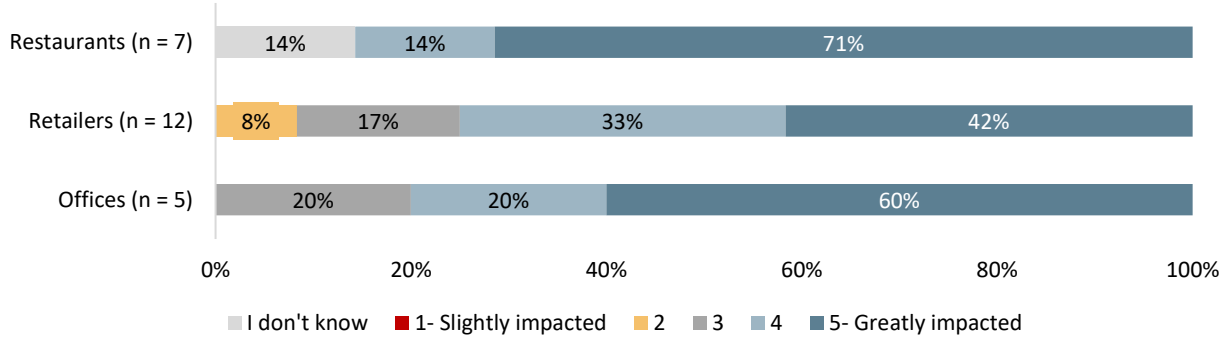

FIGURE 14-12 EXTENT OF IMPACT FROM THE PANDEMIC

Issues like labor shortages and supply chain issues affected all the survey respondents. Figure The figure below summarizes all the most common factors that have presented a challenge for the respondents.

[59] Zin, J. (2020, March 2). The Small Business Program with the One-Two Punch. ICF https://www.icf.com/insights/energy/small-business-energy-efficiency

[60] Nowak, S. (2016). Big opportunities for small business: Successful practices of utility small commercial energy efficiency programs. https://www.aceee.org/sites/default/files/publications/researchreports/u1607.pdf

[61] Nowak, S. (2016). Big opportunities for small business: Successful practices of utility small commercial energy efficiency programs. https://www.aceee.org/sites/default/files/publications/researchreports/u1607.pdf

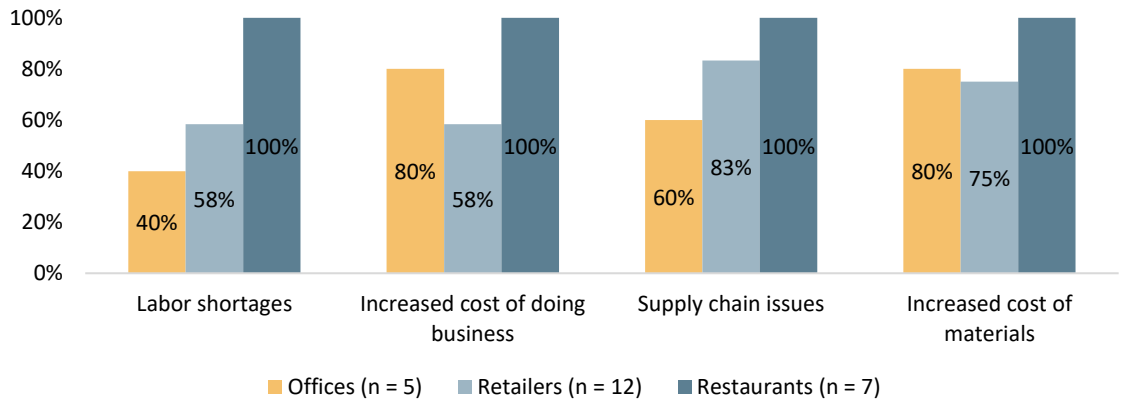

FIGURE 14-13 DIFFERENT BUSINESS AND ECONOMIC FACTORS IMPACTED BY THE PANDEMIC

Furthermore, participants shared in more detail how the pandemic impacted them. Below are some of their statements.

TABLE 14-44 PANDEMIC IMPACTS TO SMALL BUSINESS CUSTOMERS

Category of Impact	Count	Example Response
Impacted by COVID-19 Pandemic Restrictions	2	▪ "We are a restaurant group, so the shutdown caused us to shut our doors for month and lead to permanently closing one location. Guidelines and restrictions have been difficult to get our revenues back to [pre-pandemic] status." – Restaurant kit recipient ▪ "Shut down, part of second phase of reopening, attitude towards gyms "dirty," lost 1/2 of membership, mask and vaccination mandates to maintain stability." – Office kit recipient
Ability to Provide Adequate Services	2	▪ "We can no longer host in-person financial housing counseling & education sessions. Most of our LMI clients lack the capacity and/or access on virtual education sessions which decreases our ability to deliver our services to the good portion of the LMI community." – Office kit recipient ▪ "We normally are open until 9 pm in the evening and I cannot find anyone to work past 5 pm." – Retail kit recipient
Lost Revenue or Operations	3	▪ "Loss of daily operations, loss employees, family members of employees became ill." – Restaurant kit recipient ▪ "We lost $1 million of revenue in the first 8 months, and the PPP helped us through the toughest months (May, June, July). Three employees contracted [the] virus and quarantined without spreading the disease through the restaurant staff. The biggest problem we currently face is the inability to find staff that have exhausted their unemployment [claims] and are actually looking for work." – Restaurant kit recipient ▪ "We had vacant rental spaces due to lack of employment. Also, more residents worked from home, so they used more electricity." Office kit recipient
Loss in Business	2	▪ "Closed for 2 months. MANY cleaning and sterilizing put into place. Including Permanent air filters, UV lights installed in HVAC system, UV cabinets installed for cleaning stock, another full sink for washing." – Retail kit recipient ▪ "Less customers than normal, some didn't want to put a mask on, so we lost their business." – Retail kit recipient

14.4.3.7.2 *Hurricane Ida Impact on Businesses*

Restaurant and retail kit recipients indicated they were significantly affected by Hurricane Ida during 2021. Some respondents shared how they were affected:

- "We had no time to be involved, we had over 100 locations close, and one remains under reconstruction." – Restaurant kit recipient
- "No power for several weeks." – Restaurant kit recipient
- "Well, there was no power for almost 2 weeks." – Restaurant kit recipient
- "My original date was pushed back." – Retail kit recipient

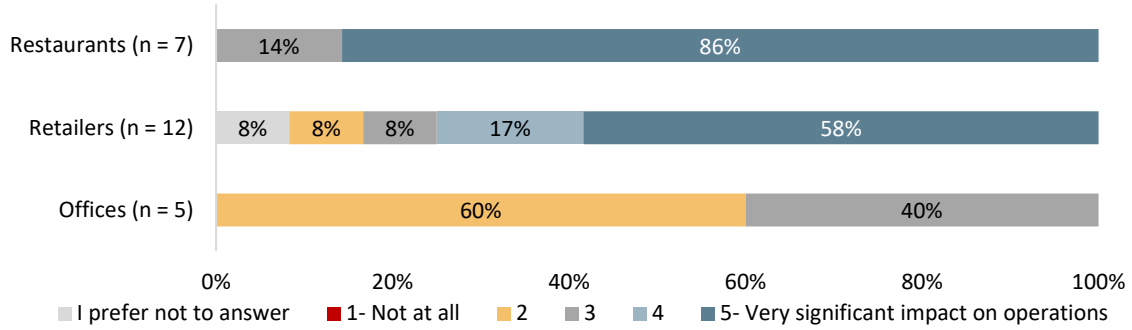

FIGURE 14-14 EXTENT OF IMPACT FROM HURRICANE IDA

Few respondents were aware of the Hurricane Ida Recovery Funds.

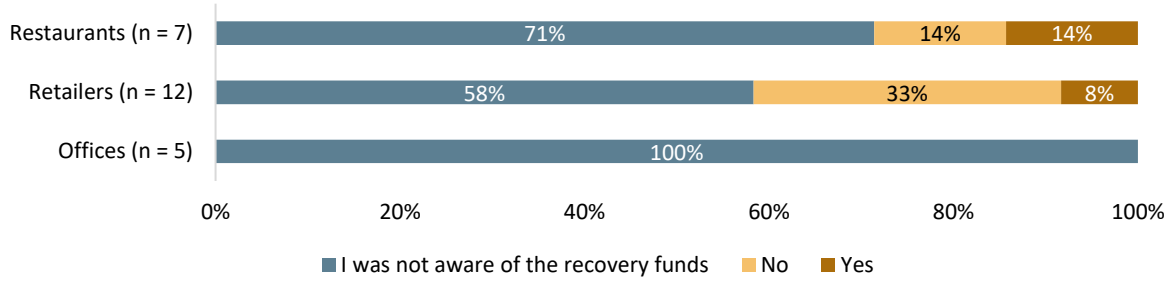

FIGURE 14-15 AWARENESS OF ENOS HURRICANE IDA RECOVERY FUNDS

Despite the challenges faced due to hurricane season, most survey respondents stated that the storm did not affect their participation in energy efficiency programs.

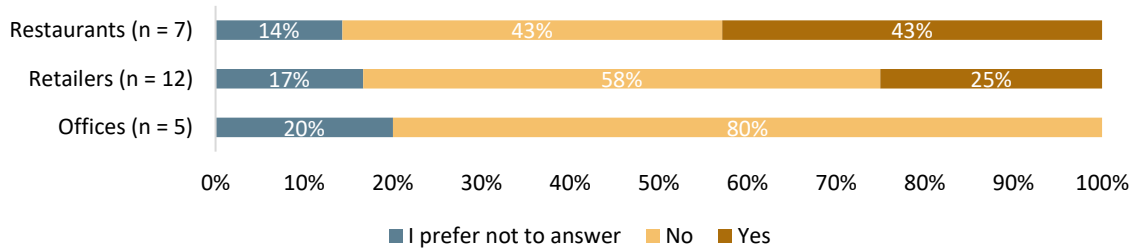

FIGURE 14-16 ABILITY TO PARTICIPATE IN ENERGY EFFICIENCY PROGRAMS

14.4.3.7.3 *Impact of Hurricane Ida and Supply Chain Issues*

Three small business customers surveyed reported being impacted by Hurricane Ida. Among those who reported being affected, 88% were somewhat or greatly impacted (Figure). Half of respondents (n=4) stated that the hurricane did not affect their ability to participate in the Energy Smart program. Among those whose ability was impacted, one explained the hurricane depleted their reserve funds and another reported they had to use their funds for a new roof and tree removal.

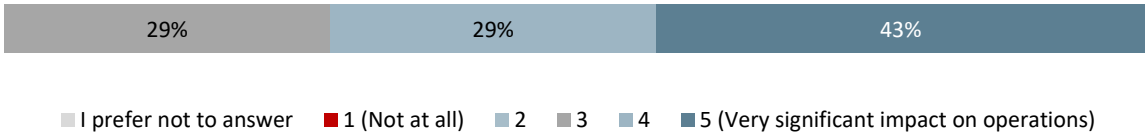

FIGURE 14-17 HOW MUCH HURRICANE IDA IMPACT SMALL BUSINESS CUSTOMERS

Two respondents applied for Hurricane Ida Recovery Funds, but four respondents did not know the funds were available.

Most respondents felt the impact of increased cost of materials and doing business more generally (71%, n=5). More than half of respondents also felt the impact of supply chain issues (57%, n=4) and 43% (n=3) felt the impact of labor supply issues.

14.4.3.8 Summary of Census Data

The Evaluators conducted a review of publicly available data to summarize the current state of the small business environment in New Orleans, Orleans Parish, and Louisiana to help inform program design and implementation. Data from the U.S. Census was analyzed to assess the impacts of COVID-19 pandemic on small businesses, identified trends in business startups and closures, assessed local resources that might explain trends, and evaluated how these findings may affect small business participation in Energy Smart programs.

The Evaluators sough to answer the following questions:

- What are the characteristics of small businesses in Orleans Parish (e.g., total number of businesses and business types)?

- How have business trends changed over the course of the pandemic? How has the pandemic primarily affected businesses at given points in time?
- What are trends in terms of small business start-ups and small business closures? How does this intersect with COVID-19 pandemic?
- How might these trends be affecting participation in Energy Smart Commercial programs?

The Evaluators reviewed several sources to gather data to understand the dynamics of the pandemic on small business. In addition, raw data was analyzed or used data visualization tools, primarily from government sources. These sources are linked and described in the table below.

TABLE 14-45 SOURCES OF PRIMARY DATA ACCESSED

Study or Source Name	Description	Link
County Business Patterns 2018	These data are an annual series that provide county level economic data by industry.	CBP Census Data
Small Business Pulse Survey, 2020-to-date	This is a high-frequency survey, gathering data on the effect of changing business conditions during the COVID-19 pandemic on small businesses (single establishments under 500 employees).	Small Business Pulse Survey – Census
Business Formation Statistics	These data track business initiation activity at a state and regional level.	Business Formation Statistics
Retailer Sales Data	This interactive visualization allows users to understand the change in sales for retailers from 2019 to 2020.	Estimated Sales for US Retailers 19-20

To conduct this research, the Evaluators used data from the U.S. Census Bureau to assess how many businesses exist Orleans Parish and what type of businesses operate. Census data was also examined on business applications, providing data on the trend of business applications in the United States and Louisiana.

14.4.3.8.1 *County Business Patterns*

Initially, the Evaluators reviewed business patterns and statistics using the County Business Patterns dataset from the U.S. Census Bureau. To summarize ENO service territory, the Evaluators selected data for the Orleans Parish, LA. The most recent version of these data is from 2018, providing a baseline understanding of businesses in Orleans Parish prior to the pandemic.

In 2018, there were 9,481 business operating in Orleans Parish employing 177,577 people. The top five business types in Orleans Parish include professional/scientific/technical services (17%), accommodation and food services (16%), retail (14%), health care and social assistance (10%), and other services (10%). Many employees in Orleans Parish work in accommodations and food services (24%), followed by health care and education.

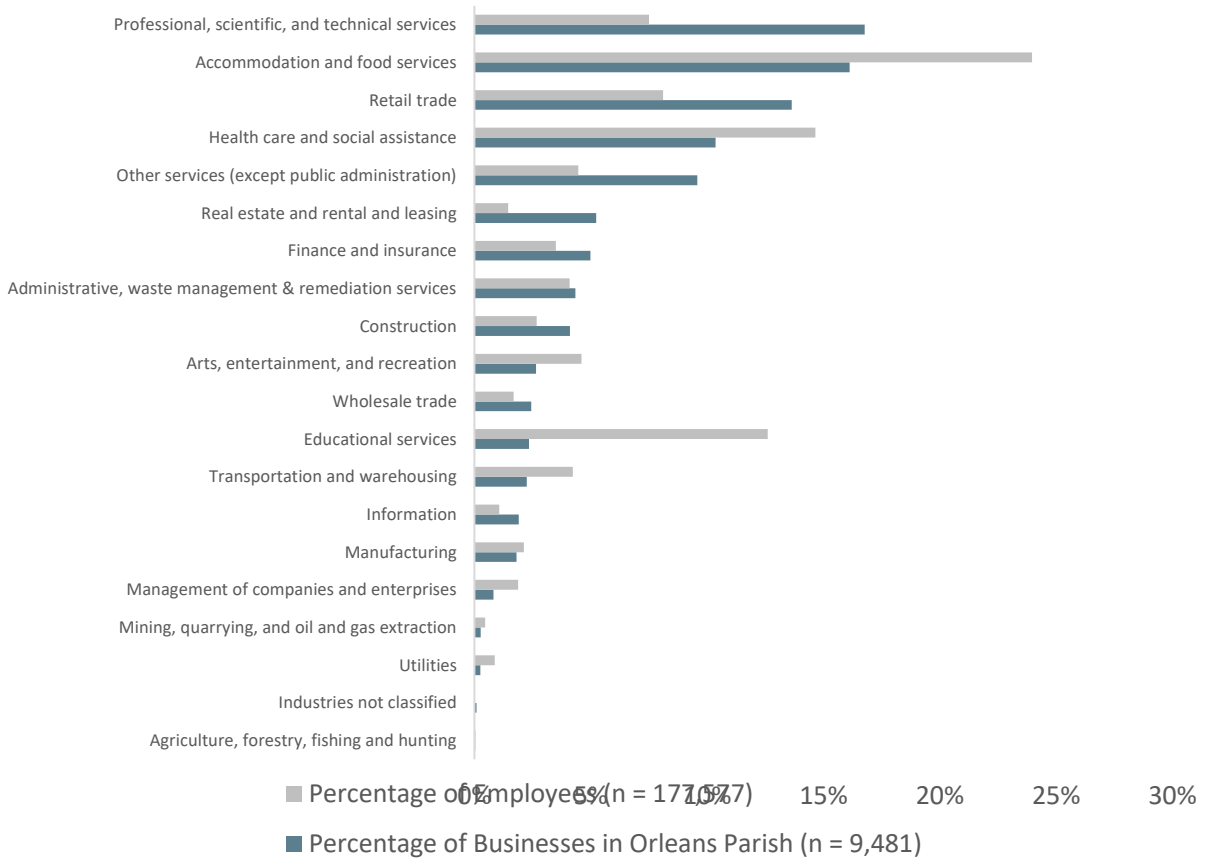

FIGURE 14-18 EMPLOYMENT BY BUSINESS TYPE AND PERCENTAGE OF BUSINESS IN ORLEANS PARISH

Ninety-three percent of businesses in Orleans Parish have less than 50 employees, with more than half of businesses in the Orleans Parish employing five employees or less. For the purposes of this summary, "small businesses" were defined as less than 50 employees, and "microbusinesses" as 5 or fewer employees.

TABLE 14-46 NUMBER OF EMPLOYEES AMONG ORLEANS PARISH BUSINESSES

Number of Employees among Businesses	Count	Percentage
1,000 employees or more	12	Less than 1%
500 to 999 employees	21	Less than 1%
250 to 499 employees	41	Less than 1%
100 to 249 employees	207	2%
50 to 99 employees	352	4%
20 to 49 employees	986	10%
10 to 19 employees	1296	14%
5 to 9 employees	1719	18%
Less than 5 employees	4847	51%

The Evaluators compared microbusinesses to small-to-large business by type. Among microbusinesses many people are employed in professional, scientific, and technical services compared to small-to-large business where many people are employed in accommodations and food services.

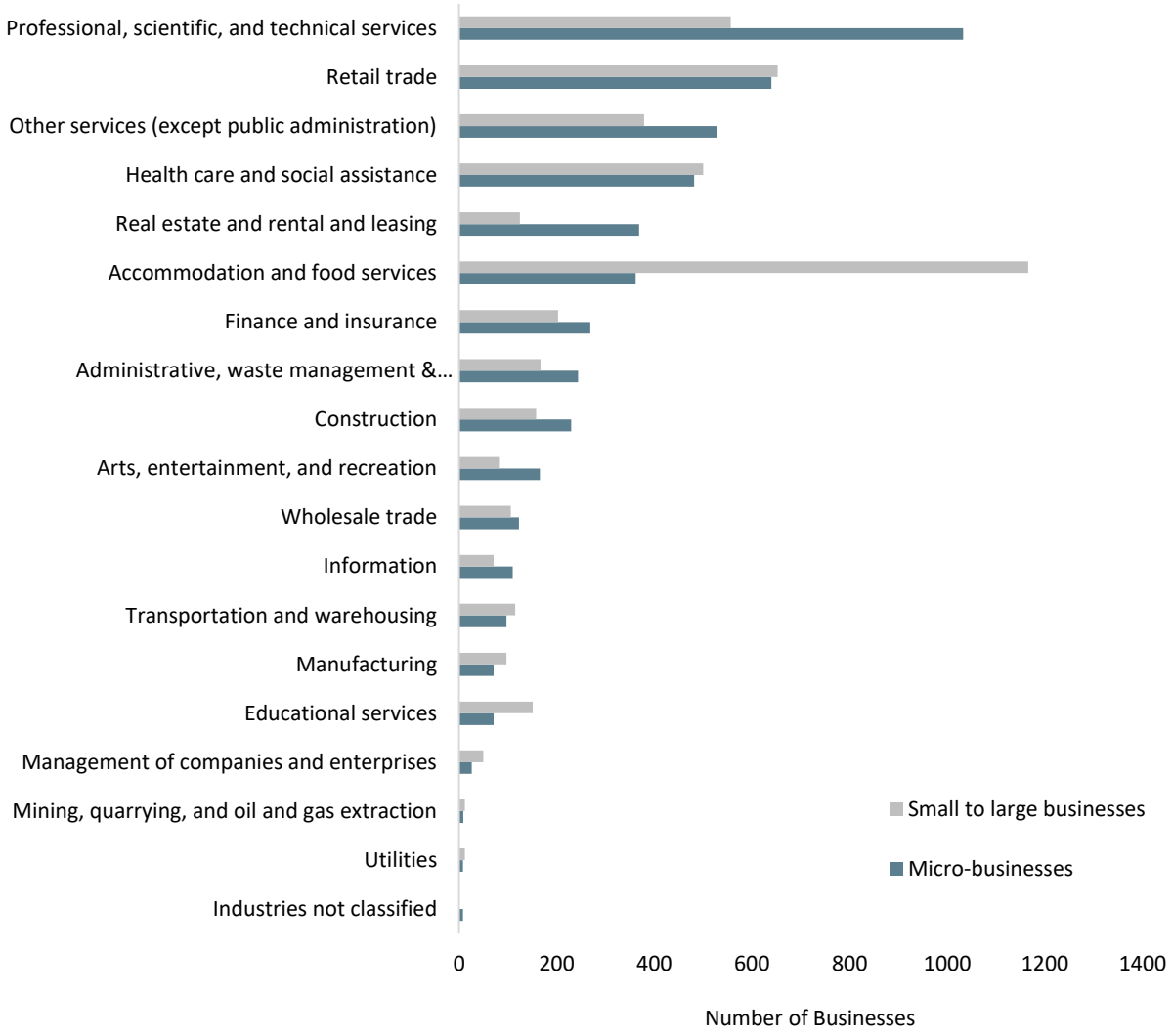

FIGURE 14-19 MICROBUSINESS TYPES COMPARED TO SMALL TO LARGE BUSINESSES

14.4.3.8.2 *U.S. Census – Small Business Pulse Survey*

The U.S. Census Bureau has been conducting a pulse survey of small businesses (single-location businesses with fewer than 500 employees) across the country every few weeks from April 2020 until present. This survey gathered information on a battery of questions relating to the impact of the COVID-19 pandemic on small businesses, including employee illness, vaccination, hiring challenges, and supply chain disruption on small business operations and outlooks. This survey also gathered information on small businesses' perspectives on economic outlooks and upcoming challenges. These data can be tracked over time to identify trends. In the charts and graphs following, the Evaluators limited the data

to just New Orleans businesses to assess their experiences and compared businesses' responses from April of 2020 through February 2022 to examine how things may have changed.

The figure below demonstrates small businesses' perspectives on how much the COVID-19 pandemic has affected their business. In April 2020, 44% of small businesses in New Orleans indicated that COVID-19 pandemic had a large negative effect and 39% indicated it had a moderate negative effect. This trend changed in the summer of 2020, with more respondents saying the pandemic had a moderate negative impact rather than large negative effect. From the start of the survey, there were only 2 instances where respondents indicated the pandemic had a moderate positive effect (7/12/21 – 7/18/21 and 12/20/21 – 12/26/21).

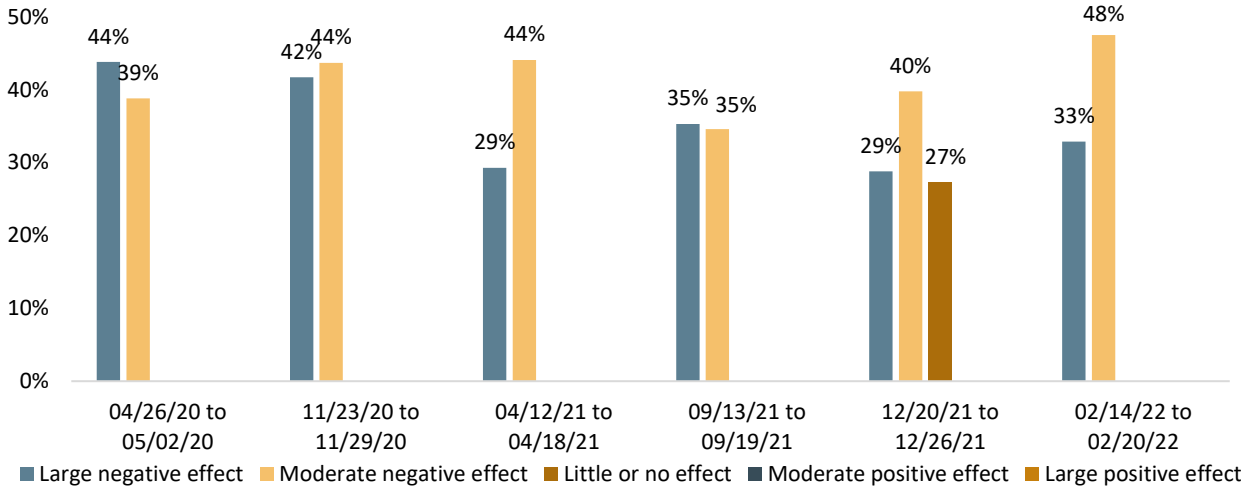

FIGURE 14-20 EFFECT OF PANDEMIC ON SMALL BUSINESSES IN ORLEANS PARISH

Figure 14-21 below shows the differences over time of business priorities. Identifying and hiring new employees rose sharply between November 2020 and January 2022. Obtaining financial assistance or additional capital decreased between September 2020 and July 2021 from 30% to 25%. These trends suggest that small businesses in New Orleans priorities were reflective of the impacts from the pandemic.

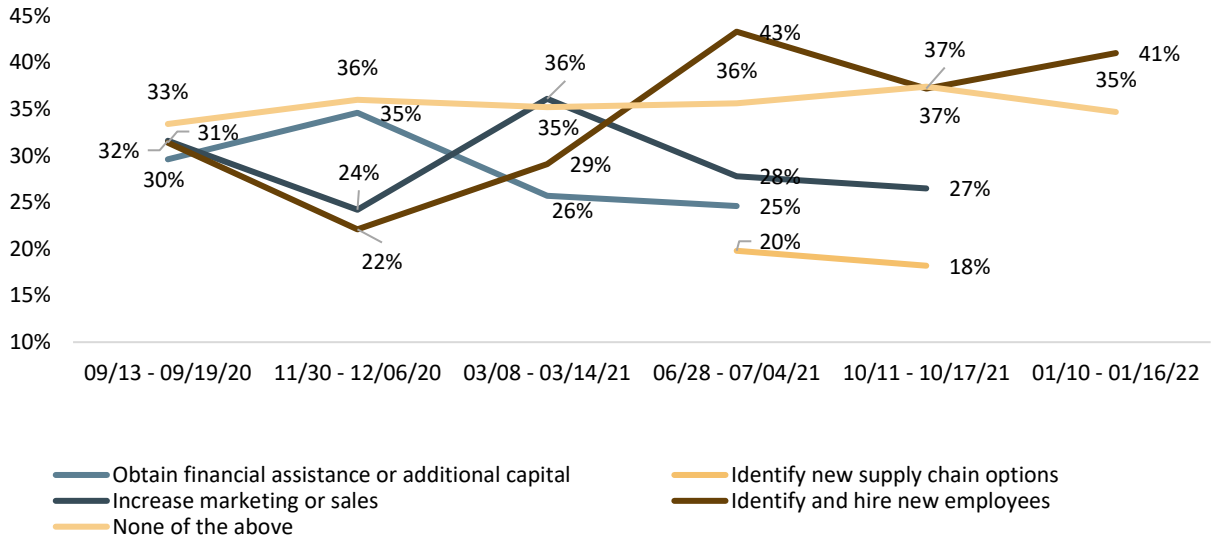

FIGURE 14-21 NEXT STEPS FOR SMALL BUSINESS

14.4.3.8.3 *Business Application Data*

The Evaluators examined business formation data from the U.S. Census to assess the state of the economy and small business environment. The graphic below shows the number of business applications across the last 16 years. Business applications decreased in the early months of the pandemic and then they began to significantly increase in July 2020 and continued to maintain a high rate into 2021. However, the rate of applications from businesses that have planned wages or corporations only increased a small amount.

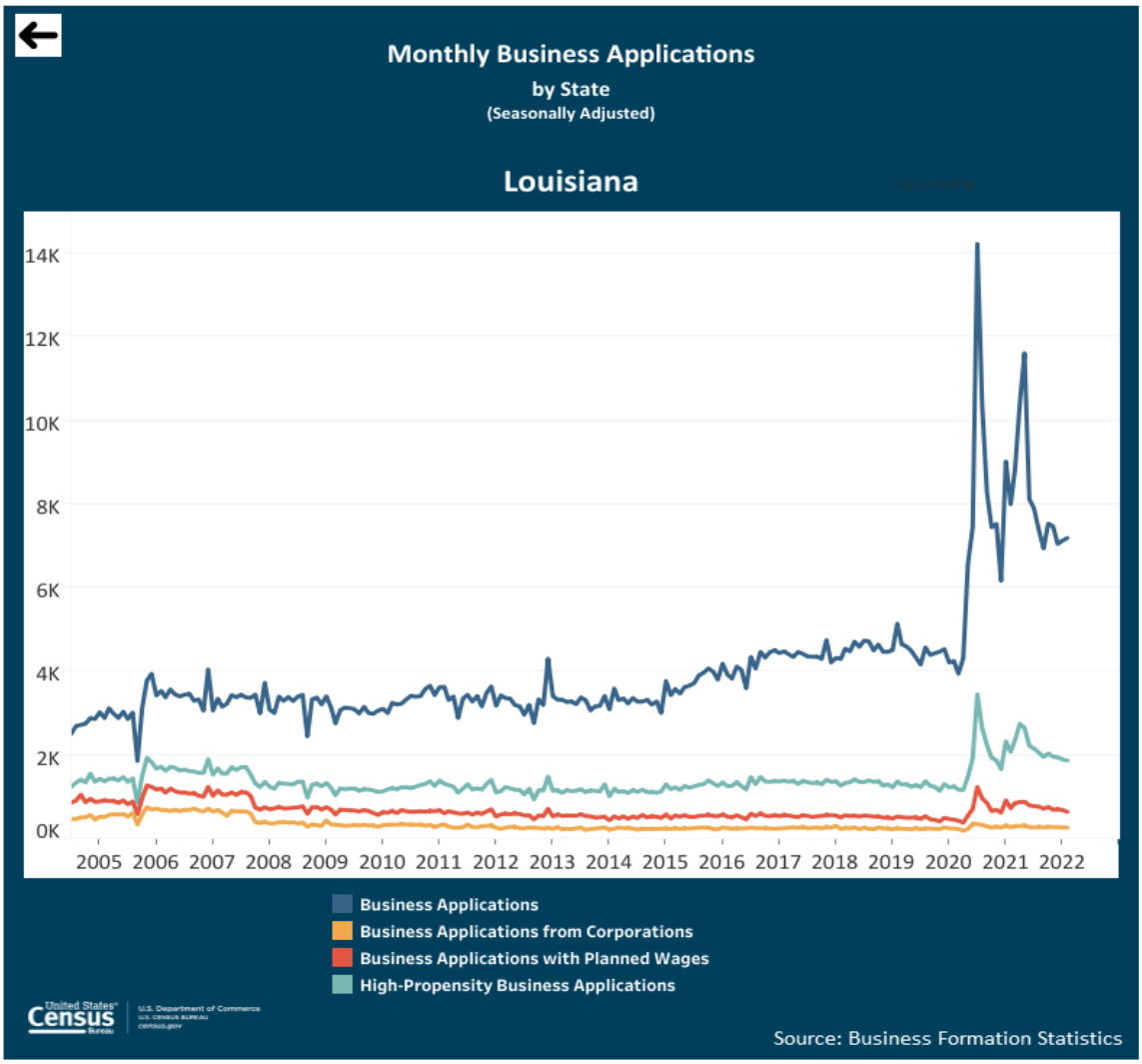

Figure retrieved from Census website: https://www.census.gov/econ/bfs/data.html

FIGURE 14-22 MONTH BUSINESS APPLICATIONS – LOUISIANA

14.4.3.8.4 *Retail Sales Data*

Finally, the Evaluators also reviewed Census data for information on trends relating to sales pre-pandemic and during the pandemic. The U.S. Census gathers data for the retail sector specifically via their Annual Retail Trade Survey. The graphic below, from the U.S. Census website, highlights growth or declining trends in terms of sales from 2019 compared to 2020 for retail businesses nationwide. Stores that sold electronics and appliances, clothing or accessories, and gas stations struggled the most in terms of reduces sales in 2020. It is unclear how much these trends have continued or reversed in 2021 and 2022 to-date, as well as how other challenges such as supply chain and hiring issues may impact them.

FIGURE 14-23 U.S. RETAILERS SALES (2019 – 2020)

Additionally, the Evaluators reviewed the monthly state retail sales data available from the Census website. The figure below represents the year-over-year comparison of retail sales in Louisiana. According to the data, there was a 25% increase in retail sales in Louisiana from November 2020 to November 2021

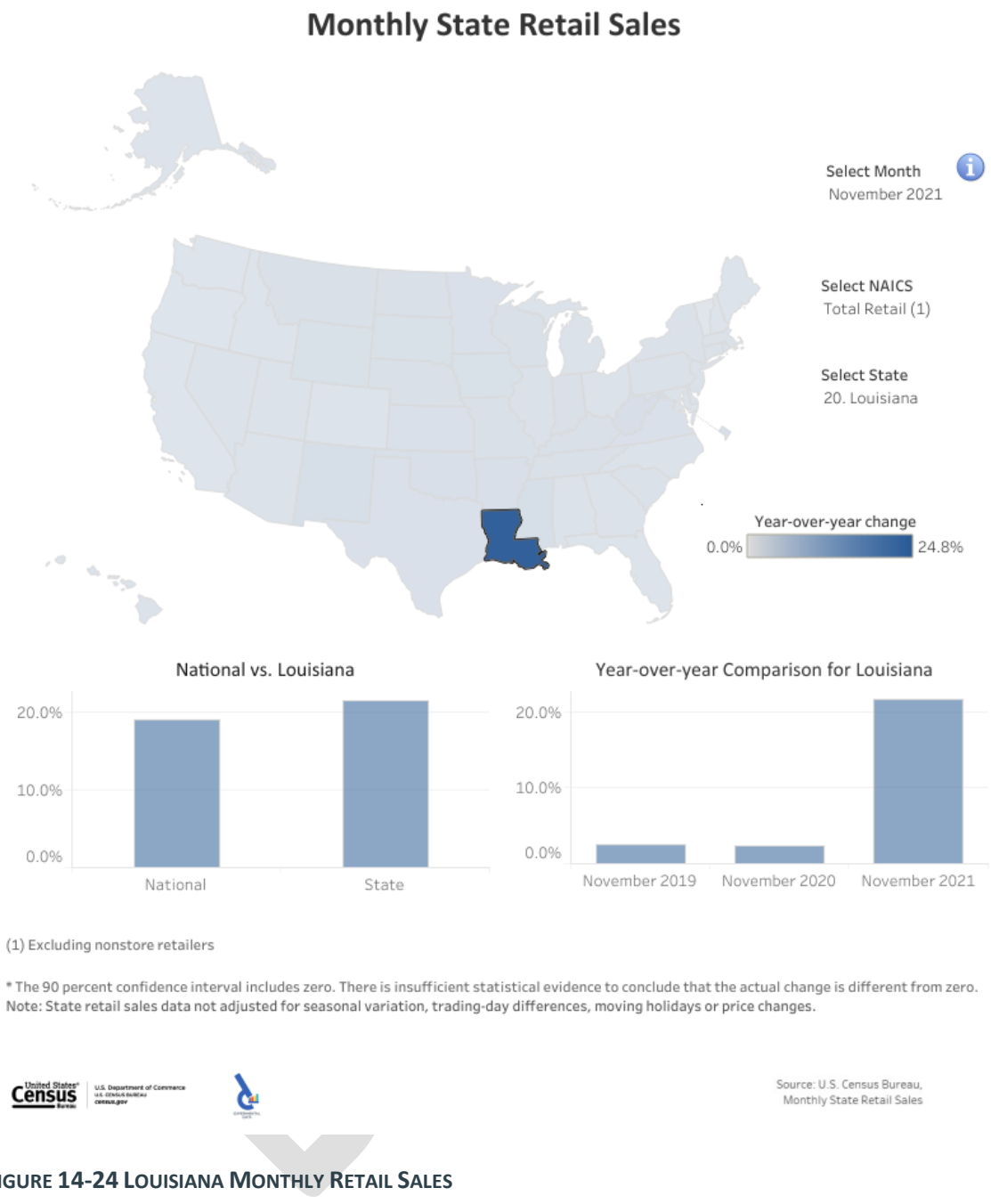

FIGURE 14-24 LOUISIANA MONTHLY RETAIL SALES

14.5 Data Tracking Review

The Evaluators reviewed the tracking data provided and found the following issues. The following parameters were missing or incomplete for the program.

- **Measure Specific Information**: The tracking data lacked pre and post measure information such as fixture codes, fixture wattages, equipment size, and equipment efficiency.
- **Facility Conditioning Type**: The tracking data lacked information on the heating and cooling systems of the participating facilities. Without information on the heating fuel type, the evaluators are unable to calculate Therm savings in lighting retrofit projects.

The Evaluators note that a supplemental tracking dataset was provided for this program and a few others. This data had some additional fields. However, the Evaluators noted that there were few inconsistencies with total program kWh savings, total kW reductions, and total project counts. Since the two did not align, it was difficult to know which was the best and final to utilize in the Evaluation.

14.6 Key Findings & Recommendations

Program Management and Delivery Key Findings and Recommendations

- **Key Finding 1: Small Business Solutions had significant challenges in PY11.** The challenges of the pandemic and Hurricane Ida have most severely impacted ENO's Small C&I Solutions offering. Program staff indicated they struggle to engage small businesses within the service territory. Staff noted that more time and effort need to be invested in this line of work in the coming program year.
    - ***Recommendation 1: Provide financing opportunities.*** *Almost all articles and reports on small business centered energy efficiency programs underscore the financial barriers small business face when deciding whether or not to upgrade to efficient equipment. Offering financing opportunities like loans, fixed monthly costs, time of use, and higher rebates make equipment upgrades more financially feasible and tenable to small businesses that may not have the upfront capital to invest in upgrades.*
- **Key Finding 2: Small business kits and the online marketplace benefitted from marketing outreach.** ENO staff brought on external marketing and outreach teams to help promote the program. Common marketing tactics included door-to-door visits, bill inserts, digital and social media marketing, ENO-sponsored trade ally trainings, as well as television, radio, and newspaper ads. Additionally, program staff introduced a "summer bonus" which involved a 25% increase in the incentive amount for various measures.
    - ***Recommendation 2: Conduct a Small Business Needs Assessment.*** *Program staff could meet with small businesses and determine their specific equipment upgrade needs and energy usage and provide personalized recommendations. The utility can take the needs assessment a step further by also offering an energy coaching program that assists small businesses through every step of the process.*

- **Key Finding 3: Online marketplace engagement is low.** The online marketplace ("Energy Smart Small Business Store") experienced some challenges throughout the program year. Not only was the launched delayed, but program staff indicated they struggle to increase site traffic and engagement. Getting customers to visit the website remains a challenge. ENO's marketing team promotes the site through various avenues, including bill inserts, TV interviews, and other advertisements. Program staff also highlighted Black Friday and Cyber Monday campaigns, as well as enhanced marketing plans for early 2022. Program staff believe the online marketplace has a lot of potential and hope engagement will increase over time as the website becomes more ubiquitous among customers.
    - ***Recommendation 3: Increase marketing of the availability of the online marketplace.*** *Program staff should explore additional channels to market the online marketplace to small businesses.*

Online Marketplace Participant Survey Key Findings and Recommendations

- **Key Finding 4: The online marketplace may have influenced customers to receive energy efficient products in and customers were generally satisfied with their experience.** More than half of survey respondents learned about the online marketplace through an informational brochure or newsletter. Many survey respondents did not have plans to purchase a smart thermostat prior to learning they could receive a free or discount through the online marketplace. About half of customers surveyed did not have plans to purchase LED lighting, and about two-thirds did not have plans to purchase low-flow sink aerators and none had plans to purchase low-flow showerheads. Generally, customers were satisfied with the Energy Smart Business Store and with the energy efficient products they received.

Small Business Kits Key Findings and Recommendations

- **Key Finding 5: Participants appear to not install all items offered in the kits.** The top measure currently installed by all types of businesses are the LED light bulbs. According to most respondents, they were not using many of the energy efficiency measures offered in the kits or had not heard of these measures before receiving them. Before receiving the kits, some respondents stated they have previously engaged with other Energy Smart offerings.

Hurricane Ida and COVID-19 Pandemic Impacts Key Findings and Recommendations

- **Key Finding 6: To some degree, almost all respondents were impacted by the pandemic**. Issues like labor shortages and supply chain issues affected all the survey respondents. Restaurant and retail kit recipients indicated they were significantly affected by Hurricane Ida during 2021. Not many respondents knew about the offer of ENO's Hurricane Ida Recovery Funds. Despite the challenges faced due to hurricane season, most survey respondents stated that the storm did not affect their participation in ENOs' C&I programs.

Census Data Key Findings and Recommendations

- **Key Finding 7: Professional and technical services, service industry, and health care are the most common businesses in Orleans Parish**. In 2018, there were 9,481 business operating in Orleans Parish employing 177,577 people. The top five business types in Orleans Parish include professional/scientific/technical services (17%), accommodation and food services (16%), retail (14%), health care and social assistance (10%), and other services (10%). Many employees in Orleans Parish work in accommodations and food services, followed by health care and education.
- **Key Finding 8: Over half of Orleans Parish business are considered microbusinesses.** Ninety-three percent of businesses in Orleans Parish have less than 50 employees, with more than half of businesses in the Orleans Parish employing five employees or less. Among microbusinesses many people are employed in professional, scientific, and technical services compared to small-to-large businesses where many people are employed in accommodations and food services.
- **Key Finding 9: The pandemic had an overall negative impact on small businesses in New Orleans.** In April 2020, 44% of small businesses in New Orleans indicated that the pandemic had a large negative effect and an additional 39% indicated it had a moderate negative effect. This trend changed in the summer of 2020, with more respondents saying the pandemic had a moderate negative impact rather than large negative effect.

15 LARGE C&I SOLUTIONS

15.1 Summary

The tables below report *ex ante* gross, *ex post* gross, *ex post* net energy savings (kWh) (both annual and lifetime), demand reductions (kW), participation, and incentive spend, by measure, where applicable. Additionally, the tables above represent evaluation findings for each measure, whereas the analysis described in this chapter summarize the findings of the evaluation stratum.

TABLE 15-1 PY11 LARGE C&I SOLUTIONS ENERGY SAVINGS (KWH)

Measure	*Ex ante* Gross Savings (kWh)	Realization Rate (kWh)	*Ex post* Gross Savings (kWh)	NTG	*Ex post* Net Savings (kWh)
Custom - LED	13,634,281	100%	13,695,283	98%	13,421,377
Custom - Retrocommissioning	2,477,241	77%	1,896,264	77%	1,460,123
Prescriptive - LED	3,998,141	103%	4,125,661	100%	4,125,661
Custom - Cooling Tower	457,544	155%	710,135	77%	546,804
Prescriptive - Lighting Controls	114,017	80%	91,205	100%	91,205
Prescriptive - Chiller	1,085,156	99%	1,075,206	42%	451,586
Custom - BMS	5,772,639	100%	5,787,433	77%	4,456,323
Custom - VFD	308,720	104%	321,852	77%	247,826
Prescriptive - Screw-Based LED	365,443	103%	374,730	100%	374,730
Custom - HVAC	8,492	100%	8,492	77%	6,539
Prescriptive - TA Incentive	0	N/A	0	N/A	0
Prescriptive - AC Tune Up	90,496	100%	90,496	42%	38,008
Prescriptive - HVAC	7,264	100%	7,264	42%	3,051
Prescriptive - Refrigeration	259,132	102%	263,763	42%	110,780
Prescriptive - Ida Recovery Fund	0	N/A	0	N/A	0
Prescriptive - BMS	172,175	103%	177,480	42%	74,542
Total	**28,750,741**	**100%**	**28,625,263**	**89%**	**25,408,556**

Sums may differ due to rounding.

TABLE 15-2 PY11 LARGE C&I SOLUTIONS DEMAND REDUCTIONS (KW)

Measure	*Ex ante* Gross Demand (kW)	RR (kW)	*Ex post* Gross Demand (kW)	NTG	*Ex post* Net Demand (kW)
Custom - LED	4,531.65	72%	3,290.57	98%	3,224.76
Custom - Retrocommissioning	193.63	88%	206.79	77%	159.23
Prescriptive - LED	631.50	105%	666.98	100%	666.98
Custom - Cooling Tower	45.89	214%	99.47	77%	76.59
Prescriptive - Lighting Controls	42.76	94%	43.02	100%	43.02
Prescriptive - Chiller	333.96	95%	329.43	42%	138.36
Custom - BMS	475.55	97%	470.42	77%	362.22
Custom - VFD	-0.30	100%	-0.30	77%	-0.23
Prescriptive - Screw-Based LED	121.77	95%	124.07	100%	124.07
Custom - HVAC	0.00	N/A	0.00	N/A	0.00
Prescriptive - TA Incentive	0.00	N/A	0.00	N/A	0.00
Prescriptive - AC Tune Up	27.67	100%	27.61	87%	11.60
Prescriptive - HVAC	3.65	100%	3.65	42%	1.53
Prescriptive - Refrigeration	20.14	102%	21.61	42%	9.08
Prescriptive - Ida Recovery Fund	0.00	N/A	0.00	N/A	0.00
Prescriptive - BMS	0.00	N/A	0.00	N/A	0.00
Total	**6,427.87**	**82%**	**5,283.34**	**89%**	**4,817.22**

Sums may differ due to rounding.

TABLE 15-3 PY11 LARGE C&I SOLUTIONS LIFETIME SAVINGS SUMMARY

Measure	EUL	*Ex post* Gross Lifetime Energy Savings (kWh)	*Ex post* Net Lifetime Energy Savings (kWh)
Custom - LED	15	205,429,239	201,320,655
Custom - Retrocommissioning	10	18,962,637	14,601,230
Prescriptive - LED	15	61,884,909	61,884,909
Custom - Cooling Tower	15	10,652,030	8,202,063
Prescriptive - Lighting Controls	8	729,643	729,643
Prescriptive - Chiller	15	16,128,083	6,773,795
Custom - BMS	10	55,213,626	42,514,492
Custom - VFD	15	4,827,779	3,717,390
Prescriptive - Screw-Based LED	9	3,372,569	3,372,569
Custom - HVAC	15	127,379	98,081
Prescriptive - TA Incentive	N/A	0	0
Prescriptive - AC Tune Up	10	904,960	380,083
Prescriptive - HVAC	15	108,960	45,763
Prescriptive - Refrigeration	4	1,162,107	488,085
Prescriptive - Ida Recovery Fund	N/A	0	0
Prescriptive - BMS	8	1,419,842	596,333
Total	**13**	**380,923,763**	**344,725,092**

Sums may differ due to rounding.

TABLE 15-4 PY11 LARGE C&I SOLUTIONS COUNT OF MEASURES AND INCENTIVE SPEND

Measure	Participation (Count of Measures)	Incentive Spend ($)
Custom - LED	198	$990,185
Custom - Retrocommissioning	6	$287,355
Prescriptive - LED	83	$371,081
Custom - Cooling Tower	3	$54,905
Prescriptive - Lighting Controls	2	$11,601
Prescriptive - Chiller	3	$129,500
Custom - BMS	8	$406,759
Custom - VFD	2	$37,402
Prescriptive - Screw-Based LED	20	$9,385
Custom - HVAC	1	$1,019
Prescriptive - TA Incentive	54	$110,496
Prescriptive - AC Tune Up	1	$5,252
Prescriptive - HVAC	1	$1,280
Prescriptive - Refrigeration	20	$32,887
Prescriptive - Ida Recovery Fund	13	$232,816
Prescriptive - BMS	2	$25,224
Total	**417**	**$2,707,147**

Sums may differ due to rounding.

15.2 Program Description

Large Commercial & Industrial Solutions (Large C&I Solutions) provides financial incentives and technical service to non-residential who's average monthly peak demand exceeds 100 kW to implement energy-savings measures. The Large C&I offering is designed to help this customer segment overcome barriers in energy improvement, such as higher initial cost of efficient equipment and a lack of technical knowledge or resources.

The incentives provided are summarized below in the table below.

TABLE 15-5 LARGE C&I SOLUTIONS SUMMARY OF OFFERING INCENTIVES

Measure	Incentive
Prescriptive	Various based on $ per unit
Custom Lighting	$0.10 per kWh Saved
Custom Non-Lighting	$0.12 per kWh Saved
Retro-commissioning	$0.04-$0.07/kWh Saved

15.2.1 PROGRAM CHANGES

There were no reported changes in PY11.

15.2.2 PROGRAM ACTIVITY

In PY11, the program had 84 projects resulting in an expected energy savings of 28,750,741 kWh and an expected peak demand reduction of 6,427.87 kW.

TABLE 15-6 LARGE C&I SOLUTIONS EXPECTED SAVINGS SUMMARY

Count of Projects	*Ex ante* Gross Energy Savings (kWh)	*Ex ante* Gross Demand Reductions (kW)
84	28,750,741	6,427.87

Table 15-7 below shows the split of savings coming from custom and prescriptive projects.

TABLE 15-7 LARGE C&I SOLUTIONS SAVINGS EXPECTATIONS BY PROJECT COMPONENT

Project Component	Count	*Ex ante* Gross Energy Savings (kWh)	*Ex ante* Gross Demand Reductions (kW)
Prescriptive	66	6,091,824	1,181.45
Custom	18	22,658,917	5,246.42
Total	**84**	**28,750,741**	**6,427.87**

Expected savings, and measure counts for each measure category are summarized in Table 15-8.

TABLE 15-8 LARGE C&I SOLUTIONS EXPECTED SAVINGS BY MEASURE CATEGORY

Project Component	Count of Project Components	*Ex ante* Gross Energy Savings (kWh)	*Ex ante* Gross Demand Reductions (kW)	Percent Savings (kWh)
LED	281	17,632,422	5,163.15	61.33%
TA Incentive	54	0	0.00	0.00%
Screw-Based LED	20	365,443	121.77	1.27%
Refrigeration	20	259,132	20.14	0.90%
Ida Recovery Fund	13	0	0.00	0.00%
BMS	10	5,944,814	475.55	20.68%
Retro-commissioning	6	2,477,241	193.63	8.62%
Cooling Tower	3	457,544	45.89	1.59%
Chiller	3	1,085,156	333.96	3.77%
Lighting Controls	2	114,017	42.76	0.40%
HVAC	2	15,756	3.65	0.05%
VFD	2	308,720	-0.30	1.07%
AC Tune Up	1	90,496	27.67	0.31%
Total	**417**	**28,750,741**	**6,427.87**	**100%**

Table 15-9 below compares the performance of PY11 to past program years.

TABLE 15-9 LARGE C&I PROGRAM PARTICIPATION SUMMARY COMPARISON

Project Year	# Projects	Expected kWh	kWh per Project	% kWh Non-Lighting
PY5	46	9,807,855	213,214	35.60%
PY6	41	12,282,310	299,569	16.80%
PY7 (nominal)	42	9,829,550	234,037	34.00%
PY7 (normalized)	56	13,106,067	234,037	34.00%
PY8	135	19,377,054	143,534	31.74%
PY9 (total)	128	27,247,005	212,867	29.88%
PY9 (calendar)	83	17,078,303	205,763	47.67%
PY10	91	19,571,940	215,076	19.16%
PY11	84	28,750,741	342,271	37.00%

PY11 saw an 8% decrease in projects completed but saw a 47% increase in expected savings while nearly doubling the expected savings coming from non-lighting measures in PY11 compared to PY10.

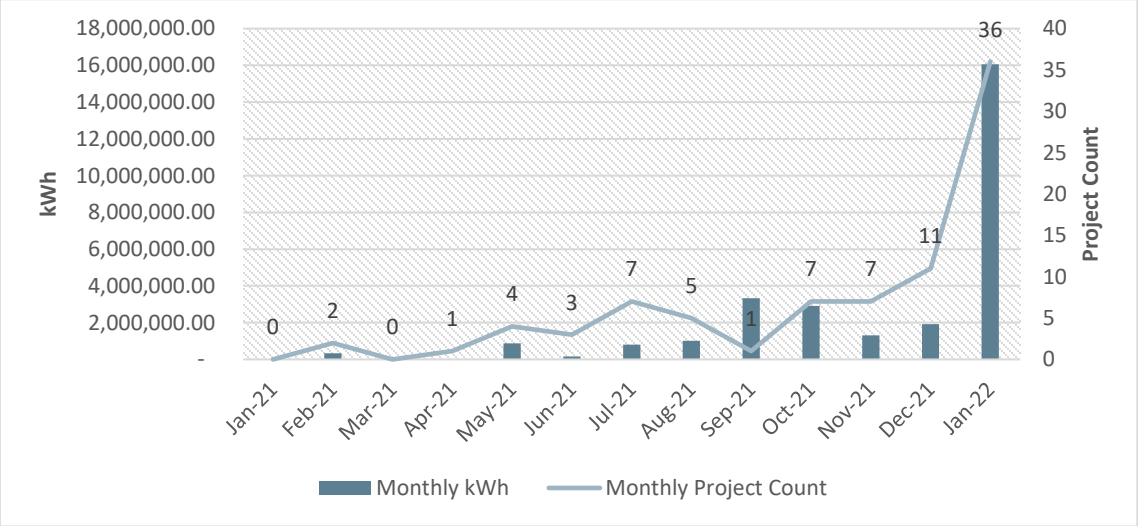

FIGURE 15-1 LARGE C&I PROGRAM MONTHLY PARTICIPATION

The figure above summarizes the monthly program activity throughout the year. During PY11, 67% of expected savings came during the months of November, December of 2021, and January of 2022, with January of 2022 being the single largest month for projects completed (36) and expected kWh (16,060,407 kWh).

15.2.3 GOAL ACHIEVEMENT

TABLE 15-10 LARGE C&I PY11 SAVINGS GOALS

Ex post Gross Energy Savings (kWh) Goal	% to kWh Goal	*Ex post* Gross Energy Savings (kWh)	*Ex post* Gross Savings (kW) Target	% to kW Target	*Ex post* Gross Savings (kW)
33,169,760	86%	28,625,263	4,833.95	109%	5,283.34

In PY11, the program's net energy savings obtained 77% of the kWh goal. The program's net peak demand reduction obtained 100% of the peak demand target.

15.3 EM&V Methodology

Evaluation of the program involved the following:

- Stratified Random Sampling (as detailed in section (as detailed in Section 3.3.1) and by selecting large saving sites with certainty.
- On-site verification for one project, desk reviews of all 84 sampled projects; and
- Interviewing of program participants and trade allies.

The on-site inspections were used to verify installations and to determine any changes to the operating parameters since the measures were first installed. Energy savings was estimated using proven techniques, including engineering calculations using industry standards to determine energy savings.

15.3.1SAMPLE DESIGN

Sampling for evaluation of ENO Large C&I offering was developed using the Stratified Random Sampling procedure detailed in Section 3.3. This procedure provides 90% confidence and +/- 10% precision with a significantly reduced sample than simple random sampling would require by selecting the highest saving facilities with certainty, thereby minimizing the variance that non-sampled sites can contribute to the overall results.

The participant population was divided into five strata. Table 15-11 summarizes the strata boundaries and sample frames for the program and

Table 15-12 summarizes expected savings of both the sample and population. The achieved sampling precision was ±6.1% at 90% confidence.

TABLE 15-11 LARGE C&I PROGRAM SAMPLE DESIGN

	Stratum 1	*Stratum 2*	*Stratum 3*	*Stratum 4*	*Stratum 5*	*Totals*
Strata boundaries (kWh)	< 50,000	50,001 - 200,000	200,001 - 500,000	500,001 - 1,250,000	>1,250,001	
Number of projects	25	24	22	8	5	84
Total kWh savings	587,433	2,556,386	6,678,683	6,426,561	12,501,679	28,750,741
Average	23,497	106,516	303,577	803,320	2,500,336	3,737,246
Standard deviation	13,502	36,421	87,268	272,390	1,334,947	665,289
Coefficient of variation	0.57	0.34	0.29	0.34	0.53	1.94
Final design sample	15	13	12	3	5	48

TABLE 15-12 LARGE C&I EXPECTED SAVINGS FOR SAMPLED AND NON-SAMPLED PROJECTS BY STRATUM

Strata	*Sample Expected Savings*	*Total Expected Savings*	*% Savings in M&V Sample*
Stratum 1	353,660	587,433	60%
Stratum 2	1,536,569	2,556,386	60%
Stratum 3	3,690,810	6,678,683	55%
Stratum 4	1,780,477	6,426,561	28%
Stratum 5	12,501,679	12,501,679	100%
Totals	**19,863,195**	**28,750,741**	**69%**

15.4 Evaluation Findings

15.4.1GROSS IMPACT FINDINGS

15.4.1.1 Large C&I Site Level Realization

Desk reviews of documentation for all sites chosen within each stratum were performed: All project documentation, calculations, invoices, photos, were carefully examined to verify the installation and operation of equipment. In addition, the Evaluators visited two sites to verify installation and operation of measures and collect data. Where there was uncertainly, the Evaluators contacted staff or site contacts for clarification. This information was then used to verify savings or adjust *ex ante* estimates based on findings. The realization rates for sites within each stratum were then applied to the non-sampled sites within their respective stratum. Table 15-13 presents realization at the stratum level.

TABLE 15-13 SUMMARY OF KWH SAVINGS FOR LARGE C&I OFFERING BY SAMPLE STRATUM

Stratum	*Sample Ex ante Gross Energy Savings (kWh)*	*Sample Ex post Gross Energy Savings (kWh)*	*Realization Rate*
1	353,660	383,950	109%
2	1,536,569	1,622,511	103%
3	3,975,520	3,886,769	105%
4	1,780,477	1,754,309	99%
Total	**7,646,227**	**7647,538**	**104%**

Table 15-14 shows the expected and verified energy savings for the sampled projects.

TABLE 15-14 LARGE C&I EXPECTED AND VERIFIED SAVINGS BY SAMPLED PROJECT

Project ID(s)	Facility Type	Expected kWh Savings	Verified kWh Savings	Realization Rate
CIP_278	Public Assembly	4,451,942	4,362,936	98%
CIP_110	Public Assembly	3,324,883	3,440,488	103%
CIP_338	Education: College, University, Vocational, Day Care, and K-12 w/ Summer Session	1,562,160	1,562,160	100%
CIP_217	Large Office	1,393,694	1,409,111	101%
CIP_027	Outdoor	32,818	36,280	111%
CIP_375	Health Care: In-patient	671,808	652,821	97%
CIP_067	Warehouse: Refrigerated	317,335	309,961	98%
CIP_353	Retail: Enclosed Mall	548,306	541,128	99%
CIP_238	Education: College, University, Vocational, Day Care, and K-12 w/ Summer Session	201,724	201,724	100%
CIP_337	Public Assembly	479,028	479,028	100%
CIP_194	Parking Structure	25,318	63,272	250%
CIP_317	Lodging (Hotel/Motel/Dorm): Common Areas	332,972	318,080	96%
CIP_242	Lodging (Hotel/Motel/Dorm): Common Areas	327,100	306,941	94%
CIP_201	Parking Structure	157,922	245,610	156%
CIP_360	Lodging (Hotel/Motel/Dorm): Common Areas	276,543	276,685	100%
CIP_298	Large Office	270,318	249,655	92%
CIP_357	Outdoor	236,976	236,975	100%
CIP_210	Large Office	327,725	578,451	177%
CIP_266	Education: K-12	176,108	176,108	100%
CIP_254	Retail: Excluding Malls & Strip Centers	139,416	147,874	106%
CIP_232	Education: K-12	127,429	157,658	124%
CIP_240	Education: College, University, Vocational, Day Care, and K-12 w/ Summer Session	166,730	164,609	99%
CIP_243	Large Office	84,622	46,352	55%
CIP_268	Education: K-12	90,496	90,496	100%
CIP_220	Retail: Enclosed Mall	89,282	89,282	100%
CIP_246	Education: College, University, Vocational, Day Care, and K-12 w/ Summer Session	560,364	560,360	100%
CIP_212	Large Office	69,283	69,283	100%
CIP_334	Lodging (Hotel/Motel/Dorm): Common Areas	62,639	62,638	100%
CIP_257	Large Office	10,885	7,110	65%
CIP_258	Food Sales: Non-24-hour Supermarket/ Retail	222,364	222,365	100%
CIP_239	Education: K-12	46,975	48,378	103%
CIP_209	Education: K-12	46,168	45,820	99%
CIP_261	Large Office	117,938	140,532	119%

CIP_322	Outdoor	39,411	39,411	100%
CIP_267	Education: K-12	124,284	109,447	88%
CIP_374	Outdoor	31,258	31,258	100%
CIP_282	Parking Structure	22,512	19,956	89%
CIP_291	Food Sales: 24-hour Supermarket/Retail	39,413	30,464	77%
CIP_320	Lodging (Hotel/Motel/Dorm): Common Areas	233,255	233,255	100%
CIP_325	Food Sales: 24-hour Supermarket/Retail	9,683	14,571	150%
CiP_343	Retail: Enclosed Mall	15,890	14,102	89%
CIP_244	Large Office	11,660	11,660	100%
CIP_347	Lodging (Hotel/Motel/Dorm): Common Areas	465,471	530,194	114%
CIP_372	Manufacturing – 1 and 2 Shift	130,421	122,622	94%
PN9-010	Large Office	1,769,000	1,197,787	68%
CIP_219	Retail: Enclosed Mall	8,492	8,492	100%
CIP_271	Large Office	7,264	7,264	100%
CIP_202	Large Office	5,912	5,912	100%

15.4.1.2 Large C&I Program level Realization

Using the realization rates presented in Table 15-13 the Evaluators extrapolated results from sampled sites to non-sampled sites in developing offering-level savings estimates. Table 15-15 presents results by stratum.

TABLE 15-15 LARGE C&I SOLUTIONS PROGRAM LEVEL REALIZATION RATE BY STRATUM

Stratum	# Sites	*Ex ante* Gross Energy Savings (kWh)	*Ex post* Gross Energy Savings (kWh)	kWh RR	*Ex ante* Gross Demand Reductions (kW)	*Ex post* Gross Demand Reductions (kW)	kW RR
1	25	587,433	638,477	109%	78.63	98.15	125%
2	24	2,556,386	2,673,750	105%	403.33	411.07	102%
3	22	6,678,683	7,004,216	105%	957.84	1,026.37	107%
4	8	6,426,561	6,336,339	99%	808.31	790.59	98%
5	5	12,501,679	11,972,481	96%	4,179.75	2,957.14	71%
Total	**84**	**28,750,741**	**28,625,263**	**100%**	**6,427.87**	**5,283.34**	**82%**

Table 15-16 shows the verified savings across the program.

TABLE 15-16LARGE C&I SOLUTIONS PROGRAM LEVEL REALIZATION

Ex ante Gross Energy Savings (kWh)	*Ex post* Gross Energy Savings (kWh)	Realization Rate kWh	*Ex ante* Gross Demand Reductions (kW)	*Ex post* Gross Demand Reductions (kW)	kW Realization Rate
28,750,741	28,625,263	100%	6,427.87	5,283.34	82%

15.4.1.3 Large C&I Causes of Savings Deviations

For illustrative purposes, the Evaluators have summarized these adjustments to kWh savings in Table 15-17.

TABLE 15-17 LARGE C&I CAUSES OF VARIANCE IN SAVINGS

Project ID(s)	Expected kWh Savings	Verified kWh Savings	Realization Rate	Causes of Variance in Savings
CIP_027	32,818	36,280	111%	The Evaluator used TRM prescribed HOU for outdoor athletic field for this project.
CIP_194	25,318	63,272	250%	The Evaluator used pre and post wattage information reflected in the APTIM calculator along with the prescribed TRM values.
CIP_201	157,922	245,610	156%	Original analysis used reported baseline wattages in the calculator because no documentation provided showed baseline fixture info or baseline fixture wattage. Updated to reflect APTIM provided MH1000, and MH400 fixtures.
CIP_210	327,725	578,451	177%	*ex ante* analysis used building modeling software. Since pre and post billing data was available, ADM opted to use the billing data to do an analysis normalized to TMY3 to calculate savings.
CIP_232	127,429	157,658	124%	The Evaluator found different AOH compared to what was shown in the ex-ante analysis files provided.
CIP_243	84,622	46,352	55%	The Evaluator used TRM deemed HOU for the lighting fixtures and the baseline fixture wattage identified in the APTIM calculator.
CIP_257	10,885	7,110	65%	Updated fixture counts and wattages to match the invoice. AOH set to TRM prescribed HOU for office.
CIP_261	117,938	140,532	119%	The Evaluator used the Baseline wattages outlined in the APTIM calculator to calculate the savings. HOU was updated to reflect the TRM deemed HOU.
CIP_267	124,284	109,447	88%	The Evaluator used the Baseline wattages outlined in the APTIM calculator to calculate the savings. HOU was updated to reflect the TRM deemed HOU.
CIP_282	22,512	19,956	89%	The Evaluator used TRM deemed HOU for the lighting fixtures.
CIP_291	39,413	30,464	77%	The Evaluator used the Linear ft shown in final invoice and the type of case was taken from provided photos. The Evaluator used the TRM deemed values for this project.
CIP_325	9,683	14,571	150%	TRM Prescribed values used in *ex post* calculations using information available in project documentation.
CiP_343	15,890	14,102	89%	The Evaluator used TRM deemed HOU for the lighting fixtures.
CIP_347	465,471	530,194	114%	Original value was based on TRM deemed HOU and had not been updated to show the 8760 HOU.
PN9-010	1,769,000	1,197,787	68%	The expected savings were calculated by taking the difference from past years energy usage and the post retrofit energy usage. *Ex post* energy savings were calculated by creating a regression model for the baseline condition and the post retrofit condition and then normalizing the models to TMY3 weather data to calculate the annual difference between pre and post conditions in a typical meteorological year.

15.4.1.4 Avoided Replacement Costs

The Evaluators have added the benefits of avoided replacement costs (ARC). The table below summarize the ARC by measure in Large C&I Solutions.

Information on methodology can be found in Section 3.4.1.3 Avoided Replacement Costs.

TABLE 15-18 SUMMARY OF ARC FOR LARGE C&I SOLUTIONS

Measure	*Ex post* Gross ARCs ($)	*Ex post* Net ARCs ($)	NPV ARCs ($)
Custom - LED	$874,064	$856,582	$856,582
Custom - Retrocommissioning	$0	$0	$0
Prescriptive - LED	$416,183	$416,183	$416,183
Custom - Cooling Tower	$0	$0	$0
Prescriptive - Lighting Controls	$0	$0	$0
Prescriptive - Chiller	$0	$0	$0
Custom - BMS	$0	$0	$0
Custom - VFD	$0	$0	$0
Prescriptive - Screw-Based LED	$9,552	$9,552	$9,552
Custom - HVAC	$0	$0	$0
Prescriptive - TA Incentive	$0	$0	$0
Prescriptive - AC Tune Up	$0	$0	$0
Prescriptive - HVAC	$0	$0	$0
Prescriptive - Refrigeration	$0	$0	$0
Prescriptive - Ida Recovery Fund	$0	$0	$0
Prescriptive - BMS	$0	$0	$0
Total	**$1,299,799**	**$1,282,318**	**$1,282,318**

Sums may differ due to rounding.

15.4.2 NET IMPACT FINDINGS

The net-to-gross for projects completed in the Large C&I program were determined from survey responses from program participants. The details of this survey can be found in the Process section following this section. The PY11 net-to-gross ratio is detailed in Table 15-19 below.

TABLE 15-19 SUMMARY OF LARGE C&I VERIFIED NET KWH SAVINGS AND NET PEAK KW REDUCTIONS

Verified Gross kWh Savings	kWh FR	Verified Net kWh Savings	kWh NTGR	Verified kW Reductions	kW FR	Verified Net kW Reductions	kW Net NTGR
28,577,139	13%	25,408,556	89%	5,283.34	4%	4,817.22	91%

15.4.3 PROCESS FINDINGS

The Evaluators conducted staff interviews as well as administered large commercial and industrial participant survey, and trade ally interviews.

15.4.3.1 Program Management and Delivery

15.4.3.1.1 *Staff Interviews*

The Evaluators interviewed two ENO staff members and two APTIM staff members. The goal of these in-depth staff interviews was to better learn more about program design and operations, as well as successes and challenges experienced during 2021 (PY11). Interviews lasted approximately 60 minutes and were conducted using the Microsoft Teams platform. All interviews were recorded with permission from the participants.

The following narrative provides an overall summary of the interviews.

- **There were not changes to program design or the mix of prescriptive measures offered.** Aside from some additional refrigeration measures, the prescriptive measures offered have remained the same. Rather than significantly expand the measures offered, program staff focused their efforts on novel marketing tactics, such as door-to-door distribution of kits and the online marketplace, for the existing measures. Program staff continue to the expand non-lighting projects.
- **Program staff continue to engage trade allies with the program.** In general, from the program staff perspective, trade allies are satisfied and engaged with the program. Staff indicated that they continue to send quarterly newsletters, communicate via the portal, as well as host meetings and trainings. Staff received positive feedback regarding the "Introduction to Energy Audits" training. At the time of the interview, most of the partnering trade allies are specific to lighting, so staff has begun to explore ways on how to attract a larger and more diverse pool of trade allies. Additionally, staff indicated that while trade allies are mostly pleased with the incentives, there have been complaints regarding processing time of the rebates.
- **In addition to energy saving goals, there are a variety of non-energy goals.** In addition to increasing energy savings, program staff note a variety of non-energy program goals. These goals include improving customer satisfaction, growing the trade ally network, and increasing the number of trade allies with diverse certifications.
- **Increased marketing and outreach efforts in PY11.** In response to low participation rates and the various challenges of PY11, ENO staff brought on external marketing and outreach team to help promote the program. Common marketing tactics included door-to-door visits, bill inserts, digital and social media marketing, ENO-sponsored trade ally trainings, as well as television, radio, and newspaper ads. Additionally, program staff introduced a "summer bonus" which involved a 25% increase in the incentive amount for various measures. Although program staff acknowledge that they likely will not meet their goals. This is due to external factors rather than a lack of creativity or effort in regard to outreach.

15.4.3.2 Participant Survey Results

The Evaluators conducted a survey to gain insight into customer satisfaction. Large C&I Solutions program participants were initially contacted by email to complete the online survey. The Evaluators also conducted phone surveys to follow up with the participants who had not responded to email requests. A $25 incentive was offered to customers who completed the survey. Seventeen participants completed the survey. Further details of the survey campaign can be found below, in the table below. The following section summarizes the findings from the participant survey. The precision of the survey is +/-10.3% at the 10% level of confidence.

TABLE 15-20 EMAIL CAMPAIGN AND RESPONSE RATE

Metric	
Number of customers contacted by email	63
Undeliverable emails	5
Number of customers contacted by phone	24
Incentives paid	$300
Completed	17
Response rate	27%

Seventeen customers completed responses to a survey about the Large C&I Solutions program. Just over half of survey respondents were managers (33%) or engineers (33%). Other positions included sustainability director, president/CEO, owner, or financial personnel. Among the customers surveyed, 40% reported completing an energy efficiency project within the last three years, and 17% of those who completed the project indicated they did not receive a rebate or discount.

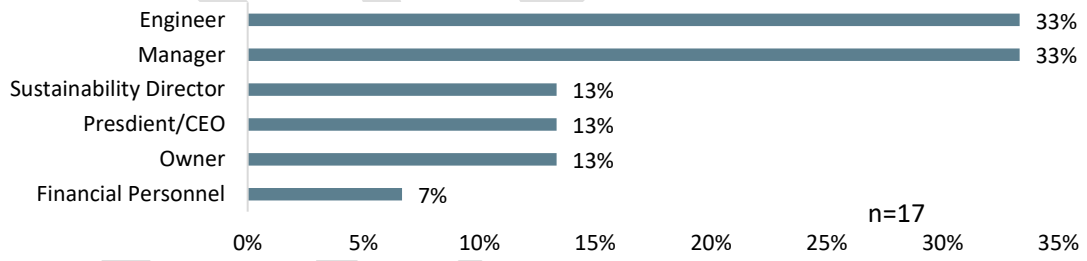

FIGURE 15-2 ROLE/POSITION WITH COMPANY

Most of the respondents surveyed indicated they had some type of specific policy requiring that energy efficiency should be considered when purchasing equipment, a person responsible for monitoring energy usage, defined energy savings goals, and/or carbon reducing goals.

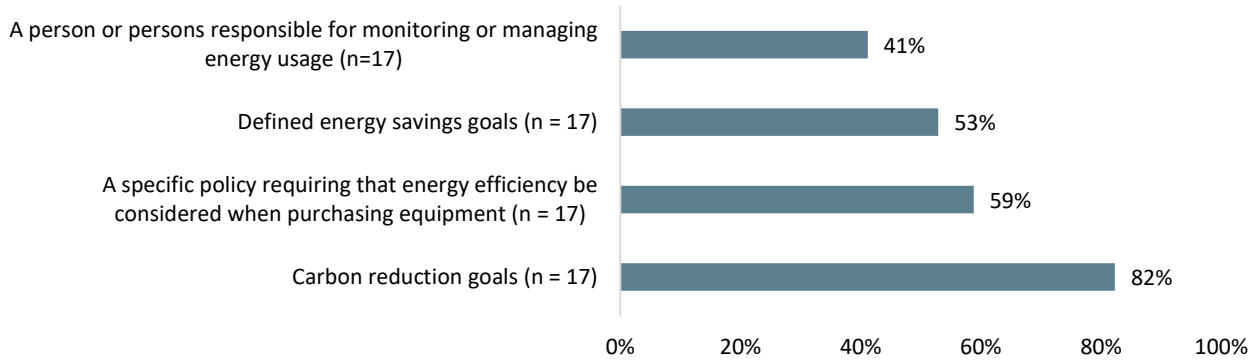

FIGURE 15-3 PERCENTAGE OF COMPANIES WITH ENERGY EFFICIENCY POLICIES

15.4.3.2.1 *How Customers Learned of the Program*

The most common reporting source of awareness was from a trade ally or program trade ally. Other common sources of awareness included Energy Smart representative (18%), program event or presentation (12%), and friends or colleagues (12%). Figure summarizes the common ways that customers learned of the Large Commercial Solutions offering.

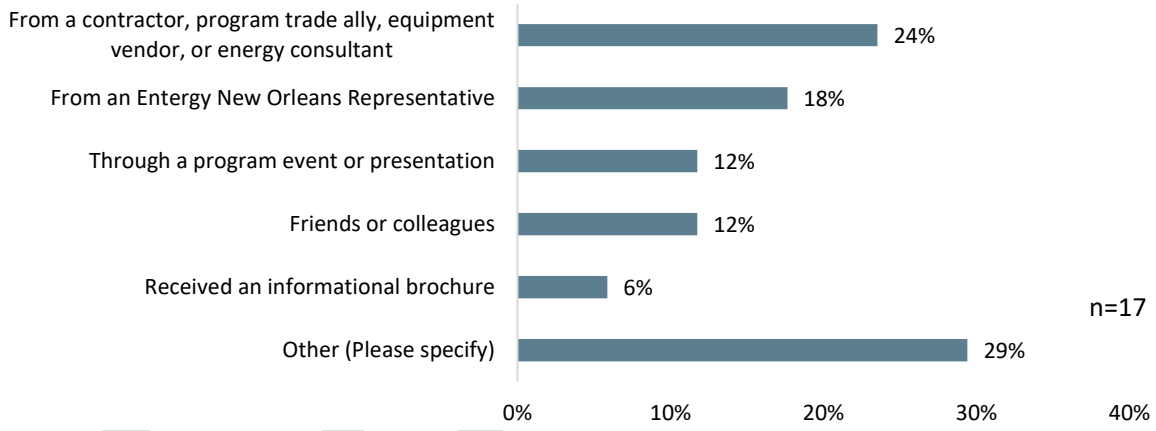

FIGURE 15-4 SOURCE OF PROGRAM AWARENESS

15.4.3.2.2 *Technical Services and Trade Allies*

Thirty percent of surveyed Large Commercial participants indicated they received application assistance, 33% received calculation assistance, and 26% received facility assessment from an Energy Smart representative. Among those who received a facility assessment or technical support (n=11), 36% indicated a commercial project upgrade was recommended.

Most large business customers (82%) reported working with a trade ally through the entire project (e.g., design through installation). Thirty-five percent of respondents reported that a trade ally who they had worked with before installed the equipment for their project (see Table).

TABLE 15-21 WHO INSTALLED THE QUALIFYING EQUIPMENT

Response	Percent of Respondents (n = 17)
A trade ally who we have worked with before	35%
A trade ally registered with the Energy Smart program	29%
My own staff	12%
A new trade ally that someone else recommended	18%
Other	6%

Three-quarters (75%) stated it was an easy decision when their trade ally first approached them about participating in the Large Commercial Solutions offering. Most surveyed participants agreed that the trade ally they worked with could answer most questions, made recommendations that made sense for their business, and was professional (see Figure). Many indicated they would recommend the trade ally to others.

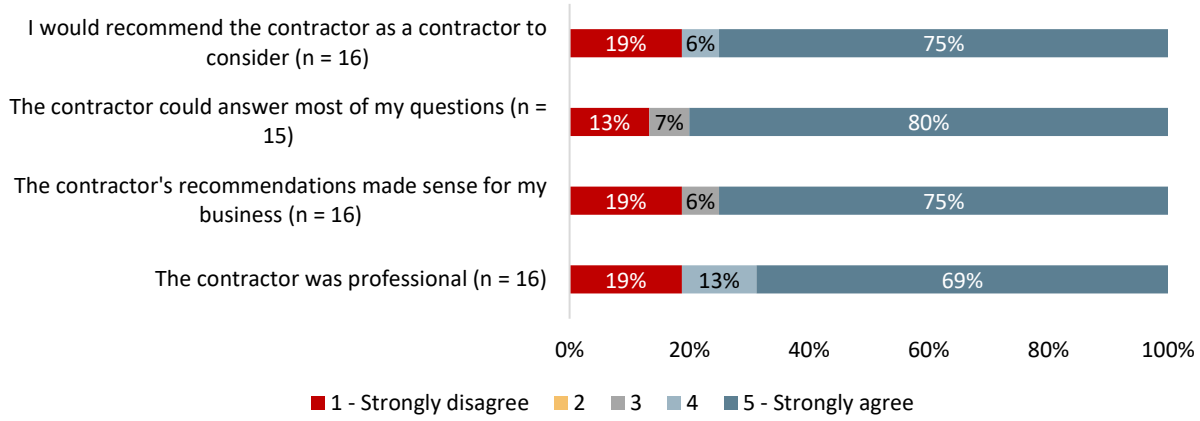

FIGURE 15-5 PARTICIPANT FEEDBACK ON TRADE ALLIES

Just over a quarter (27%) of respondents reported completing the application process on their own. Others received assistance from a trade ally (33%) or equipment vendor (18%) when completing their project application to receive the incentives, followed by 11% who reported help from APTIM or someone else from their company (Table).

TABLE 15-22 APPLICATION PROCESS SUPPORT

Response	Percent of Respondents (n = 23)
A trade ally	32%
Myself	27%
An equipment vendor	16%
Another member of your company	11%
A program representative (APTIM)	11%
A designer or architect	3%

Eighty-eight percent of the surveyed Large Commercial Solutions customers agreed that the overall application process was smooth. Additionally, most of survey respondents agreed that the time it took to approve the application was acceptable (82%), that the information on how to complete the application was clear (65%), and that providing the required invoices or other supporting documentation was effortless (83%). Most (71%) of the participants agreed that finding forms on the website was easy. More than half (59%) agreed that using the electronic application worksheets was easy.

Forty-one percent of respondents indicated the project cost was about what they expected it to be, while 24% reported it was more than what they had expected.

TABLE 15-23 PROJECT COST EXPECTATIONS

Response	Percent of Respondents (n = 17)
It was much less	24%
It was somewhat less	6%
It was what was expected	41%
It was somewhat more	12%
It was much more	12%

15.4.3.2.3 *Motivations for Participating*

Reducing energy costs was the main motivation for participating in the program. Eighty-two percent of respondents stated that they participated in the program to reduce their energy cost, and 71% of respondents stated they wanted to receive a rebate for the equipment. Table below summarizes the responses.

TABLE 15-24 REASONS FOR COMPLETING THE PROJECT

Response	Percent of Respondents (n = 17)
To reduce energy costs	82%
To replace old or outdated equipment	71%
To get a rebate from the program	71%
To reduce energy use/power outages	59%
To improve equipment performance	47%
To update to the latest technology	41%
To reduce maintenance costs on downtime and associated expenses for the old equipment	35%
As part of a planned remodeling, build-out, or expansion	29%
To improve the product quality	24%
To protect the environment	24%
To improve indoor air quality	18%
To improve health and safety	18%
To gain more control over how the equipment was used	12%
To comply with organizational policies regarding regular/normal maintenance/replacement policy	6%

*Responses add to greater than 100% because respondents could select multiple responses.

15.4.3.2.4 *Participant Satisfaction*

Most survey respondents were very satisfied with the Energy Smart Large Commercial Solutions offering. Sixty-three percent of large business survey respondents reported that after their project was completed a program representative conducted either a virtual or in-person inspection. Among those respondents, 80% agreed the inspector was courteous and efficient. Additionally, many were satisfied with the trade ally's' explanation of the program rules and processes, the trade ally they worked with, the proposal they received, and the technical assistance they received.

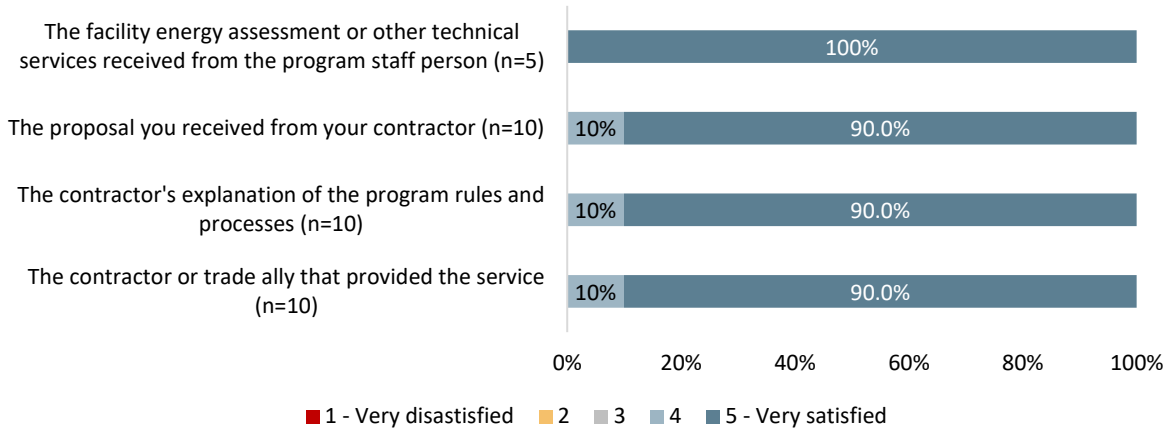

FIGURE 15-6 PARTICIPANT SATISFACTION WITH THE TRADE ALLIES AND TECHNICAL ASSISTANCE

Ninety percent of survey respondents were very satisfied with the range of equipment that qualified for the offering and with the equipment that was installed. Additionally, large business customers who participated in the program were satisfied with the amount of time it took to complete the project, the time between the audit and installation, and the steps to complete the project (Figure).

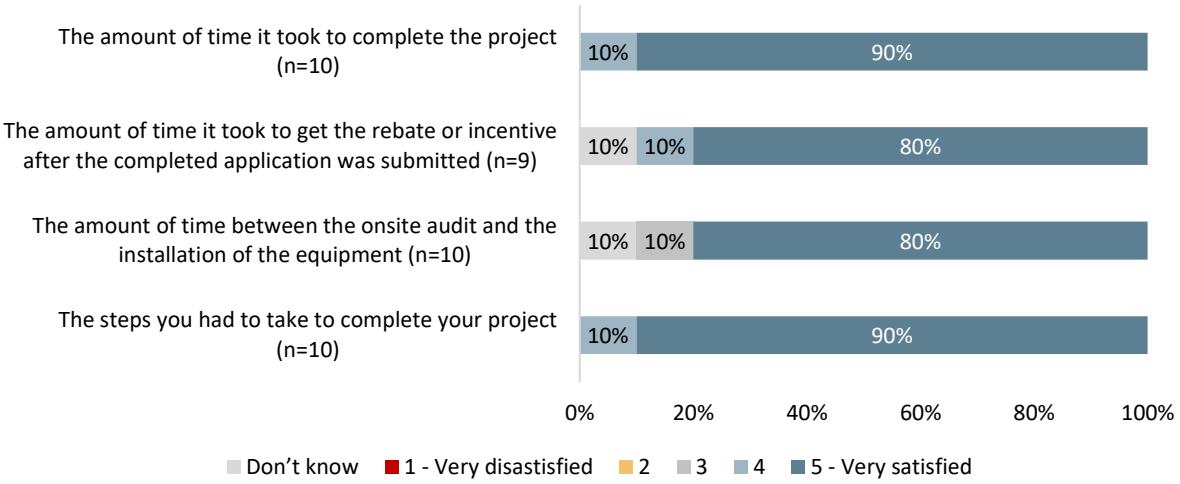

FIGURE 15-7 PARTICIPANT SATISFACTION WITH THE ASPECTS OF THE PROJECT

The majority of respondents (81%) were satisfied with ENO as their electric service provider. More than (56%) of those surveyed stated that they were very satisfied with ENOs as their electric service provider.

TABLE 15-25 SATISFACTION WITH ENOS

Response	Percent of Respondents (n = 16)
1 (Very dissatisfied)	6%
2	6%
3	0%
4	25%
5 (Very satisfied)	56%

Participants are likely to recommend the program to others. The majority (85%) of respondents agreed that they would recommend the Energy Smart Program to others. Two-thirds (67%) indicated they intend to initiate another energy efficiency improvement in the next 12 months. Just over half (56%) of respondents indicated they would be willing to help with program marketing.

15.4.3.2.5 *Firmographics*

Most participants stated that their company owns and occupies the property (88%). Lodging was the most common facility type, followed by retail (Figure 15-8). Most participants (87%) are billed directly by ENO.

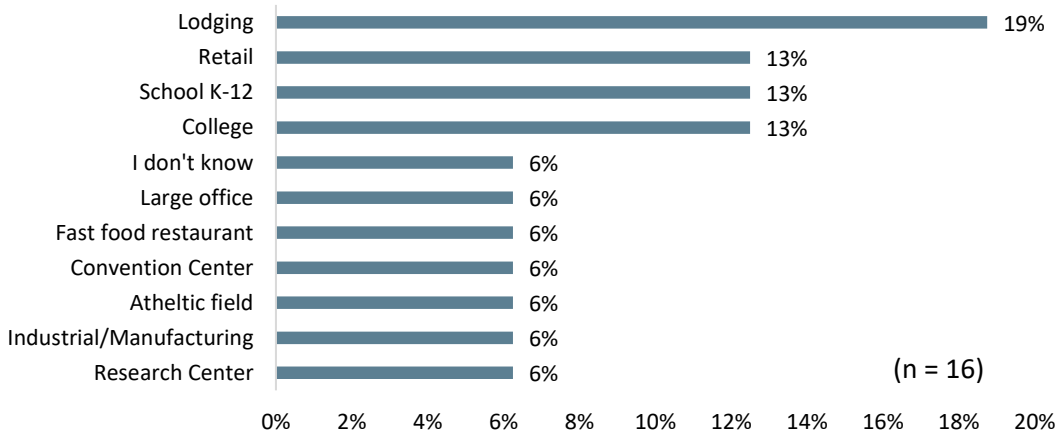

FIGURE 15-8 BUSINESS/FACILITY TYPE

15.4.3.3 Trade Ally Interview Results

The Evaluators analyzed survey responses from fifteen people who participated in the offering. The Evaluators conducted a survey using email invitations through an online survey platform and utilized phone calls to complete the survey telephonically. The evaluators sent a total of 49 survey invitations, of which one was undeliverable.

TABLE 15-26 EMAIL CAMPAIGN AND RESPONSE RATE

Metric	Number
Initially contacted via email	49
Undeliverable	1
Phone call attempts	56
Completed	15

The trade allies indicated they were satisfied with the Energy Smart Commercial Offering overall. Most survey respondents (82%) stated they were either "satisfied" or "completely satisfied" with the offering. Many expressed their satisfaction with communication between program staff (64%), incentive amount (73%), and the range of offering-qualifying equipment (91%). One respondent stated they were not satisfied because the experience they had with filling out paperwork. This respondent indicated the person they spoke with lacked the knowledge needed to assist them with the required paperwork. Another respondent stated they had frustrations with the paperwork and believed there was a lack of staffing available to process projects at the end of the year. See the figure below for additional feedback on aspects of the commercial programs.

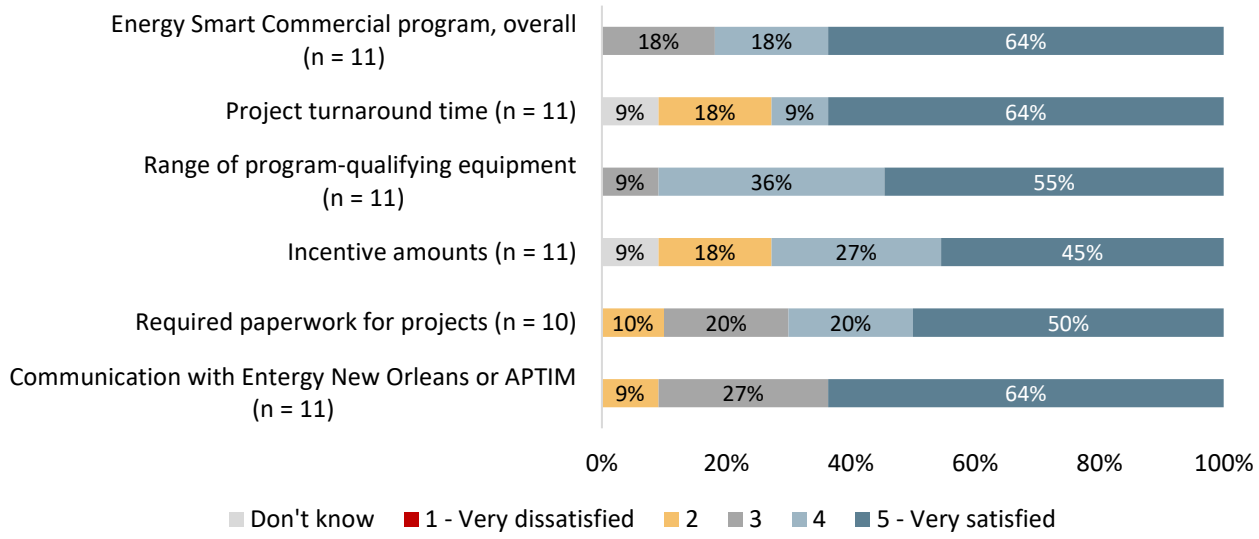

FIGURE 15-9 SATISFACTION WITH ASPECTS OF THE OFFERING

On average, trade allies have been active with this offerings for about 4.6 years. Among the trade allies who completed the survey or phone interview, 47% identified as owners, 27% were employees, 13% were executives, and another 13% were managers. Participation ranged from one to ten years among the respondents, with 45% indicating they have been completing projects for three years. Most of the trade allies specialize in a combination of lighting controls (71%), building automation systems (57%), general lighting (57%), or HVAC (43%). The table below summarizes the different offerings the trade allies have experienced.

TABLE 15-27 TRADE ALLIES EXPERIENCE WITH COMMERCIAL OFFERINGS

Response	Count
Large Commercial or Industrial	8
Small Business Solutions	6
New Construction	2
Retro-Commissioning	2
Publicly Funded Institutions (PFI)	1
Commercial Real Estate	1

In 2021, most trade allies have been able to complete one or more projects, ranging from one to 60. Two respondents indicated they have not completed any projects for Energy Smart in 2021. Forty-six percent of surveyed trade allies indicated the number of projects they completed in PY11 stayed the same compared to the previous year, followed by 31% who indicated there was an increase, and 23% who indicated there was a decrease.

Twenty-three percent of trade allies surveyed indicated their business specializes in lighting, followed by 21% who specialize in HVAC, and 15% who specialize in lighting controls.

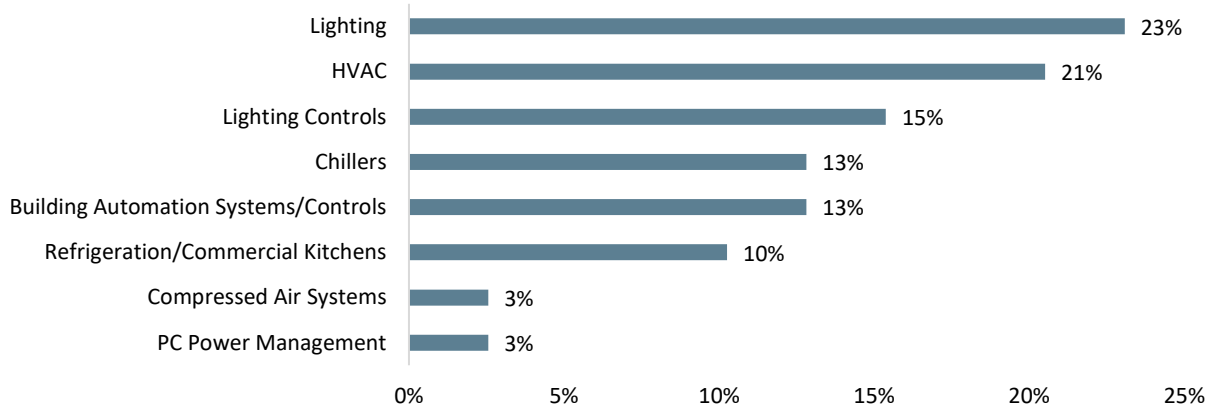

FIGURE 15-10 TYPE OF WORK THAT TRADE ALLIES SPECIALIZE IN

Most trade allies expressed challenges promoting certain measure to customers**.** Fifty-five percent of surveyed trade allies indicated there are measures in which the incentive amounts are too low to encourage adoption among the clients they serve. The measures identified included lighting, HIDs, CFM reduction, recreation facilities, and HVAC equipment. Among the surveyed trade allies, four said that additional measures should be added to the list of qualifying equipment. Examples of measures that should be added included expanding the prescriptive lighting offering and time-based exterior dimming. Additionally, one respondent stated removing pre-approval would help projects complete quickly.

Most trade allies always recommend high efficiency equipment to their customers. Fifty-seven percent of surveyed trade allies stated they always recommend high efficiency equipment, followed by 21% who recommend most of the time, and 14% who recommend some of the time. Most trade allies (77%) indicated that the Energy Smart program and the availability of incentives are extremely important in

influencing a customer's decision to install the recommended equipment. Additionally, 54% stated that the availability of the incentives is extremely important in influencing the likelihood of recommending high-efficiency equipment over standard equipment. Trade allies use various approaches with clients to promote energy efficiency. These approaches include email blasts, door-to-door canvassing, design services, printed materials, cost-benefit analysis, and other traditional forms of marketing. Ninety-one percent of surveyed trade allies characterized an increased acceptance of energy efficiency among the average business compared to the previous five years.

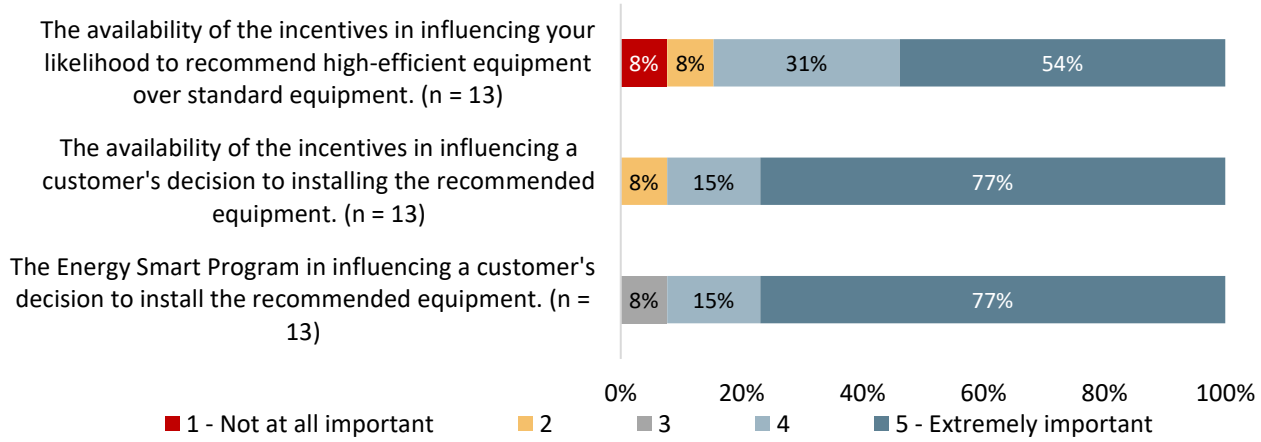

FIGURE 15-11 FACTORS THAT INFLUENCE ENERGY EFFICIENT EQUIPMENT PURCHASES

Trade allies tend to find a variety of approaches effective when working with customers to adopt energy efficient equipment. The strategies include showing the long-term pay back due to efficient equipment, the durability of the equipment, financial incentive, and other cost savings associated with energy savings. Most (55%) do not have Energy Smart marketing materials that they can use with customers. Among those who do have materials available, all stated they use them when talking with customers about the program. Among those who don't have materials, half believed they would be beneficial to have them available. According to trade allies, customers tend to purchase these items most of the time (57%) or some of the time (29%). Most trade allies (57%) expressed that they were satisfied with the longer prescriptive list of eligible measures updated this year. Cost, time, and effort on the part of customers are the main reasons cited by trade allies as to why their clients might not install energy efficient equipment.

Most trade allies observe barriers or obstacles to customers installing efficient equipment. Fifty-seven percent of surveyed trade allies indicated that their customers expressed obstacles for installing efficient equipment. The barriers cited by trade allies included pricing or cost of project, getting customers to provide personal information, material delay, COVID-19 pandemic related issues, and financing.

Five trade allies indicated they sometimes install program qualifying equipment in the territory but do not apply for program incentives. They cited the time it takes to approve projects, wait times for

incentives, cost of analysis, and some customers are not a fit for the program as the main reasons they may not apply for an incentive.

Most of the trade allies found the training conducted by ENOs or APTIM to be practical. Sixty-nine percent of trade allies received training from ENO or APTIM. All respondents indicated that ENOs offered an adequate amount of training opportunities in 2021. Sixty percent of trade allies who attended a training found it somewhat or extremely useful. Most surveyed trade allies (55%) prefer email for providing them information about program changes or updates, followed by 27% who indicated phone calls, 9% who said presentation, and another 9% who stated in-person visits.

Trade allies suggested improvements to outreach, incentives, and response times. One trade ally suggested that ENOs increase their outreach efforts to educate customers about the availability of the programs. “Some customers think it is too good to be true. ENO needs to separate themselves from historical perceptions of the program.” Another respondent suggested to improve response times and to provide the increase incentive earlier in the year. Additionally, this person suggested that ENO should coordinate with them when working directly with clients as it can create confusion for customers.

15.4.3.4 Commercial Midstream Literature Review

The Evaluators completed a review of commercial midstream programs, focusing on non-lighting measures. The purpose of this review was to provide information and insight into implementation of a similar program design. The Evaluators reviewed publicly available information on websites, evaluation reports, studies, and other publications related to midstream programs. There were a limited number of publicly available reports and studies.

15.4.3.4.1 *Commercial Midstream Program Design*

A midstream program focuses outreach and engagement up the supply chain at the distributor level. Programs target midstream market actors – distributors and trade allies. Midstream program designs typically involve a cooperative agreement or memorandum of understanding (MOU) with wholesale distributors to provide discounts on energy efficient equipment.

Incentive structures for midstream programs can vary and may include one or more components to the structure. One incentive structure can include a requirement that all or a portion of the incentive is to be used to buy down the cost to the customer. Another way to structure the incentives is to provide them directly to the distributor to use them to increase sales of the equipment. The last type of incentive structure covers specific costs associated with administering the program or training of staff.[62]

Incentive design should be easy for the distributor to understand and sufficient to drive sales, while remaining reasonable relative to the level of energy savings that the equipment can provide. Additionally, incentives should be provided to increase sales relative to the distributors baseline sales of the equipment to mitigate free-ridership risk. One approach is to provide a flat per-unit incentive structure that allows for distributors to anticipate payments. Incentive payments should be timely to

62 Michaels Energy (2018). *Midstream HVAC potential study*. Prepared for Efficiency Maine Trust.

keep distributor engaged and satisfied with the program. Additional stipends to offset costs of administering the program, providing training, and marketing the measures can be used to increase distributor buy-in. Additionally, allowing distributors flexibility in how they utilize the incentives (e.g., for training, system upgrades, sales bonuses) is a recommended practice.

The most common measures offered among midstream programs are lighting, HVAC equipment, kitchen equipment, and refrigeration equipment. Other measures offered in midstream programs may include motors and variable frequency devices, boilers, and water heaters. The next few sections will summarize some commercial non-lighting measures that are incented by utilities in various states.

15.4.3.4.2 *Commercial Midstream HVAC Incentives*

Commercial midstream HVAC offerings commonly offered include split systems, ductless, and packaged rooftop units. Less common incentive offers for HVAC components include high-performance circulator pumps, economizer controls, and VFDs. The table summarizes example midstream HVAC offerings with the incentive amounts by utility and state.

TABLE 15-28 MIDSTREAM HVAC INCENTIVES

Utility	State	Measure Name	Incentive Amount
Duke Energy[63]	SC, IN, NC, OH	High efficiency air-cooled and water-cooled electric chillers	Not listed
		High-efficiency ductless mini-split AC and heat pump upgrades	Not listed
		Unitary AC and heat pumps starting at 7 tons and above	Not listed
		Upgrade to a high efficiency packaged terminal AC	Not listed
		VFD (cooling only) upgrades for chillers (max. 200 HP), fans (max. 100 HP) and pumps	Not listed
Efficiency VT	VT	Heat pump heating and cooling system[64]	≤ 2 tons capacity $400; > 2 tons capacity $500
		High-performance circulator pump[65]	Tier 1: $15 Tier 2: $50 - $600
Entergy[66]	AR	VFD	$35/HP
Mass Saves[67]	MA	Air cooled air conditioner or heat pump	Tier 1 $25 - $30/ton; Tier 2 $37.50 - $50/ton; Tier 3 $62.50 - $100/ton
		Air cooled ductless mini and multi split system	Tier 1: $75/ton; Tier 2: $150/ton
		Dual enthalpy economizer controls installed with qualifying equipment	$125/unit
		Electronically commutated motor (ECM) circulator pumps for hydronic heating or service hot water installations	$100 - $200/unit
		Variable refrigerant flow (water and air cooled	$125/ton
		Water cooled air conditioner or heat pump	Tier 1 $20/ton; Tier 2 $40/ton; Tier 3 $75 /ton
PNM[68]	NM	Air conditioner	< 3 Tons AC: $73 - $337/unit 3-5.4 Tons AC: $76 - $568/unit 5.4-11.25 Tons AC: $146 - $715/unit 11.25-20 Tons AC: $283 - $1,115/unit 20-63 Tons AC: $513 - $1633/unit Packaged Terminal AC: $26 - $122/unit
		Heat pump	11.5-20 Tons HP: $552 - $606/unit 3-5.4 Tons HP: $39 - $592/unit 5.4-11.25 Tons HP: $340 - $490/unit Packaged Terminal HP: $57 - $124/unit
		Minisplit air conditioner	0.675-4 Tons Mini Split AC: $83 - $426/unit 0.675-4 Tons Mini Split HP: $37 - $508/unit
		Variable refrigerant flow	11.25-20 Tons VRF: $767 - $5,083/unit 20-63 Tons VRF: $1300 - $7,067/unit 5.4-11.25 Tons VRF: $422 - $4,792/unit

63 Duke Energy. (2021). *Smart Saver – Midstream Channel*.

15.4.3.4.3 *Commercial Kitchen and Refrigeration Equipment Incentives*

Midstream incentive offerings targeting kitchen and refrigeration equipment can be an opportunity to engage with small business customers seeking to upgrade equipment with high efficiency options. Common measures incented include combination ovens, convection ovens, fryers, griddles, pre-rinse sprayers, hot holding cabinets, ice machines, commercial dishwashers, steam cookers, and refrigerators/freezers. The table below summarizes examples of midstream programs that provide discounts for commercial kitchen equipment.

TABLE 15-29 MIDSTREAM KITCHEN EQUIPMENT PROGRAMS AND INCENTIVES

Utility	State	Measure Name	Incentive Amount
DTE[69]	MI	Combi oven	$1,800/unit
		ENERGY STAR convection ovens	$250/unit
		ENERGY STAR fryers	$150/unit
		ENERGY STAR griddles	$300/unit
		Pre-rinse sprayers	$30/unit
		ENERGY STAR hot holding cabinets	1/2 size: $300/unit 3/4 size: $400/unit Full size: $600/unit
		ENERGY STAR ice machines	< 500 lbs: $150/unit 500-1,000 lbs: $250/unit > 1,000 lbs: $500/unit
		ENERGY STAR steam cookers	3-Pan: $900/unit 4-Pan: $1,200/unit 5-Pan: $1,500/unit 6-Pan: $1,800/unit
		ENERGY STAR dishwasher	Under Counter: $150/unit High Temp: $800 /unit Low Temp: $1,250 /unit Multi Tank Conveyor: $1,750/unit
Duke Energy[70]	SC, IN, NC, OH	High-efficiency electric and combination ovens	Not listed
		High-efficiency electric dishwashers with conveyers	Not listed
		High-efficiency electric steam cookers and hot food holding cabinets	Not listed

64 Efficiency Vermont (n.d.). Ductless Heat Pumps. https://www.efficiencyvermont.com/rebates/list/heat-pump-heating-cooling-system

65 Efficiency Vermont (n.d.). High-Performance Circulator Pump. https://www.efficiencyvermont.com/rebates/list/high-performance-circulator-pumps

66 Entergy. (2022). *Entergy solutions: An Entergy Arkansas program*. Entergy Arkansas, LLC. https://www.entergy-arkansas.com/your_business/save_money/ee/commercial-midstream/

67 Mass Saves (n.d.). Commercial and Industrial Electric HVAC Program. https://www.masssave.com/en/saving/business-rebates/upstream-electric-hvac-program/

68 https://www.pnmenergyefficiency.com/distributor-discount/

69 DTE. (2019). Food service instant rebate program. DTE Food Service Counter Mat Insert. https://webtools.dnvgl.com/projects/Portals/8/Public%20Files/Food%20Service%20Current%20Rebates.pdf?ver=2019-04-03-092133-993

70 Duke Energy Corporation. (2022). *Midstream Foodservice*. Duke Energy. https://www.duke-energy.com/business/products/midstream/food-service

Utility	State	Measure Name	Incentive Amount
Focus on Energy[71]	WI	CEE tier II PRSV	$25/Valve
		ENERGY STAR commercial dishwasher	$200–$800/Unit
		ENERGY STAR fryer	$120–$250/Fry Pot
		ENERGY STAR griddle	$30–$50/Linear Foot
		ENERGY STAR hot holding cabinet	$160/Cabinet
		ENERGY STAR oven	Convection Oven: $300–$500/Oven Combination Oven: $300–$500/Unit Rack Oven: $300–$500/Unit
		ENERGY STAR steam cooker	$350–$700/Unit
		Ice machine	$50/Unit
		Infrared salamander broiler	$300/Broiler
		Kitchen hood ventilation controls	Temperature and Optical Sensing: $80–$600/Horsepower Controlled; Temperature Sensing Only: $40–$200/Horsepower Controlled
		Refrigerator/freezer	$100/unit
National Grid	MA, RI	Combi oven	$2,000/unit
		Convection oven	$500/unit
		Dishwasher high temp - door type	Door Type: $250/unit Multi Tank Conveyor: $100/unit Pot, Pan, Utensil: $100/unit Single Tank Conveyor: $100/unit Under Counter: $250/unit Door Type: $250/unit Multi Tank Conveyor: $100/unit Single Tank Conveyor: $100/unit Under Counter: $250/unit
		Griddle	$400/unit
		Ice machine	Ice Making Head: $250/unit Remote Cond./Split Unit - Batch: $200/unit Remote Cond./Split Unit - Continuous: $200/unit Self Contained: $100/unit
		Steam cooker	$1,000/unit
		Fryer large and standard vat	$150/unit
		Hot food holding cabinet	3/4 Size: $750/unit Full Size: $900/unit Half Size: $600/unit
PNM	NM	Energy efficient ice machines	101-500 lbs: $100/unit 501-1000 lbs: $225/unit 1001-1500 lbs: $350/unit > 1500 lbs: $400/unit
		ENERGY STAR ® commercial vat fryer	$225/unit
		ENERGY STAR ® griddle	$125/unit
		ENERGY STAR ® hot food holding cabinet	Half size: $200/unit 3/4 size: $300/unit Full size: $400/unit
		ENERGY STAR ® steam cooker	$400/unit
		ENERGY STAR® beverage vending machine	$800/unit

71 Focus On Energy. (2022). *Midstream solutions: focus on energy*. Focus On Energy: Partnering with Wisconsin Utilities. https://focusonenergy.com/midstream

Utility	State	Measure Name	Incentive Amount
		ENERGY STAR® solid door reach-in freezer	$100/unit
		ENERGY STAR combination oven	$800/unit
		ENERGY STAR® glass door reach-in freezer	$350/unit
SCE[72]	CA	Combi oven	< 15 pans $1,350/unit; > 28 pans $5,000/unit
		Convection oven	Half size: $350/unit Full size: $750/unit
		Deck oven	$1,250/deck
		Fryer	$650/unit
		Hand wrap	$125/unit
		Ice machine	<110 lbs./day Ice Machine: $50/unit 110-200 lbs./day Ice Machine: $75/unit >200 lbs./day Ice Machine: $100/unit <300 lbs./day Ice Machine: $75/unit 300 to 800 lbs./day Ice Machine: $125/unit 801 to 1500 lbs./day Ice Machine: $200/unit >1500 lbs./day Ice Machine: $300/unit <988 lbs./day Ice Machine: $200/unit 988 or greater lbs./day Ice Machine: $300/unit
		Steamer	$1,850/unit

The table below summarizes some examples of midstream programs that provide discounts for commercial refrigeration equipment.

TABLE 15-30 MIDSTREAM REFRIGERATION PROGRAMS AND INCENTIVES

Utility	State	Measure Name	Incentive Amount
DTE	MI	ENERGY STAR commercial glass/solid door refrigerators/freezers	< 15 cu. ft: $75/unit, 15-30 cu. ft.: $100/unit, 31-50 cu. ft.: $150/unit, > 50 cu. ft.: $200/unit
Duke Energy[73]	SC, IN, NC, OH	Display case motors	Not listed
		ENERGY STAR rated refrigerators and freezers	Not listed
	SC, NC, IN	LED display case lighting	Not listed
Efficiency VT	VT	Efficient evaporator fan motors[74]	$40 - $100/unit
		High efficiency condensing unit[75]	$600 - $2,000/unit

72 SCE. (2022). *Energy management online application tool*. Southern California Edison: Login. https://www.sceonlineapp.com/Login.aspx?ReturnUrl=%2fMidstreamPOP.aspx

73 Duke Energy (2019). *Food Service Instant Rebate Program*. https://webtools.dnvgl.com/projects/Portals/8/Public%20Files/Food%20Service%20Current%20Rebates.pdf?ver=2019-04-03-092133-993

74 Efficiency Vermont (n.d.). *Efficient Evaporator Fan Motors*. https://www.efficiencyvermont.com/rebates/list/evaporator-fan-motors

75 Efficiency Vermont (n.d.). *High Efficiency Condensing Unit*. https://www.efficiencyvermont.com/rebates/list/high-efficiency-condensing-unit

Utility	State	Measure Name	Incentive Amount
		High efficiency evaporators[76]	Tier 1: $150/fan; Tier 2: $250/fan
		Q sync motors[77]	Tier 1: $60/motor; Tier 2: $100/motor
National Grid[78]	MA, RI	Glass or solid door freezer	Volume less than 15 cubic feet: $100/unit, Volume of 15 - 29.9 cubic feet: $200/unit, Volume of 30 - 49.9 cubic feet: $150/unit, Volume of 50 cubic feet or more: $250/unit
		Glass or solid door refrigerator	Volume less than 15 cubic feet: $100/unit, Volume of 15 - 29.9 cubic feet: $150/unit, Volume of 30 - 49.9 cubic feet: $200/unit, Volume of 50 cubic feet or more: $250/unit
SCE	CA	Freezer	< 15 cubic feet Glass-Door Reach-In Freezer: $60/unit < 15 cubic feet Solid-Door Reach-In Freezer: $75/unit ≥ 50 cubic feet Glass-Door Reach-In Freezer: $515/unit 15 - 29 cubic feet Glass-Door Reach-In Freezer: $125/unit ≥ 50 cubic feet Solid-Door Reach-In Freezer: $350/unit 30 - 49 cubic feet Glass-Door Reach-In Freezer: $275/unit 15 - 29 cubic feet Solid-Door Reach-In Freezer: $100/unit 30 - 49 cubic feet Solid-Door Reach-In Freezer: $160/unit
		Refrigerator	< 15 cubic feet Solid-Door Reach-In Refrigerator: $45/unit, 15 - 29 cubic feet Glass-Door Reach-In Refrigerator: $60/unit, ≥ 50 cubic feet Solid-Door Reach-In Refrigerator: $120/unit, 15 - 29 cubic feet Solid-Door Reach-In Refrigerator: $60/unit, ≥ 50 cubic feet Glass-Door Reach-In Refrigerator: $100/unit, 30 - 49 cubic feet Glass-Door Reach-In Refrigerator: $80/unit, < 15 cubic feet Glass-Door Reach-In Refrigerator: $30/unit, 30 - 49 cubic feet Solid-Door Reach-In Refrigerator: $85/unit

15.4.3.4.4 *Example Midstream Programs*

15.4.3.4.4.1Baltimore Gas and Electric (BGE)

In 2018, BGE launched a midstream HVAC program that provided incentives for ductless heat pumps. The program stopped accepting downstream rebate applications from trade allies when it launched. Additionally, the program started during the shoulder season to minimize market disruption. Ductless

76 Efficiency Vermont (n.d.). *High Efficiency Evaporators*. https://www.efficiencyvermont.com/rebates/list/high-efficiency-evaporators

77 Efficiency Vermont (n.d.). *Q Sync Motors*. https://www.efficiencyvermont.com/rebates/list/q-sync-motors

78 Mass Saves (n.d.). *Instant Foodservice Rebates: Point-of-Sale Commercial Foodservice Initiative.* https://www.masssave.com/saving/business-rebates/food-service-equipment/instant-rebates/

heat pumps were the first measure introduced because these systems had lower program impact overall and allowed for time to train, recruit, and onboard distributors.

In-person and online trainings were provided for distributors. The training focused on the program guidelines and the online portal used for product and customer validation. Program marketing collateral was developed for distributors to display. The incentives offered to commercial customers varies by equipment type.[79]

Through the downstream offering, there had been eight ductless heat pump systems rebated by January 2018. In comparison, fifty-two ductless systems were discounted through the midstream program in January 2019. This result suggests that a midstream offering of ductless heat pumps was successful.

TABLE 15-31 BGE MIDSTREAM HVAC EQUIPMENT INCENTIVE AMOUNTS

Unit Type	Discount/Ton
Air Conditioning Unitary and Split Systems	$200
Air Source Heat Pumps Unitary and Split Systems	$200
PTAC & PTHP Single Package <9,000 Btu/h	$60
PTAC & PTHP Single Package ≥9,000 and <12,000 Btu/h	$80
PTAC & PTHP Single Package ≥12,000 Btu/h	$100
Ductless Mini Split Air Conditioner and Heat Pump	$100

15.4.3.4.4.2Xcel Energy Colorado

Xcel Energy Colorado offers an HVAC midstream rebate for commercial for packaged and split AC units, water source heat pumps, air-cooled chillers, and PTAC/PTHP units. An evaluation of the Xcel Energy midstream commercial HVAC program found that the program performed well in meeting its 2016 savings targets of 20,000 tons of cooling equipment. Because of the success, the savings goal was increased for the following year. During a two-year period, the midstream component accounted for 51.2% of *Ex ante* Gross Energy Savings (kWh) with the remainder accounted for prescriptive and custom downstream rebates.

The evaluation found that incentives were being used to increase product stocking, reductions in equipment costs, and an increased likelihood of informing engineers and architects of the benefits of high efficiency equipment. Trade ally interviews suggested that the availability of the midstream incentives increased the availably of some HVAC measures.[80]

Two observations were made of relationships between distributors and the types of HVAC equipment moved through the program that emphasize the need to work with multiple distributors. First, 11 distributors participated in the program and the program data showed that distributors tended to provide one or two of the four types of equipment discounted through the program (air cooled chillers,

79 BGE (2021). *HVAC equipment discounts*. BGE Smart Energy Savers Program. https://www.bgesmartenergy.com/business/hvac-equipment-discounts

80 EMI Consulting (2018). *Xcel Energy Colorado Cooling Efficiency Product 2017 Evaluation*. https://www.xcelenergy.com/staticfiles/xe-responsive/Company/Rates%20&%20Regulations/Regulatory%20Filings/Cooling-Efficiency-Evaluation.pdf

DX and RTUs, PTACs, and water source heat pumps). Thus, broad coverage of equipment types required participation from several distributors. Second, four of the eight equipment manufacturers, including the manufacture of the equipment that accounted for the largest share of savings, moved equipment through a single participating distributor.

Three distributor business models were identified in evaluation: a vertically integrated manufacturer/distributor model, a model where distributors sold equipment from multiple manufacturers, and a manufacturer representative model where the representatives do not stock equipment but develop sales for the manufacturers through working with trade allies and engineers. Manufacturer representatives largely used the incentives to discount the cost of the equipment. The evaluation found that the vertically integrated manufactures and distributors accounted for 55% of program savings and the manufacturer representative model accounted for 28% of savings.

15.4.3.4.4.3Focus on Energy Wisconsin

The Focus on Energy provides midstream discounts to utility customers for commercial kitchen equipment, ductless mini-split heat pumps, heat pump water heaters, and high performance circulator pumps. The commercial kitchen program provides incentives for distributors to pass through as point-of-sale discounts for commercial kitchens and boast of saving customers more than $5,300 per year on energy costs. Additionally, the program provided spiffs paid to distributors. The intent of the spiffs was to offset distributor overhead costs resulting from participation.

The net-to-gross ratio for the pilot program was 32%. The low net-to-gross ratio was a function of the program claiming savings for all units sold and not just incremental sales over a baseline sales volume. In other words, if a distributor normally sells 100 units of equipment but sold an additional 50 units it was attributed to the midstream program. Interviews with distributors provided some evidence of increased ENERGY STAR® equipment sales.[81] Nonparticipating distributor interviews were conducted as part of the evaluation, and they found additional labor required for paperwork and setting up a point-of-sale system as primary reasons for not participating. A lag between invoice submission and receipt of payment was also cited.

The pilot program was not found to be cost effective. The test used was a modified version of TRC that includes all benefits and costs to the state including emissions benefits. Incremental measure costs were a key factor – incremental costs exceed total benefits. Delivery costs equaled 24% of costs, a relatively large share that is likely a function of the small size of the pilot.

15.4.3.4.4.4DTE C&I Midstream Food Service Program

DTE provides instant rebates for high efficiency kitchen equipment to commercial customers. They partnered with food service equipment dealers to provide discounts on qualifying equipment. Qualifying electric equipment includes combination ovens, convection ovens, conveyor broilers, deck ovens, demand controlled kitchen ventilation, dishwashers, griddles, freezers, refrigerators, pre-rinse spray

81 Cadmus. (2019). *Focus on energy calendar year 2018 evaluation report.* Volume II. https://www.focusonenergy.com/sites/default/files/WI_FOE_CY_2018_Volume_II.pdf

valves, hot food holding cabinets, ice machines, ultra-low temperature freezers, and steamers. According to the PY2020 evaluation report, this program has high satisfaction rate among distributors at 92%. The net-to-gross findings decreased from 73% in PY2019 to 54% for PY2020.

15.4.3.4.5 *Advantages of Midstream Program Designs*

Midstream programs have the potential to provide several advantages over traditional downstream programs: 1) they can increase stocking of energy efficient equipment; 2) they can reduce transaction costs for customers and program staff; 3) they can increase educational opportunities for end-users and purchasers; and 4) they can strengthen ties between program administrators and market actors.

Increased stocking of equipment among distributors.[82] Midstream programs can increase stocking of efficient equipment among participating distributors either directly through the provision of stocking incentives or indirectly through reducing the cost of more expensive efficient equipment. This practice can reduce the amount of capital the distributor has tied up in stock. The impacts on stocking practices can potentially help to increase installations of equipment types that would typically require a special order and for which customers would be less willing to wait for delivery of ordered equipment.

Reduced transaction costs for customers and lower operating costs.[83] Downstream program designs require that each project submits an application which is reviewed by program staff. Additionally, purchasers are provided education on equipment qualifications and submission requirements. By working with a relatively small number of distributors, these costs can be reduced by leveraging the distributors to collect data on purchases and educate buyers. The design also helps to decrease outreach and marketing costs typically associated with downstream programs. Low-cost measures are most advantageous for midstream programs because of the reduced transaction and administrative costs.

Increased educational opportunities for end-users and purchasers.[84] Because distributors have established relationships with their clients, midstream programs have increased educational opportunities to inform end-user and purchasers on the benefits of efficient equipment options.

Strengthened ties between program administrators and market actors.[85] Midstream programs provide an opportunity for program administrators to develop relationships with distributors providing equipment in their service territory.

82 Bickel S. et al. (2016). *Swimming to midstream: New residential HVAC program models and tools.* ACEEE Summer Study on Energy Efficiency in Buildings.

83 Seryak, J. et al. (2015). *A midstream cogged v-belt pilot program: Concept and early challenges*. ACEEE Summer Study on Energy Efficiency in Industry.

84 ENERGY STAR. (2022). *Why it works: Understand how the market chain benefits when*. ENERGY STAR. https://www.energystar.gov/products/retailers/midstream_programs/why_it_works

85 Midstream Program Work Group. (2019). *In the matter of empower Maryland 2018 – 2020 energy efficiency, Conservation and demand response program plans pursuant to the empower Maryland energy act of 2008*. Status Report of the Midstream Program Implementation. https://webapp.psc.state.md.us/newIntranet/Casenum/NewIndex3_VOpenFile.cfm?filepath=//Coldfusion/Casenum/9400-9499/9494/Item_99/9494-MidstreamProgramInplementationStatusReport-wg-021519.pdf

15.4.3.4.6 *Disadvantages of Midstream Program Designs*

Despite the potential benefits of a well-implemented midstream program, there are some factors to consider when designing an offering. Things to consider during the design phase: incentives may not generate additional sales of energy efficient equipment, program setup costs may be prohibitive, data limitations and net-to-gross, and lack of customer contact opportunities.

Distributor incentives does not always result in additional sales of efficient equipment. Midstream incentives can result in distributor incentive payments without impacting sales of efficient equipment. This can happen when sales are based on the number of units sold without payments contingent on increased sales above a baseline sales volume.

Program implementation can be time intensive and expensive. The costs of setting up a midstream program can be high because of the investments in recruiting and building relationships with distributors, developing systems for capturing sales, training distributors on program requirements and data systems.

Data collection can be difficult and net-to-gross determination may be challenging.[86] The streamlined processes necessary for a midstream program result in a reduction of data collected about the project. The reduction of data collection can create challenges in supporting claimed program impacts. Programs need to focus on limiting data to collection of critical data needs to reduce administrative burdens that could reduce the effectiveness of the program. Early engagement with third-party evaluators to get agreement on key data needs is recommended.

Evaluators will need to take a thoughtful approach to determining net-to-gross for a midstream program. Spillover may pose a unique challenge to estimate because of the nature of the program design. Additionally, evaluators should consider shelf surveys, and/or sales data to estimate potential spillover.

Reduced customer contact opportunities. Midstream programs reduce the opportunity for the program administrator to interface with the customer. This reduced contact limits opportunities for the administrator to affect customer satisfaction and demonstrate the benefit of using rate-payer dollars to fund investments in energy efficiency.

15.4.3.4.7 *Implementation Tips*

Careful and thoughtful implementation plans are key to ensure successful outcomes of a midstream offering. A successful midstream program can enable programs to increase claimed saving results for the incentivized measures.[87] Below are a list of tips and suggestions while planning for implementation.

86 Quaid, M. & Geller, H. (2014). *Upstream utility incentive programs: Experience and lessons learned*. Southwest Energy Efficiency Project.

87 Backen, D. Burmester, C., & Sheehan, M. A. (2016). *Moving to the middle – How to navigate the ins and outs of C&I midstream programs*. Association of Energy Services Professionals.

Take a thorough approach to product selection.[88] Program administrators will need to decide what energy efficient equipment to include in their product mix for a midstream program. Equipment that is not well stocked, has high savings potential, but low downstream rebate volume, or are relatively low per unit cost and have low savings are ideal for a midstream program. High efficiency equipment that can replace less efficient equipment that is easy to communicate the benefits to end-users are also good options for incented measures.

Program administrators should make sure not to duplicate measures offered in a midstream program with those offered in a downstream program to prevent double counting of savings and incentive payments.

Involve likely distributors early in the design and implementation process. Getting early input and buy-in from distributors during the program design and implementation phase is important for program success. Distributors can provide critical details about their stocking practices, input on potential equipment to include in the product mix, feedback about the incentive structures and amounts needed to move product, and the information about the development of data collection procedures. The distributor input can support program implementation and evaluation without creating barriers to participation.

A key component of distributor involvement is to collect baseline data on products that are being considering for inclusion for the midstream offer. This data can help the decision-making process on what equipment to include in the product mix. Additionally, the data can assist in the establishment of a baseline sales volume that needs to be bested to provide sales-based incentives.

Provide training and collective feedback periodically. Program administrators should begin developing distributor training prior to program launch and carrying into the initial months of program operations. The training should include information on program requirements and data collection systems and processes.

Additionally, distributors should be encouraged to provide training to their customers including the trade allies and end-users that they work with. These trainings should focus on benefits of the program measures and encouraging their adoption. It would be advantageous for program administrators to conduct train-the-trainer events for distributors to ensure universal and cohesive messaging.

Feedback from distributors should be solicited periodically during the program, such as through monthly or quarterly calls, to identify opportunities to improve the program effectiveness and efficiency. Program administrators should remain flexible and adaptive in the early phases of implementation.

Provide marketing support and market to end-users.[89] Developing marketing materials and collateral for distributors and trade allies is a key component to a successful midstream program. Program

88 Milostan, C. et al. (2017). *Commercial midstream energy efficiency incentive programs: Guidelines for future program design, implementation, and evaluation*. Argonne National Laboratory: Energy Systems Division.

89 DNV GL (2017). *Upstream HVAC initiative process evaluation*. Massachusetts Program Administrators and Energy Efficiency Advisory Council.

administrators should provide distributors and trade allies with marketing support through materials such as in-store displays, educational pamphlets, and co-branded collateral to use with customers. These materials can also help promote awareness of the program discounts. Additionally, some promotion of the discounts to trade allies and end-users can help drive interest in and awareness of the measures.

15.4.3.5 Hurricane Ida and COVID-19 Pandemic Impacts

15.4.3.5.1 *Program Staff Perspective*

The program has remained adaptable in response to uncontrollable, outside forces. Both the ongoing COVID-19 pandemic, Hurricane Ida, and supply chain issues have resulted in unforeseen obstacles for program delivery. Although the Energy Smart Commercial programs are unlikely to reach the energy savings goal this year, program staff continue to demonstrate nimbleness and flexibility in their efforts to engage commercial and industrial customers. Staff note that they have been able to interact with customers in person and virtually, based on customer preference. Program staff provided higher incentives towards the end of the year than in years past and were more flexible regarding timelines and payments: "we want to try and remove all the barriers that we can. A lot of those things we do not have control over." Staff also talked about their strategy of targeting customers with high bills early in the year to jump start engagement. Overall, the pandemic and hurricane have taught staff that they "cannot be complacent"; they need to always be thinking of innovative ways to adapt and increase participation.

Hurricane Ida Recovery Fund was a successful addition to Energy Smart commercial programs. All program staff commented on the success of the Hurricane Ida Recovery Fund. Implemented in less than three weeks, the Ida Recovery Fund provided special funds for commercial customers impacted by the hurricane. C&I customers had to demonstrate damage to equipment that would be eligible for the funds (e.g., HVAC, chillers, refrigeration, lighting). Targeting customers that were hit particularly hard by the storm, the initiative received 80 applications, with 26 projects being funded: these projects represent over a million dollars' worth of incentives and 4.7 million kWh savings.

15.4.3.5.2 *Trade Ally Perspective*

The trade allies reported that COVID-19 pandemic affected them in some way during PY11. Table summarizes the extent of the impact, with 45% indicating COVID-19 pandemic greatly impacted them. Respondents provided feedback on ways they were impacted by the pandemic in PY11. Some trade allies indicated they lost staff, ran into challenges with face-to-face outreach with clients, business slowed down, supply chain issues, experienced increased cost of materials, and had financial concerns.

TABLE 15-32 IMPACT OF THE CORONAVIRUS PANDEMIC ON TRADE ALLIES

Categories	Percentage (n = 11)
1-Not at all impacted	9%
2	9%
3	18%
4	18%
5-Greatly impacted	45%
Prefer not to answer	0%

More than half of survey respondents indicated their organization was provided COVID-19 pandemic related trainings or materials through Energy Smart. Trade allies indicated the types of materials they received included monthly emails and pamphlets with COVID-19 pandemic protocols.

Three respondents indicated that the pandemic impacted their ability to participate in Energy Smart programs because of the difficulty in coordinating pre and post project inspections, the inability to canvas the area for potential clients, and labor shortages.

Increased cost of materials, labor shortages, supply chain issues, and increased cost of doing business impacted trade allies. Thirty-three percent of surveyed trade allies indicated they have been impacted by increased cost of materials in 2021, followed by 25% who were impacted by supply chain issues, 21% who were impacted by labor shortages, and another 21% who were impacted by the increased cost of doing business.

Most trade allies' operations were impacted by Hurricane Ida to some extent. Twenty-seven percent of surveyed trade allies indicated Hurricane Ida had a very significant impact on their business operations while nine percent stated it did not impact them at all (see Figure). Over half (55%) stated Hurricane Ida affected their ability to participate in ENOs' commercial energy efficiency programs.

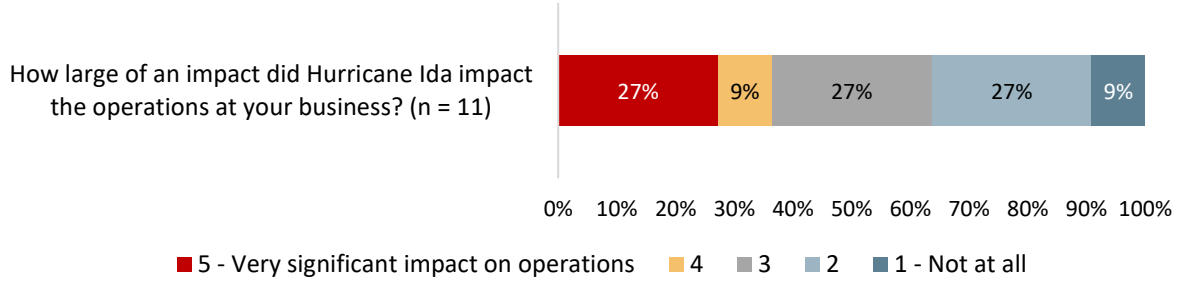

FIGURE 15-12 EXTENT OF IMPACT TO BUSINESS OPERATIONS DUE TO HURRICANE IDA

Four trade allies shared how their ability to participate in programs was impacted. Two respondents indicated the lack of power limited their ability to get to affected areas for weeks, and one respondent indicated the "devastation" to the region limited their ability to get there. Another stated they were able to offer their customers Ida recovery funds that were offered by ENO.

15.4.3.5.3 *Large C&I Participants' Perspectives*

More than half (57%) of large business customers surveyed reported that Hurricane Ida had a very significant impact on their operations. Over a quarter (29%) of respondents reported applying for ENOs' Hurricane Ida Recovery Funds; 21% did not know the fund existed.

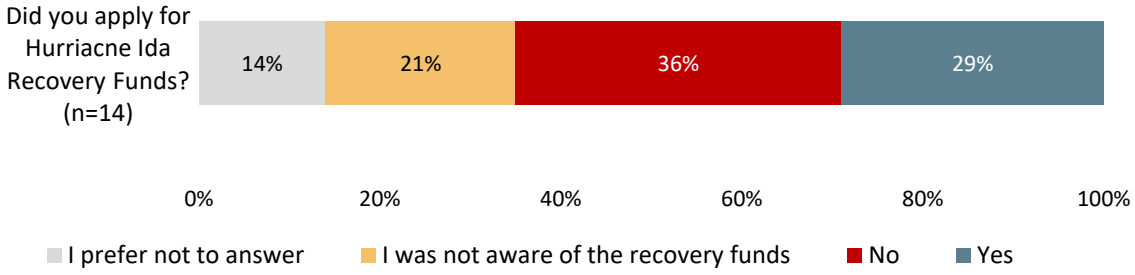

FIGURE 15-13: APPLY FOR HURRICANE IDA FUNDS

About a quarter of respondents reported experiencing an increase in the cost of materials (27%), labor supply issues (22%), increase in cost of doing business (24%), and supply chain issues (27%) during 2021.

15.5 Data Tracking Review

The Evaluators reviewed the tracking data provided and found the following issues. The following parameters were missing or incomplete for the program.

- **Measure Specific Information**: The tracking data lacked pre and post measure information such as fixture codes, fixture wattages, equipment size, and equipment efficiency.
- **Facility Conditioning Type**: The tracking data lacked information on the heating and cooling systems of the participating facilities. Without information on the heating fuel type, the evaluators are unable to calculate Therm savings in lighting retrofit projects.

The Evaluators note that a supplemental tracking dataset was provided for this program and a few others. This data had some additional fields. However, the Evaluators noted that there were few inconsistencies with total program kWh savings, total kW reductions, and total project counts. Since the two did not align, it was difficult to know which was the best and final to utilize in the Evaluation.

15.6 Key Findings and Recommendations

Program Management and Delivery Key Findings and Recommendations

- **Key Finding 1: There were not changes to program design or types of measures offered.** Aside from some additional refrigeration measures, the prescriptive measures offered have remained the same. Rather than significantly expand the measures offered, program staff focused their efforts on novel marketing tactics, such as door-to-door distribution of kits and the online marketplace, for the existing measures. Program staff continue to the expand non-lighting projects.

- **Key Finding 2: Increased marketing and outreach efforts in PY11.** In response to low participation rates and the various challenges of PY11, ENO staff brought on external marketing and outreach teams to help promote the program. Common marketing tactics included door-door visits, bill inserts, digital and social media marketing, ENO-sponsored trade ally trainings, as well as television, radio, and newspaper ads. Additionally, program staff introduced a "summer bonus" which involved a 25% increase in the incentive amount for various measures. Although program staff acknowledge that they likely will not meet their goals, it is "due to external factors. It is not from a lack of creativity or effort" regarding outreach.
    - ***Recommendation: Explore offering bonuses earlier in the year to spur project completions.*** *To increase project completions earlier in the year, program staff could explore unique opportunities to offer various bonuses earlier in the year and throughout the year.*

Participant Survey Findings and Recommendations

- **Key Finding 3: Trade allies were a key component to participants' experience with the Energy Smart Large C&I Solutions offering.** Trade allies or other trade allies were how most participants learned about Large C&I Solutions. Other common sources of awareness included from an Energy Smart representative or through a program event or presentation. Most large business customers reported working with a trade ally through the entire project (e.g., design through installation). Many of respondents reported that a trade ally who they had worked with before installed the equipment for their project. More than half of the survey participants stated it was an easy decision when their trade ally first approached them about participating in the offering. Additionally, many survey respondents were satisfied with the trade allies' explanation of the program rules and processes, the trade ally they worked with, the proposal they received, and the technical assistance they received.
- **Key Finding 4: Large C&I Solutions participants were mostly satisfied with application process, the offering, and ENOs**. Most participants agreed that the overall application process was smooth and agreed that the time it took to approve the application was acceptable. All survey respondents were very satisfied with the offering. Large business customers who participated in the program were satisfied with the amount of time it took to complete the project, the time between the audit and installation, and the steps to complete the project. Most respondents were satisfied with ENO as their electric service provider. Furthermore, many respondents agreed that they would recommend the program to others.

Trade Ally Interview Findings and Recommendations

- **Key Finding 5: The trade allies indicated they were satisfied with the Energy Smart Large C&I Solutions Offering overall.** Most respondents stated they were either somewhat or completely satisfied with the offering. Many expressed their satisfaction with communication between program staff, incentive amount, and the range of offering-qualifying equipment.

- ***Recommendation: Continue to engage trade allies and provide opportunities to gather their feedback****. Large C&I customers were generally satisfied with the trade ally they worked with throughout the project. This finding suggests that trade allies are integral to the success of the Energy Smart commercial offerings. Program staff should continue to engage the trade allies and create*

- **Key Finding 6: Most trade allies expressed challenges promoting certain measure to customers.** Over half of the interviewed trade allies indicated there are measures in which the incentive amounts are too low to encourage adoption among the clients they serve. Some of the trade allies provided suggestions for improving the commercial offerings. These recommendations included adding measures to the list of qualifying equipment, expanding prescriptive lighting, and removing pre-approval to help projects complete quickly.
  - ***Recommendation: Explore ways to incorporate suggestions from trade allies.*** *Program staff could create a systematic way to collect suggestions from trade allies and explore the feasibility of the recommendations. While not all suggestions may be feasible to incorporate immediately, trade allies are most familiar with market dynamics and may be able to provide real-time assessments of barriers to participation and opportunities to improve the offering.*
- **Key Finding 7: Most of the trade allies found the training conducted by ENOs or APTIM to be practical.** Most interviewed trade allies received training from ENO or APTIM. All respondents indicated that ENO offered an adequate amount of training opportunities in 2021. Sixty percent of trade allies who attended a training found it somewhat or extremely useful. Most surveyed trade allies (55%) prefer email for providing them information about program changes or updates, followed by 27% who indicated phone calls, 9% who said presentation, and another 9% who stated in-person visits.
  - ***Recommendation: Continue to offer adequate and up to date trainings to trade allies.*** *Program staff have been successfully offering training to trade allies and should continue to look for new training topics. Offering multiple modes of training (in-person, online/webinar, self-paced prepared education) to accommodate trade allies' preferences. When possible, incorporate training evaluations to ensure that training is adequate and appropriate.*

Midstream Literature Review Key Findings and Recommendations

- **Key Finding 8: Midstream programs focus outreach and engagement up the supply chain at the distributor level**. Programs target midstream market actors – distributors and trade allies. Midstream program designs typically involve a cooperative agreement or memorandum of understanding with wholesale distributors to provide discounts on energy efficient equipment.
- **Key Finding 9: Incentive structure and design should be easy for distributors to understand**. The incentives should also be sufficient to drive sales while remaining reasonable relative to the level of energy savings that the equipment can provide. Additionally, incentives should be provided to increase sales relative to the distributors baseline sales of the equipment to mitigate free-ridership risk.

One approach is to provide a flat per-unit incentive structure that allows for distributors to anticipate payments. Incentive payments should be timely to keep distributor engaged and satisfied with the program. Additional stipends to offset costs of administering the program, providing training, and marketing the measures can be used to increase distributor buy-in. Allow distributors flexibility in how they utilize the incentives.

- **Key Finding 10: Common measures offered among midstream programs are lighting, HVAC equipment, kitchen equipment, and refrigeration equipment.** Commercial midstream HVAC offerings commonly included in offerings include split systems, ductless, and packaged rooftop units. Less common incentive offers for HVAC components included high-performance circulator pumps, economizer controls, and VFDs. Midstream incentive offerings targeting kitchen and refrigeration equipment can be an opportunity to engage with small business customers seeking to upgrade equipment with high efficiency options. Common measures incented include combination ovens, convection ovens, fryers, griddles, pre-rinse sprayers, hot holding cabinets, ice machines, commercial dishwashers, steam cookers, and refrigerators/freezers.
- **Key Finding 11: There are several advantages and disadvantages to implementing a midstream commercial program.** Midstream programs have the potential to provide several advantages over traditional downstream programs: 1) they can increase stocking of energy efficient equipment; 2) they can reduce transaction costs for customers and program staff; 3) they can increase educational opportunities for end-users and purchasers; and 4) they can strengthen ties between program administrators and market actors. Despite the potential benefits of a well-implemented midstream program, there are some factors to consider when designing an offering. Things to consider during the design phase: incentives may not generate additional sales of energy efficient equipment, program setup costs may be prohibitive, data limitations and net-to-gross, and lack of customer contact opportunities.
    - ***Recommendation: Investigate the possibility of designing and implementing a commercial midstream pilot program.*** *Program staff could start by conducting outreach with distributors and other market actors to assess the readiness of implementing a midstream program. Staff could explore a pilot program with limited measures targeting hard to reach businesses (e.g., kitchen equipment for restaurants).*

Hurricane Ida and COVID-19 pandemic Key Findings and Recommendations

- **Key Finding 12: A significant proportion of large business customers surveyed reported being impacted by Hurricane Ida.** Most respondents stated that the hurricane did not affect their ability to participate in the Energy Smart program. About a quarter experienced increase in material cost, business cost, supply chain issues, and labor supply issues.
- **Key Finding 13: The program remained adaptable in response to uncontrollable, outside forces.** Both the ongoing COVID-19 pandemic, Hurricane Ida, and supply chain issues have resulted in unforeseen obstacles for program delivery. Although the Energy Smart Commercial programs are unlikely to reach the energy savings goal this year, program staff continue to demonstrate nimbleness and flexibility in their efforts to engage commercial and industrial customers.

Staff note that they have been able to interact with customers in person and virtually, based on customer preference. Program staff provided higher incentives towards the end of the year than in years past and were more flexible regarding timelines and payments. Staff also talked about their strategy of targeting customers with high bills early in the year to jump start engagement. Overall, the pandemic and hurricane have taught staff that they need to always be thinking of innovative ways to adapt and increase participation.

- **Key Finding 14: Hurricane Ida Recovery Fund was a successful addition to Energy Smart C&I programs.** All program staff commented on the success of the Hurricane Ida Recovery Fund. Implemented in less than three weeks, the Ida Recovery Fund provided special funds for commercial customers impacted by the hurricane. C&I customers had to demonstrate damage to equipment that would be eligible for the funds (e.g., HVAC, chillers, refrigeration, lighting). Targeting customers that were hit particularly hard by the storm, the initiative received 80 applications, with 26 projects being funded: these projects represent over a million dollars' worth of incentives and 4.7 million kWh savings.
- **Key Finding 15: Most trade allies were impacted by COVID-19 pandemic.** Forty-five percent of trade allies stated they were greatly impacted by COVID-19 pandemic in PY11. Some trade allies indicated they lost staff, ran into challenges with face-to-face outreach with clients, business slowed down, supply chain issues, experienced increased cost of materials, and had financial concerns. More than half of survey respondents indicated their organization was provided COVID-19 related trainings or materials through Energy Smart. Trade allies indicated the types of materials they received included monthly emails and pamphlets with COVID-19 pandemic protocols.
- **Key Finding 16: More than half of large business customers surveyed reported that Hurricane Ida had a very significant impact on their operations.** Over a quarter of respondents reported applying for ENOs' Hurricane Ida Recovery Funds. Twenty-one percent did not know the fund existed. Some large C&I customers reported experiencing an increase in the cost of materials, labor supply issues, increase in cost of doing business, and supply chain issues during PY11.
    - ***Recommendation: Remain adaptable to outside forces that significantly impact participation and engagement in the Energy Smart offerings.*** *Program staff, large commercial customers, and trade allies all noted that both COVID-19 pandemic and Hurricane Ida impacted their operations in PY11. Program staff will need to remain flexible to be able to adjust program to meet the needs of businesses (e.g., Hurricane Ida Recovery Funds).*

16 PUBLICLY FUNDED INSTITUTIONS

16.1 Summary

The tables below report *ex ante* gross, *ex post* gross, *ex post* net energy savings (kWh) (both annual and lifetime), demand reductions (kW), participation, and incentive spend, by measure, where applicable. Additionally, the tables above represent evaluation findings for each measure, whereas the analysis described in this chapter summarize the findings of the evaluation stratum.

TABLE 16-1 PY11 PFI ENERGY SAVINGS (KWH)

Measure	*Ex ante* Gross Savings (kWh)	Realization Rate (kWh)	*Ex post* Gross Savings (kWh)	NTG	*Ex post* Net Savings (kWh)
Custom BMS	2,272,096	89%	2,019,868	77%	1,555,298
Custom Retrocommissioning	1,153,532	94%	1,086,765	77%	836,809
Prescriptive LED	661,847	93%	614,495	100%	614,495
Custom LED	303,825	94%	285,671	98%	279,958
Prescriptive Screw-Based LED	8,494	61%	5,203	100%	5,203
Incentive Adjustment	0	N/A	0	N/A	0
Total	**4,399,794**	**91%**	**4,012,002**	**91%**	**3,291,763**

Sums may differ due to rounding.

TABLE 16-2 PY11 PFI DEMAND REDUCTIONS (KW)

Measure	*Ex ante* Gross Demand (kW)	Realization Rate (kW)	*Ex post* Gross Demand (kW)	NTG	*Ex post* Net Demand (kW)
Custom BMS	11.60	24%	2.74	77%	5.03
Custom Retrocommissioning	0.00	N/A	0.00	77%	0.00
Prescriptive LED	83.75	102%	85.19	100%	85.19
Custom LED	37.96	90%	34.19	98%	34.58
Prescriptive Screw-Based LED	1.52	76%	1.15	100%	1.15
Incentive Adjustment	0.00	N/A	0.00	N/A	0.00
Total	**134.83**	**91%**	**123.27**	**82%**	**121.95**

Sums may differ due to rounding.

TABLE 16-3 PY11 PFI LIFETIME SAVINGS SUMMARY

Measure	EUL	*Ex post* Gross Lifetime Energy Savings (kWh)	*Ex post* Net Lifetime Energy Savings (kWh)
Custom BMS	8	16,158,943	12,442,386
Custom Retrocommissioning	10	10,867,645	8,368,087
Prescriptive LED	15	9,217,424	9,217,424
Custom LED	15	4,285,070	4,199,369
Prescriptive Screw-Based LED	9	46,827	46,827
Incentive Adjustment	N/A	0	0
Total	**10**	**40,575,909**	**34,274,092**

Sums may differ due to rounding.

TABLE 16-4 PY11 PFI COUNT OF MEASURES AND INCENTIVE SPEND

Measure	Participation (Count of Measures)	Incentive Spend ($)
Custom BMS	6	$201,450
Custom Retrocommissioning	6	$51,740
Prescriptive LED	16	$57,746
Custom LED	5	$27,791
Prescriptive Screw-Based LED	1	$264
Incentive Adjustment	1	$491
Total	**35**	**$339,483**

Sums may differ due to rounding.

16.2 Program Description

The Publicly Funded Institutions (PFI) program provides financial incentives and technical services to encourage the participation of publicly funded customers. The program is designed to help this customer segment overcome barriers to energy improvement, such as higher first-cost of efficiency equipment and a lack of technical knowledge or resources.

The incentives are based on the total demand (kW) of the facility; above or below 100 kW. Rates for both facility demand groups are provided are summarized below in Table 16-5.

TABLE 16-5 PFI SUMMARY OF PROGRAM INCENTIVES

Measure	Incentive	
Facility Demand	**Small (<100 kW)**	**Large (>100 kW)**
Prescriptive	$ per unit	$ per unit
Custom Lighting	$0.12 per kWh Saved	$0.10 per kWh Saved
Custom Non-	$0.12 per kWh Saved	$0.12 per kWh Saved

16.2.1 PROGRAM CHANGES

There were no reported changes to this program.

16.2.2 PROGRAM ACTIVITY

The PY11 program was open and available to customers between January 1, 2021, and December 31, 2021. Project documentation showed that during PY11, there were fifteen projects completed. These fifteen projects have a total expected energy savings of 4,399,794 kWh and a peak demand reduction of 134.83 kW.

TABLE 16-6 PFI SAVINGS EXPECTATIONS BY UTILITY

Project Count	Measure Count	*Ex ante* Gross Energy Savings (kWh)	*Ex ante* Gross Demand Reductions (kW)
15	5	4,399,794	134.83

TABLE 16-7 PFI SAVINGS EXPECTATIONS BY MEASURE TYPE

Program Component	Program Component	Count of Project Components	*Ex ante* Gross Energy Savings (kWh)	*Ex ante* Gross Demand Reductions (kW)	Percent Savings (kWh)
Custom	BMS	6	2,272,096	11.60	51.64%
	RCx	6	1,153,532	-	26.22%
	Lighting	5	303,825	37.96	6.91%
Prescriptive	Lighting	17	670,341	85.27	15.24%
Total		**34.00**	**4,399,793.70**	**134.83**	**100.00%**

PY11 saw a significant increase in expected energy savings while maintaining a similar number of projects. The year-to-year comparison is in the table below.

TABLE 16-8 PFI PARTICIPATION SUMMARY COMPARISON

Project Year	# Projects	Expected kWh	kWh per Project
PY7 (nominal)	3	814,317	271,439
PY7 (normalized)	4	1,085,756	271,439
PY8	20	2,898,984	144,949
PY9 (nominal)	16	3,449,536	215,596
PY9 (normalized)	13	2,759,629	212,279
PY10 (nominal)	13	1,924,976	148,075
PY10 (normalized)	17	2,566,635	150,979
PY11	15	4,399,794	293,319

The PFI program had the largest number of projects completed in July (five projects) and saw its largest expected energy reduction claimed in April (1,148,480 kWh) which was 26.1% of the total expected

energy savings for the year. Figure 16-1 below shows the monthly participation throughout PY11 for the PFI program.

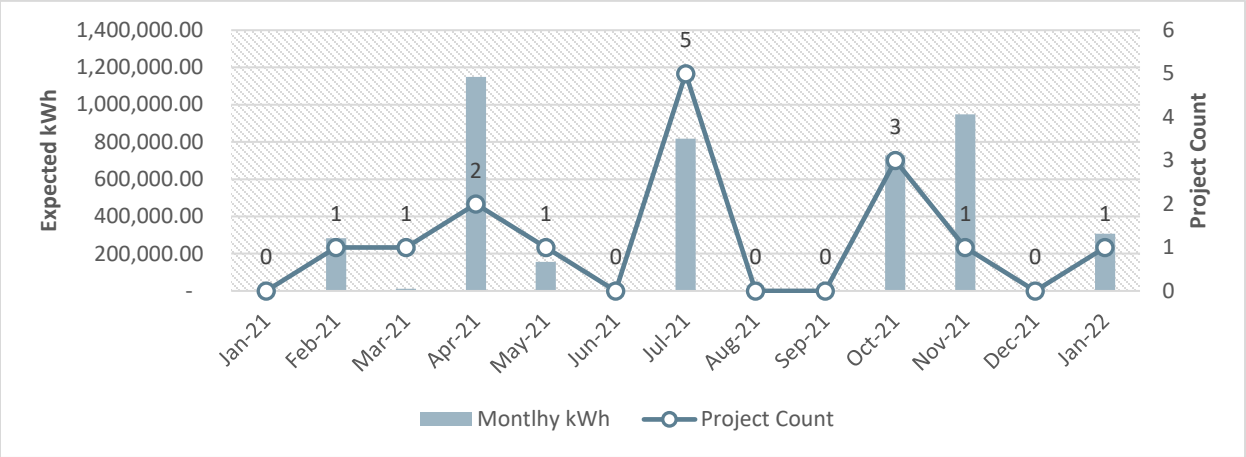

FIGURE 16-1 PFI MONTHLY PARTICIPATION

16.2.3 GOAL ACHIEVEMENT

In PY11, the PFI program had a verified savings of 3,017,487 kWh and a verified peak demand reduction of 125.94 kW.

TABLE 16-9 PFI SUMMARY OF GOAL ACHIEVEMENT

Ex post Gross Energy Savings (kWh) Goal	% to kWh Goal	*Ex post* Gross Energy Savings (kWh)	*Ex post* Gross Savings (kW) Target	% to kW Target	*Ex post* Gross Savings (kW)
3,385,031	119%	4,012,002	445.06	28%	123.27

16.3 EM&V Methodology

Evaluation of the PFI offering requires the following:

- Stratified Random Sampling (as detailed in Section 3.3.) and by selecting large saving sites with certainty.
- No On-site verifications were conducted, desk reviews of all nine sampled; and
- Interviewing of program participants and trade allies.

Energy savings was estimated using proven techniques, including engineering calculations using industry standards to determine energy savings. Methods for evaluating lighting measures are described in the Small Commercial & Industrial Solutions Chapter, section 1.2.1 M&V Methodology.

16.3.1 SAMPLE DESIGN

Sampling for evaluation of ENOs' PFI offering was developed using the Stratified Random Sampling procedure detailed in Section 3.3. This procedure provides 90% confidence and +/- 10% precision with a significantly reduced sample than simple random sampling would require by selecting the highest saving

facilities with certainty, thereby minimizing the variance that non-sampled sites can contribute to the overall results. Table 16-10 summarizes the total participation in the PY10 PFI offering.

TABLE 16-10 PY11 PFI OFFERING PARTICIPATION AND SAMPLING SUMMARY

# Projects	Expected kWh	Expected Peak kW	Sample Size
15	4,399,794	134.83	10

The participant population was divided into four strata. Table 16-11 summarizes the strata boundaries and sample frames for the program. Table 16-11 summarizes expected savings for of both the sample and population. The achieved sampling precision was ±9.1% at 90% confidence.

TABLE 16-11 PFI OFFERING SAMPLE DESIGN

	Stratum 1	Stratum 2	Stratum3	Stratum 4	Totals
Strata boundaries (kWh)	< 100,000	100,000 - 300,000	200,001 - 500,000	500,001<	
Number of projects	4	2	5	4	15
Total kWh savings	46,869	296,861	1,409,563	2,646,501	4,399,794
Average	11,717	148,431	281,913	661,625	1,103,686
Standard deviation	3,970	9,971	55,510	192,762	293,320
Coefficient of variation	0.34	0.07	0.20	0.25	270,762.82
Final design sample	3	1	3	3	10

TABLE 16-12 PFI EXPECTED SAVINGS FOR SAMPLED AND NON-SAMPLED PROJECTS BY STRATUM

Stratum	Total Expected Savings	Sampled Expected Savings
1	46,869	29,427
2	296,861	155,481
3	1,409,563	875,011
4	2,646,501	2,042,969
Total	**4,399,794**	**3,102,888**

16.4 Evaluation Findings

16.4.1 GROSS IMPACT FINDINGS

16.4.1.1 PFI Project Level Results

Sites chosen within each stratum were reviewed to verify installation of rebated equipment. The reviewed information was used to perform calculations to determine the *ex post* verified savings. The realization rates for sites within each stratum were then applied to the non-sampled sites within their respective stratum. These realization rates are shown in Table 16-13 below:

TABLE 16-13 SUMMARY OF PFI KWH SAVINGS FOR PFI OFFERING BY SAMPLE STRATUM

Stratum	Sample *Ex ante* Gross Energy Savings (kWh)	Sample *Ex post* Gross Energy Savings (kWh)	Realization Rate
1	29,427	18,900	64%
2	155,481	147,635	95%
3	875,011	842,662	96%
4	2,042,969	1,801,925	88%

The specific site level realization rates are shown in Table 16-14 below.

TABLE 16-14 PFI EXPECTED AND VERIFIED SAVINGS BY SAMPLED PROJECT

Project ID(s)	Facility Type	*Ex ante* Gross Energy Savings (kWh)	*Ex post* Gross Energy Savings (kWh)	Realization Rate
CIP_198	Education: College, University, Vocational, Day Care, and K-12 w/ Summer Session	544,948	511,174	94%
CIP_021	Small Office	232,052	207,637	89%
PN9-012	Public Assembly	550,000	541,176	98%
CIP_221	Education: College, University, Vocational, Day Care, and K-12 w/ Summer Session	360,300	359,987	100%
CIP_205	Education: K-12	8,494	5,203	61%
CIP_222	Education: K-12	9,766	2,182	22%
CIP_227	Public Order and Safety	948,021	749,575	79%
CIP_199	Education: K-12	155,481	147,635	95%
CIP_191	Education: College, University, Vocational, Day Care, and K-12 w/ Summer Session	11,166	11,515	103%
PN8-013	Public Assembly	282,659	275,038	97%
Total		**3,102,888**	**2,811,122**	**91%**

16.4.1.2 PFI Program Level Results

Using the realization rates presented in Table 16-13, the evaluators extrapolated the results from the sampled projects to non-sampled projects to determine the program level verified results.

TABLE 16-15 PFI OFFERING LEVEL REALIZATION BY STRATUM

Stratum	# Sites	*Ex ante* Gross Energy Savings (kWh)	*Ex post* Gross Energy Savings (kWh)	Realization Rate kWh	*Ex ante* Gross Demand Reductions (kW)	*Ex post* Gross Demand Reductions (kW)	Realization Rate kW
1	4	46,869	29,756	63%	9.23	7.45	81%
2	2	296,861	281,880	95%	27.93	32.75	117%
3	5	1,409,563	1,353,490	96%	10.31	0.00	0%
4	4	2,646,501	2,346,875	89%	87.36	83.07	95%
Total	**15**	**4,399,794**	**4,012,002**	**91%**	**134.83**	**123.27**	**91%**

The overall *ex post* gross energy savings (kWh) in PY11 are 4,012,002 kWh and 123.27 kW resulting in realization rates of 91% and 91% respectively.

16.4.1.3 PFI Causes of Savings Deviations

For illustrative purposes, the Evaluators have summarized these adjustments and others in Table 16-16.

TABLE 16-16 PFI CAUSES OF VARIANCE IN KWH SAVINGS

Project ID(s)	*Ex ante* Gross Energy Savings (kWh)	*Ex post* Gross Energy Savings (kWh)	RR	Causes of Variance in Savings
CIP_021	232,052	207,637	89%	The expected savings were calculated by taking the difference from past years energy usage and the post retrofit energy usage. *Ex post* energy savings were calculated by creating a regression model for the baseline condition and the post retrofit condition and then normalizing the models to TMY3 weather data to calculate the annual difference between pre and post conditions in a typical metrological year.
CIP_205	8,494	5,203	61%	The expected savings were calculated using a fixed kWh per fixture replaced rather than calculating savings using pre and post fixture wattages. Following the methodology outlines in the New Orleans TRM and using the pre and post fixture wattages yielded a lower verified savings.
CIP_222	9,766	2,182	22%	The implementer calculator claimed post fixture wattages of 10 and 14W. Invoice showed fixture wattages of 40 and 35W. Updated wattages to match invoice. TRM prescribed HOU used. Updated baseline fixture wattage per APTIM calculator.
CIP_227	948,021	749,575	79%	The analysis that was conducted to generate the expected savings calculated different hours of use for the facilities HVAC equipment due to how the expected savings treated on/off hours and found evidence of a different building schedule than what was used in the ex-ante estimate. The hours of use used in the ex-post analysis yielded a lower verified savings.

16.4.2 NET IMPACT

The net-to-gross for projects completed in the PFI program were determined from survey responses from program participants. The details of this survey can be found in the Process section following this section.

Net impacts can be found in Section 16.1 Summary.

16.4.2.1 Avoided Replacement Costs

The Evaluators have added the benefits of avoided replacement costs (ARC). The table below summarize the ARC by measure in PFI.

Information on methodology can be found in Section 3.4.1.3 Avoided Replacement Costs.

TABLE 16-17 SUMMARY OF ARC FOR PFI

Measure	*Ex post* Gross ARCs ($)	*Ex post* Net ARCs ($)	NPV ARCs ($)
Custom BMS	$0	$0	$0
Custom Retrocommissioning	$0	$0	$0
Prescriptive LED	$57,618	$57,618	$57,618
Custom LED	$10,040	$7,731	$7,731
Prescriptive Screw-Based LED	$77	$77	$77
Incentive Adjustment	$0	$0	$0
Total	**$67,735**	**$65,426**	**$65,426**

Sums may differ due to rounding.

16.4.3 PROCESS FINDINGS

The Evaluators conducted staff interviews as well as administered a participant survey, and trade ally interviews.

16.4.3.1 Program Management and Delivery

Methods and findings related to the staff interview from the Publicly Funded Institutions are presented in the Large C&I Process section.

16.4.3.2 Participant Survey Results

The Evaluators conducted a survey of PFI participants for PY11. The evaluators sent an email invitation to five PFI participants to complete the online survey, with two additional reminders and phone calls to solicit additional responses. Two emails were undeliverable. A $25 incentive was offered to customers who completed the survey. A total of two participants completed the survey (29% response rate). Below are the key findings from the survey results. The precision of the survey is +/- 31.9% at the 10% level of confidence.

- **Educational settings were common for PFI survey respondents.** One project was completed at a college facility, and the other was at a K-12 school. One of the survey respondents was a facilities manager, and the other was a grants manager. One customer indicated a person at their company was responsible for monitoring or managing energy usage, while the other did not. Both program participants own and occupy the facility where the project was completed.
- **PFI participants received technical assistance through the Energy Smart program.** Although both customers received calculation and application assistance, one indicated they received a facility assessment from an Energy Smart program representative. Without the recommendation from a program representative, one of the participants would not have made the upgrades. Finally, an ENOs account representative is how one PFI participant learned of the offering, and the other learned of it through a trade ally.

- **Trade allies were very involved with the PFI customers' projects.** Both survey respondents worked with their trade ally/trade ally through the entire project (e.g., design to installation). One participant hired a trade ally they worked with previously to install the equipment, and the other hired a trade ally registered with the Energy Smart program. When the trade ally first approached the customers about participating in the program, one indicated it was an easy decision, and the other had concerns about the upfront costs. Yet, the latter decided to participate despite their concerns due to the savings. Both customers agreed that their trade ally was professional, and their recommendations made sense for their facility. According to the participants, the trade allies could answer most of their questions. Finally, they indicated they would recommend the trade ally to others.
- **PFI participants were satisfied with the application process and generally satisfied with the Energy Smart program.** Both PFI participants agreed that finding forms on ENOs' website was easy and using the electronic application worksheets was easy. They also agreed the time it took to approve the application seemed acceptable. Finding the information on how to complete the application was clear, providing the required invoices or other supporting documentation was effortless, and the overall application process was smooth. The two survey respondents indicated the project cost was somewhat more than expected. Surveyed participants were generally satisfied with the PFI offering and various aspects of the offering (see Table). The two respondents were somewhat satisfied with ENOs as their electricity service provider. Both respondents intend to initiate another energy efficiency improvement in the next 12 months and recommend the Energy Smart program to others.

TABLE 16-18 SURVEY RESPONDENTS SATISFACTION WITH VARIOUS ASPECTS OF THE ENERGY SMART PROGRAM

Statement	1 - Very dissatisfied	2	3	4	5 - Very satisfied
The program staff who assisted with the project	0%	0%	0%	50%	50%
The facility energy assessment or other technical services received from the program staff person	0%	0%	0%	0%	100%
The proposal received from a trade ally	0%	0%	50%	0%	50%
The amount of time between the onsite audit and the installation of the equipment	0%	0%	0%	50%	50%
The equipment that was installed	0%	0%	0%	0%	100%
The trade ally's explanation of the program rules and processes	0%	0%	50%	0%	50%
The amount of time it took to receive the incentive after the application was submitted	0%	0%	0%	50%	50%
The range of qualifying equipment	0%	0%	0%	50%	50%
The steps you had to take to complete the project	0%	0%	0%	0%	100%
The trade ally or trade ally that provided the service	0%	0%	0%	0%	100%
The energy efficiency improvement(s) completed	0%	0%	0%	50%	50%
The amount of time it took to complete the project	0%	0%	50%	0%	50%
The Energy Smart Program overall	0%	0%	0%	50%	50%

16.4.3.3 Publicly Funded Institutions: Literature Review

For the past couple of decades, the United States has collaborated with gas and electric utilities, utility regulators, and other partner organizations to create a national commitment to energy efficiency throughout all economic sectors.[90] Although some sectors have begun to expand their energy portfolio and focus more on energy efficiency, others, like the public building sector, remain vulnerable to the current rising demand and uncertain supply of energy sources.[91]

For example, according to the Environmental Protection Agency, buildings in the U.S. account for nearly 75% of the nation's overall annual electricity demand and heavily rely on non-renewables to meet these energy needs.[62] Furthermore, during the 2015 fiscal year, the United States spent approximately $6 billion on energy consumption for federal buildings alone, which is about 33% of total federal energy use.[92] Other public buildings like colleges and universities can spend well over $100,000 a year in just energy use. In comparison, the entire K-12 public schools' system in the country spends $8 billion a year on energy costs.[93,94]

Fortunately, the transition towards energy efficiency in the public building sector has been slow but successful in some areas. For example, section 109 of the Energy Policy Act (EPACT) of 2005 amends the Energy Conservation and Production Act (ECPA) and directs the Secretary to require all new federal building designs to achieve an energy consumption level of 30 percent below those of the current building codes.[95] Since 2007, federal agencies have reported that about 94% of all new federal buildings have met this requirement and are 30% more energy efficient than the relevant code.[65]

However, older buildings do not follow the same guidelines, which offers an opportunity for stakeholders to identify the challenges and barriers facing older construction.[62] Overcoming the obstacles at a local, state, and federal level can help reduce energy use, become more energy efficient, and cut costs.

16.4.3.3.1 *Method*

The Evaluators reviewed the best practices for implementing energy efficiency programs designed for publicly funded institutions (PFIs). PFIs (e.g., government buildings and public schools) are subject to funding, regulatory, and timing constraints. For these facilities, energy efficient measure

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[90] Environmental Protection Agency. (2021, June 14). *National action plan for energy efficiency*. EPA.gov. https://www.epa.gov/energy/national-action-plan-energy-efficiency#:~:text=The%20National%20Action%20Plan%20for,regulators%2C%20and%20other%20partner%20organizations.

[91] The WBDG Sustainable Committee. (2021, September 8). *Optimize energy use*. WBDG - Whole Building Design Guide. https://www.wbdg.org/design-objectives/sustainable/optimize-energy-use

[92] Reott, J. (2018, August 24). *Federal buildings use far more energy than they should. This bipartisan bill would help cut the waste.* Alliance to Save Energy - Using less. Doing more. https://www.ase.org/blog/federal-buildings-use-far-more-energy-they-should-bipartisan-bill-would-help-cut-waste

[93] E Source Companies LLC. (2020, June 15). *Colleges and universities*. Friendly Power. https://esource.bizenergyadvisor.com/article/colleges-and-universities#case-studies

[94] Mamen, K., Hoyos, L., & Klees, S. (2019, April). *100% clean energy school districts campaign - Sierra Club.* Sierra Club, 1-25. https://www.sierraclub.org/sites/www.sierraclub.org/files/Clean_Schools_Toolkit.pdf

[95] Simmons, D.R. (2017). *The fiscal Year 2015 Annual report to Congress*. Department of Energy- Energy Efficiency and Renewable Energy https://www.energy.gov/sites/prod/files/2018/01/f46/fy15_annual_report.pdf

implementation may be a gradual process. A partnership with the utility and its affiliates is built to continuously provide upgrades as funding becomes available or is approved through appropriations.

Energy efficiency programs for PFIs perform retrofits, conduct energy assessments, and develop energy savings guidelines to optimize energy usage and maximize savings. In terms of measures, these programs typically offer upgrades of high-efficiency measures such as lighting systems, HVAC, building construction (insulation, door, windows), motor drives, refrigeration, and even chiller replacement.

The following review focuses on government buildings and schools with publicly available information from websites, case studies, and other publications. The general best practices included in this review also can improve energy efficiency and alleviate the cost burden for publicly funded institutions. Although the review is not exhaustive, the information gathered provides insight into current practices.

16.4.3.3.2 *Best Practices*

The following section describes the different aspects of the PFI energy efficiency programs highlighted in this review. The Evaluators identified critical aspects of program design, delivery, end-use offerings, incentive levels, and marketing approaches used by the program staff.

Below are some of the questions the evaluators asked when researching PFI energy efficiency programs:

- **Program Design** – What are the programs' objectives led by utilities?
- **Program Delivery** – Who implements the program (i.e., consultant-led, trade ally driven, etc.)?
- **End-Use Offerings** – What measures are offered (prescriptive or custom) led by peer utilities?
- **Incentive Levels** – What is the range of incentives the peer utilities offer?
- **Marketing Approaches** – How do utilities approach their government or school customers

The following tables summarize the programs included in this review that run PFI energy efficiency programs.

TABLE 16-19 HIGHLIGHTED PFI ENERGY EFFICIENCY PROGRAMS FOR SCHOOLS AND HIGHER EDUCATION

Stakeholder	Program Name	Program Delivery	Measure Name(s)	Incentive Levels	Marketing Approaches
Ameren – Illinois	Ameren Illinois Energy Efficiency Program: Educational Facility Incentives	Utility-driven	Lighting upgrades Motor efficiency (VFDs) Steam systems Specialty equipment Demand-controlled ventilation Management systems Heating and cooling upgrades	1. 10% cash incentive bonus for energy efficiency projects completed during summer break 2. Additional 15%, 10%, or 5% discounts for projects completed by three deadlines.	Schools can go online and request consultation
NV Energy – Nevada	PowerShift Energy Smart School program	Utility-driven	Lighting and occupancy sensors Vending machine sensors Heating and air conditioning Management systems Window film Efficiency motors Set-back thermostats LED gym lighting PC power management Custom applications.	$0.05 per kWh savings for all projects Customizable a financial plan	Public K-12 schools and institutions of higher education located within the service territories are eligible
Southern California Edison (SCE) – California	Savings By Design (SBD)	Utility-driven	Occupancy sensors Dimmable ballasts Lighting controls Management systems	On-Bill Financing	Schools can go online to find out more information
PG&E – California	School Energy Efficiency Program (SEE)	Utility-driven	Equipment Insulation Motor VFDs Vending machine controls	Equipment Insulation: $3.00/linear foot Motor VFDs: $80.00/horsepower Vending machine controls: $100/unit	Schools can go online to find out more information
OG&E – Arkansas	School and Government Efficiency (SAGE) program	Utility-driven	PC power management Lighting retrofit Lighting controls Exterior lighting HVAC HVAC controls Chiller VFD motor drives Refrigeration Low flow pre-rinse spray valves Low flow faucet aerators Low flow showerheads Door sweeps Weather stripping	PCPM: $0.10/kWh Direct install: all costs are covered All other measures: $0.13/kWh. Projects have a total cost cap	Public K-12 schools and institutions of higher education located within the service territories are eligible
State of California	California Community Colleges / IOU EE Partnership UC / CSU Utility EE Partnership	Partnership between Community College and Investor-Owned Utilities	Lighting Commercial Cooking HVAC Solar Retrofit MBCx New construction	Cash incentives for solar power Grant funding	Schools can go online to find out more information Schools can go online to find out more information

TABLE 16-20 HIGHLIGHTED PFI ENERGY EFFICIENCY PROGRAMS FOR ALL TYPES OF PUBLIC BUILDINGS

Stakeholder	Program Name	Program Delivery	Measure Name(s)	Incentive Levels	Marketing Approaches
Georgia Power – Georgia	Energy Services program 1. Energy Services 2. Premium Services	Utility-driven	No information readily available	1. Facilities can self-fund projects or finance through third parties; they can also conduct an audit. 2. Utility conducts an assessment on energy consuming devices and to the sites total power cost.[82]	Organizations that are interested can go online to find more information and contact the program team
Ameren – Missouri	BizSavers Government program 1. Standard incentives 2. Custom incentives 3. Retro-commissioning 4. Demand Response	Utility-driven	Exterior lighting Interior lighting Occupancy sensors Exit sign replacements Commercial cooking Refrigeration Compressed air Water heating HVAC HVLS VFDs Custom measures Motors New construction	1. Incentive paid on a per unit-installed basis 2. Incentives based on projected annual energy reduction 3. $0.01-0.03 per kWh for performing a technical analysis study and a $0.06-$0.18 per kWh incentive for energy efficient system upgrades 4. Participants can earn recurring capacity payments	Organizations that are interested can go online to find more information
PG&E – California	Energy Watch Partnership Energy Efficient On-Bill Financing	Utility-driven	Exterior lighting Interior lighting	Energy Efficient On-Bill Financing	Organizations that are interested can go online to find more information
State of Massachusetts	Leading by example program	State-led	Depends on the project. Measures may vary	Grants	Organizations that are interested can go online to find more information

As previously mentioned, PFI energy efficiency programs can be offered by government or utility stakeholders. The following describes the programs targeting schools and other PFIs.

16.4.3.3.2.1Ameren Illinois[96,97]

Ameren Illinois utility company has a school incentive and bonus program for specific energy efficiency measures and upgrades. In 2020, they offered over $6 million in incentives to complete almost 700 projects in schools, colleges, and universities. Facilities could also receive point-of-purchase discounts through participating with approved lighting distributors and combine these bonuses with instant incentives to receive even more significant savings.

Schools that have participated in Ameren Illinois's programs, like Elmwood Elementary School, have saved over $13,000 annually in energy costs.[6] Other institutions, like Parkland College, have seen over $600,000 in energy savings (6,810,522 kWh in electricity) in the past three years. Academic institutions interested in participating in the program can request a free energy consultation online to find an Ameren Illinois recommended energy advisor, program ally, or trade ally.

16.4.3.3.2.2NV Energy[98,99,100,101]

The **PowerShift Energy Smart School** incentives developed by NV Energy allow school districts to benchmark energy use to find specific opportunities to achieve maximum savings. The incentive structure is $0.05 per kWh savings for all projects but cannot exceed the project's overall costs. Pre-notification is also required for all projects. Funding is usually available from January through December or until exhausted. Energy Advisors will customize a financial plan that fits the school's budget while maximizing the return on investment.

Touro University performed an LED retrofit project that estimated $85,782 in annual and 779,839 kWh in energy savings through the incentive program. Clark County School District also constructed 80 new portables with LED lighting and occupancy sensors which estimated an annual $26,182.75 and 238,025 kWh energy savings.

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96 Ameren Illinois. (2021, March 10). *PowerPoint Presentation.* AmerenIllinoisSavings.com https://amerenillinoissavings.com/wp-content/uploads/2021/03/2021-March-Power-Lunch-Final.pdf

97 Ameren Services. (2022, January 13). *Education*. Ameren Illinois. https://amerenillinoissavings.com/business/industry-solutions/education/

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99 NV Energy. (n.d.). *Energy Smart Schools Q&A*. PowerShift by NV Energy. https://www.nvenergy.com/publish/content/dam/nvenergy/brochures_arch/save-with-powershift/schools/ESS-Facts.pdf

100 NV Energy. (n.d.). *Energy smart schools most extensive led retrofit in Nevada*. PowerShift by NV Energy. https://www.nvenergy.com/publish/content/dam/nvenergy/brochures_arch/save-with-powershift/schools/ESS-LED-Case-Study.pdf

101 NV Energy. (n.d.). Clark County School Distrct's LED Portable Upgrade. PowerShift by NV Energy. https://www.nvenergy.com/publish/content/dam/nvenergy/brochures_arch/save-with-powershift/schools/ESS-Portables-Case-Study.pdf

16.4.3.3.2.3Southern California Edison (SCE) [102,103]

Savings By Design (SBD) aims to help maximize energy performance in non-residential building design and construction. For schools and universities, the process begins with an energy audit performed by the utility, and once complete, SCE offers express or customized solutions.

SCE offers **On-Bill Financing**, which allows schools to distribute the costs of qualifying upgrades over time with no fees or interest. In addition, payments can be offset by saving results, and benchmarking allows for equal comparison of performance to other facilities. Viewpoint School has successfully saved nearly 87,000 kWh through this program by making building improvements with efficient glazing measures, upgrading HVAC systems with modulating economizers and variable frequency drives, installing occupancy sensors, and installing energy-efficient lighting.

16.4.3.3.2.4Pacific Gas & Electric (PG&E) [104,105,106,107]

In California, schools spend $700 million annually on energy. By implementing larger energy efficiency projects in addition to smaller individual level energy saving tips, schools can reduce their annual energy spending by roughly 20%. PG&E offers many options for both school and government facilities, including resources to take full advantage of California's Proposition 39 funds.

The main program for K-12 schools is the **School Energy Efficiency Program (SEE)**, which helps public school districts with the entire process of retrofitting measures. In addition, they provide tips and instructions for K-12 facilities as well as resources for educators to use in their classrooms to supplement the energy efficiency measures at their school and provide energy education to students. For colleges, PG&E assists maintenance departments by providing incentives and rebates to guarantee their budgets can fulfill as many needs as possible. Campuses, therefore, become more energy-efficient and increase the comfort of the learning environment for students.

Since PG&E has begun offering these incentives, many buildings have benefited from their upgrades. The Standard School District, for example, upgraded thermostats and installed door sensor retrofits to control the classrooms' temperatures. A total of 24 Honeywell thermostats were installed on two campuses. The upgrade resulted in nearly 45,000 kilowatt-hours per year of projected savings and more than 3,800 terms.

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[102] Southern California Edison. (2022). *Energy solutions: a guide for schools and universities*. Southern California Edison: Energy for what's ahead. https://www.sce.com/business/ems/schools

[103] Southern California Edison. (2017). *Energy management solutions schools and universities*. Southern California Edison: Energy for what's ahead. https://www.sce.com/sites/default/files/inline-files/Schools_Universities%2BIS%2Br1_WCAG_0.pdf

[104] Pacific Gas and Electric Company. (2022). *Saving energy and money in K-12 schools: Manage school energy costs.* https://www.pge.com/en_US/small-medium-business/save-energy-and-money/rebates-and-incentives/industry-rebates/K12-schools.page

[105] U.S. Environmental Protection Agency. (2011). *Energy efficiency programs in K-12 schools: Local government climate and energy strategy series*. EPA.gov. https://www.epa.gov/sites/default/files/2015-08/documents/k-12_guide.pdf

[106] Pacific Gas and Electric Company. (2010). *Energy management for heating, ventilation, and air conditioning (HVAC).* https://www.pge.com/includes/docs/pdfs/mybusiness/energysavingsrebates/moneybacksolutions/ schools_k12/ case_studies/bssd_cs.pdf

[107] Energy watch partnerships. (2022). https://www.pge.com/en_US/small-medium-business/building-and-property-management/find-trade allys-and-trade-professionals/find-a-local-government-energy-watch-partnership.page

PG&E also relies on its **Energy Watch Partnership for government facilities,** which helps local governments develop and implement energy management plans. The government program is mainly focused on internal and external lighting solutions. The zero-percent interest **Energy Efficient On-Bill Financing** plan allows government entities to complete retrofit projects. Government agencies can receive loans from $5,000 to $250,000 with a 10-year payback period.

16.4.3.3.2.5Ameren Missouri[108,109]

Ameren Missouri offers lighting retrofits, HVAC, commercial cooking, and motor controls/ VFDs for government facilities. The **BizSavers** program also offers the following incentives that help reduce energy usage.

Standard incentives: Incentives are paid on a per unit-installed basis, and all Standard Fast-Track measures do not require pre-approval unless the incentive is greater than $15,000. Linear fluorescent lighting projects may be eligible for enhanced incentive rates through the Standard Pre-Approval process.

Custom incentives: Custom incentives are calculated based on the projected annual energy reduction and require pre-approval.

Retro-commissioning: Projects can receive a $0.01-0.03 per kWh incentive for performing a technical analysis study and a $0.06-$0.18 per kWh incentive for energy efficient system upgrades.

Demand Response: Ameren Missouri has partnered with Enel X to offer businesses and other organizations incentive payments for participating in a program to maintain a reliable and cost-effective electric grid. Program participants can earn recurring capacity payments for agreeing to standby during high electricity demand.

To participate in the program, facilities submit an online application. Then a utility representative walks through the process and project at the site. Once the project is approved and completed, the utility representative checks the facility, and the incentive check is distributed.

16.4.3.3.2.6Georgia Power[110,111]

Georgia Power Offers two options for commercial buildings. The **Energy Services** program offers customized solutions and installation to decrease operating costs and increase efficiency. Facilities can self-fund projects or finance through third parties who provide low-cost options based on the projected energy savings. Thus, publicly funded groups can complete projects with little to no initial capital

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[108] Ameren Services. (2022). *Savings for Government Facilities.* Ameren Missouri. https://www.ameren.com/missouri/business/energy-efficiency/savings-by-business-type/government

[109] Enel X North America. (2021, February). *Ameren Missouri Demand Response FAQ.* https://www.ameren.com/-/media/missouri-site/files/energy-efficiency/demand-response-faqs.ashx

[110] Southern Company. (2022). *Leading Georgia through energy savings*. Georgia Power. https://www.georgiapower.com/business/products-programs/utility-services/energy-services.html

[111] Southern Company. (2022). Premium services and commercial audits. Georgia Power. https://www.georgiapower.com/business/products-programs/utility-services/energy-services/premium-services.html

investment. An audit can also be performed to determine the benefits of upgrading, installing system controls, or integrating renewable energy sources.

The **Premium Services** program consists of a team of certified Auditors and Specialists (Professional Engineers & Certified Energy Managers (CEMs)) with experience in a wide range of segments, including businesses, government and state agencies, commercial and industrial sites, and schools. The services include assessments tailored to meet exactly your needs, a verification that the facility complies with the Department of Energy's Energy Star® Program, an inspection of compressed air leaks using ultrasonic technology, and even an assessment on significant energy consuming devices and their contribution to the sites total power cost.

16.4.3.3.2.7Oklahoma Gas and Electric (OG&E) Arkansas[112,113,114]

The **School and Government Efficiency (SAGE)** program developed by OG&E Arkansas helps PFIs overcome the barriers to implementing energy efficiency projects by providing incentives and installing energy-efficient measures and technologies. SAGE's primary focus is the cost-effectiveness of implementation through multi-phased projects and ensuring facilities do not miss any opportunities.

Incentives depend on the type of project and measures. For example, PC Power Management has an incentive of $0.10 per kWh, and the total project cost cap is up to 90%. For direct install measures all costs are covered, and for all other measures the cost is $0.13 per kWh and the total project cost cap is up to 90%.

By participating in the program, facilities receive incentive payments and non-cash benefits of energy performance benchmarking, energy master planning, technical support, and recognition. Any local public or private entity OG&E customer (e.g., K - 12 schools, higher education, and municipalities) may be eligible for the SAGE Program.

16.4.3.3.2.8State of California[115,116]

California is at the forefront of energy efficiency with government regulations, such as Proposition 39, and partnerships with utility companies and the college and university systems to create the greatest impact. See specific utility programs below.

California Community Colleges (CCC) / Investor-Owned Utilities (IOU) Energy Efficiency Partnership: The program's goal is to help educate colleges on energy efficiency and lower energy usage primarily

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112 CLEAResult. (2021). *Schools and government efficiency program.* OG&E Energy Corporation. https://www.oge.com/wps/wcm/connect/05527949-0e6d-4dd4-b267-b737b2661226/1120-OGEOK-SAGE-2061126-Measure-Sheet_WEB.pdf?MOD=AJPERES&CACHEID=ROOTWORKSPACE-05527949-0e6d-4dd4-b267-b737b2661226-nuRvfUs

113 CLEAResult. (2021). *OG&E Arkansas Schools and Government Efficiency (SAGE) Program Manual*. OG&E Energy Corporation. https://www.oge.com/wps/wcm/connect/fd859796-d6ce-43b6-bb0b-527e03247ee7/OGE+Arkansas+2020+SAGE+Program+Manual.pdf?MOD=AJPERES&CACHEID=ROOTWORKSPACE-fd859796-d6ce-43b6-bb0b-527e03247ee7-n4JI8bN

114 Elmore, T. (2019). Program overview. DSIRE. https://programs.dsireusa.org/system/program/detail/4899/pg-e-non-residential-energy-efficiency-rebates

115 Website Design. (2022). Cost-Saving Energy Efficiency in Colleges. California Community Colleges Investor Owned Utilities. https://www.cccutilitypartnership.com/

116 UC-CSU-Utility Energy Efficiency Partnership. (2021). Home: UCCSUIOU-Partnership. https://www.uccsuiouee.org/

through lighting, HVAC, and solar programs. The partnership offers cash incentives to participating institutions.

UC/ CSU Utility Energy Efficiency Partnership: This partnership helps the UC and CSU college systems achieve critical energy savings (i.e., 480 million kWh, 65 MW, 26 million therms, and 285,000 metric tons of annual CO2 avoided) in addition to over $135 million in incentives from utilities. The projects considered for the partnership include retrofit, MBCx, and new construction.

16.4.3.3.2.9State of Massachusetts[117,118,119,120,121,122,123,124]

At the state level, Massachusetts implemented the Lead by Example (LBE) program, which targets large and small college campuses, prisons, youth detention facilities, 24/7 hospital, and residential facilities, vehicle depots, maintenance facilities, state park facilities, and other government buildings to become more energy efficient. Specific to PFI energy efficiency, the LBE program has created a sub-program, Countdown to 100 LEED Certified Building, which focuses on buildings achieving Leadership in Energy and Environmental Design (LEED) certification. For example, the Trial Court New Lowell Justice Center achieved a 48% improvement over the baseline energy performance through the installation of the high-performance envelope, efficient lights and controls, a chilled beam HVAC system, and two solar PV arrays in addition to other measures.

16.4.3.3.3 *Alternative Funding*

Energy Efficient Government Building Deduction: Available to architects, engineers, and trade allies as a first-year tax deduction on government commercial buildings. The maximum deduction is capped at $1.80 per square foot if the overall components attain 50% energy savings related to the 2001 energy standard.

Better Buildings Initiative: Available to the public and private sectors to make the nation's homes, commercial buildings, and industrial plants more energy-efficient by accelerating investment and sharing successful best practices. The initiative is sponsored by the U.S. Department of Energy (DOE). Their website offers specific financial guidelines for different types of commercial buildings.

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[117] Commonwealth of Massachusetts. (2022). *Massachusetts Energy Rebates & Incentives*. Mass.gov. https://www.mass.gov/guides/massachusetts-energy-rebates-incentives#-municipalities/state-facilities-

[118] Energy.gov. (n.d.). *179d commercial buildings energy-efficiency tax deduction.* https://www.energy.gov/eere/buildings/179d-commercial-buildings-energy-efficiency-tax-deduction

[119] U.S. Department of Energy. (n.d.). *Better Buildings Initiative*. https://betterbuildingssolutioncenter.energy.gov/

[120] U.S. Department of Energy. (n.d.). *Financing navigator resources*. https://betterbuildingssolutioncenter.energy.gov/financing-navigator/resources

[121] U.S. Department of Energy. (n.d.). *Federal Energy Management Program*. https://www.energy.gov/eere/femp/federal-energy-management-program

[122] U.S. Department of Energy. (n.d.). About Utility Energy Service contracts. https://www.energy.gov/eere/femp/about-utility-energy-service-contracts

[123] CliftonLarsonAllen. (2022). Energy Efficient Government Building Deduction. https://www.claconnect.com/industries/construction/energy-efficient-government-building-deduction-services

[124] U.S. Department of Energy. (n.d.). Energy savings performance contracts for federal agencies. https://www.energy.gov/eere/femp/energy-savings-performance-contracts-federal-agencies

Federal Energy Management Program (FEMP): Helps federal agencies find energy savings and affordable solutions, in addition to creating partnerships with local entities to implement energy efficiency measures.

Utility energy service contract (UESC): This is a limited-source acquisition for energy management between a federal agency and a local utility company. UESC provides opportunities for federal agencies to improve their buildings through energy assessments and the implementation of energy conservation measures. The federal agency can use any combination of appropriations and financing to pay for the project.

Energy savings performance contracts (ESPCs): is a partnership between a federal agency and an energy service company that allows federal agencies to increase energy savings and facility improvements with no up-front capital costs or special appropriations from Congress.

16.4.3.3.4 *General Recommendations*

Although each PFI energy efficiency program is unique and tailored to the specific needs of the region and its community, there are overarching best practices that emerge in many of these programs.

First, stakeholders would benefit from an integrative approach. One method proposed by ENERGY STAR® recommends stakeholders to implement energy efficiency strategies in a sequential order that helps build upon upgrades and improvements. The figure below shows how upgrades interact and affect the energy flow with each subsequent stage. By focusing on the upgrades that affect the most first, stakeholders can feel more confident about achieving the most significant energy and cost savings possible.

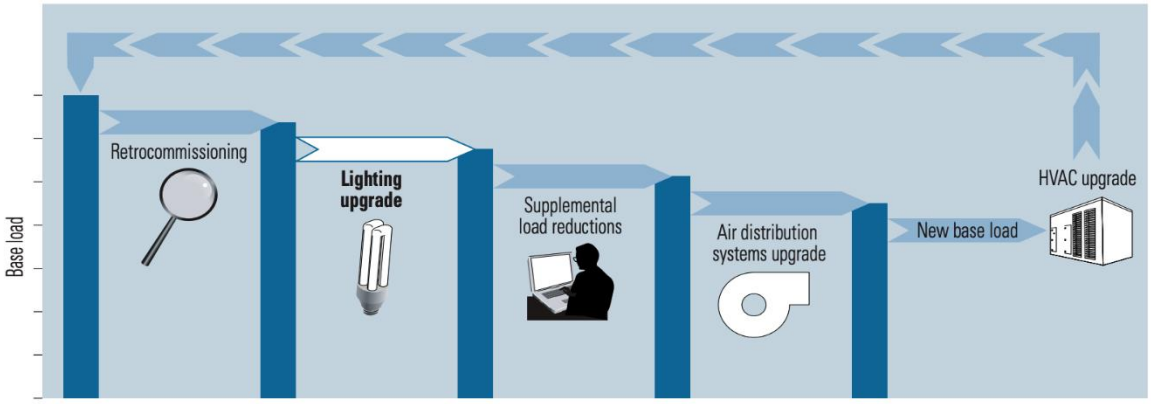

FIGURE 16-2 STAGES OF INTEGRATED UPGRADE APPROACH[125]

To identify what energy efficiency upgrade should be prioritized, stakeholders must also share similar goals. The Rocky Mountain Institute offers the following recommendation for deep retrofitting projects, but the suggestions can also be implemented for other types of PFI energy efficiency projects too.[126]

1. Set aggressive goals when planning the project. The decisions made early in the project can significantly influence results.
2. Involve a diverse group of stakeholders who will voice each intrinsic need and constraint related to the project scope.
3. Start the project without arbitrary design constraints so that the development team can create the most efficient design possible without being limited to repeating previous designs that may not have been as energy efficient.
4. Consider frequently neglected impacts, quantify synergies between project measures, and use a nonlinear design process to incorporate new information.
5. Ensure the preservation of initial savings to justify the project's investment and mitigate risk for all stakeholders involved.

The recommendations set forth by the Rocky Mountain Institute align with the six guiding principles for sustainable federal buildings the Council on Environmental Quality proposed in their 2020 report.[127] Below are the six principles the council lists.

1. **Employ Integrated Design Principles:** For existing buildings, apply integrated management principles to identify areas for optimization and plan for provisions or the ability to accommodate operating conditions during an emergency or significant event.
2. **Optimize Energy Performance:** Perform benchmark building performance annually and regularly monitor building energy performance against historical performance data and peer buildings to identify operating inefficiencies and conservation opportunities.

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[125] Carmichael, C., & Gartman, M. (2015, August). *Deep energy retrofits using energy savings performance contracts: Success stories.* **https://www.gsa.gov/cdnstatic/Deep_Energy_Retrofits_Using_ESPC_508_small.pdf**

[126] Deep Retrofit Tools and resources. RMI. (2018, June 4). **https://rmi.org/our-work/buildings/deep-retrofit-tools-resources/**

[127] Council on Environmental Quality. (2020). *Guiding principles for sustainable federal buildings.* **https://www.sustainability.gov/pdfs/guiding_principles_for_sustainable_federal_buildings.pdf**

3. **Protect and Conserve Water:** Implement water conservation technologies to the maximum extent that the technologies are life-cycle cost-effective. Utilize current best practices and management strategies for water-efficient landscaping and indoor use.
4. **Enhance the Indoor Environment:** Maximize opportunities for and benefits of daylight in regularly occupied space to introduce natural light and views into the spaces, except where not appropriate because of building function, mission, or structural constraints.
5. **Reduce the Environmental Impact of Materials:** Procure and utilize construction materials and building supplies that protect human health and the environment over their life cycle compared with similar products.
6. **Assess and Consider Building Resilience:** To protect and ensure investments in Federal facilities, balance options to address current and projected risks against mission criticality, cost, and security needs over the building's intended service life. Where applicable, align assessment and planning activities with local and regional efforts to increase community resilience.

16.4.3.4 Hurricane Ida Impacts

The Evaluators also inquired over effects of 2021's Hurricane Ida on PFI participants for PY11. According to the two survey participants, the storm significantly impacted their operations. Hurricane Ida has increased the cost of materials and doing business as well as experienced labor and supply chain issues for both respondents. Fortunately, both participants stated that despite the storm, Hurricane Ida did not affect their ability to partake in ENOs' commercial energy efficiency programs. One participant did apply for the ENOs' Hurricane Ida Recovery Funds, while the other respondent stated they were unaware of the funds.

16.5 Data Tracking Review

The Evaluators reviewed the tracking data provided and found the following issues. The following parameters were missing or incomplete for the program.

- **Measure Specific Information**: The tracking data lacked pre and post measure information such as fixture codes, fixture wattages, equipment size, and equipment efficiency.
- **Facility Conditioning Type**: The tracking data lacked information on the heating and cooling systems of the participating facilities. Without information on the heating fuel type, the evaluators are unable to calculate Therm savings in lighting retrofit projects.

The Evaluators note that a supplemental tracking dataset was provided for this program and a few others. This data had some additional fields. However, the Evaluators noted that there were few inconsistencies with total program kWh savings, total kW reductions, and total project counts. Since the two did not align, it was difficult to know which was the best and final to utilize in the Evaluation.

16.6 Key Findings and Recommendations

Key Findings and Recommendations

- **Key Finding 1: PFI participants were satisfied with the Energy Smart program**. Both PFI participants agreed that the application process, interactions with program staff, the improvements made, and the turnaround time to complete ethe projects was satisfactory. The two respondents were somewhat satisfied with ENOs as their electricity service provider. Finally, both respondents intend to initiate another energy efficiency improvement in the next 12 months and recommend the Energy Smart program to others.
- **Key Finding 2: Educational settings were common for PFI survey respondents**. One project was completed at a college facility, and the other was at a K-12 school. PFI participants learned of the offering through a program representative or through a trade ally/trade ally. Although both customers received calculation and application assistance, one indicated they received a facility assessment from an Energy Smart program representative. Without the recommendation from a program representative, one of the participants would not have made the upgrades.
- **Key Finding 3: Trade allies were very involved with the PFI customers' projects**. Both survey respondents worked with their trade ally/trade ally through the entire project (e.g., design to installation). One participant hired a trade ally they worked with previously to install the equipment, and the other hired a trade ally registered with the Energy Smart program. According to the participants, the trade allies could answer most of their questions. Finally, they indicated they would recommend the trade ally to others.
- **Key Finding 4: Hurricane Ida significantly impacted participants' operations**. According to participants, the storm increased the cost of materials and doing business as well as experienced labor and supply chain issues for both respondents. Fortunately, both participants stated that despite the storm, Hurricane Ida did not affect their ability to partake in ENOs' commercial energy efficiency programs. One participant did apply for the ENOs' Hurricane Ida Recovery Funds, while the other respondent stated they were unaware of the funds.
- **Key Finding 5: The Evaluators reviewed the best practices for implementing energy efficiency programs designed for publicly funded institutions (PFIs).** The Evaluators identified critical aspects of program design, delivery, end-use offerings, incentive levels, and marketing approaches used by the program staff. In general, eligible measures for PFIs range from lighting to upgrading heating and cooling systems. Incentives also vary by price on kWh, providing discount by total cost, or offering on-bill financing services. Finally, most successful PFI programs implement an integrative approach that includes all groups impacted by the upgrades and produces the most energy savings long-term by making changes that positively affect future improvements/upgrades.

17 LARGE C&I DEMAND RESPONSE

17.1 Summary

The tables below report *ex ante* gross, *ex post* gross, *ex post* net energy savings (kWh) (both annual and lifetime), demand reductions (kW), participation, and incentive spend, by measure, where applicable.

TABLE 17-1 PY11 LARGE C&I DR ENERGY SAVINGS (KWH)

Measure	*Ex ante* Gross Savings (kWh)	Realization Rate (kWh)	*Ex post* Gross Savings (kWh)	NTG	*Ex post* Net Savings (kWh)
Event (x 1)	1,993	202%	4,029	100%	4,029
Total	**1,993**	**202%**	**4,029**	**100%**	**4,029**

Sums may differ due to rounding.

TABLE 17-2 PY11 LARGE C&I DR DEMAND REDUCTIONS (KW)

Measure	*Ex ante* Gross Demand (kW)	Realization Rate (kW)	*Ex post* Gross Demand (kW)	NTG	*Ex post* Net Demand (kW)
Event (x 1)	459.11	97%	446.84	100%	446.84
Total	**459.11**	**97%**	**446.84**	**100%**	**446.84**

Sums may differ due to rounding.

TABLE 17-3 PY11 LARGE C&I DR LIFETIME SAVINGS SUMMARY

Measure	EUL	*Ex post* Gross Lifetime Energy Savings (kWh)	*Ex post* Net Lifetime Energy Savings (kWh)
Event (x 1)	1	4,029	4,029
Total	**1**	**4,029**	**4,029**

Sums may differ due to rounding.

TABLE 17-4 PY11 LARGE C&I DR PARTICIPATION AND INCENTIVE SUMMARY

Measure	Participation	Incentive Spend ($)
Event (x 1)	6	$25,178
Total	**6**	**$25,178**

Sums may differ due to rounding.

17.2 Program Description

The Large C&I Demand Response (Large C&I DR) program is designed to help reduce the strain on the electric grid during periods of peak demand. The automated program is free, flexible, and easy to use. The program provides scaled incentives based on the load provided (with seasonal payments in summer and winter). Customers nominate the load they will provide in collaboration with Honeywell (the program implementer) and may provide the curtailment with automated controls or via manual curtailment of the proposed systems. Curtailed systems may include HVAC, lighting, industrial processes, or any other applicable end-use.

Incentives are based on twice-yearly payments based on average demand reduction across all events during a performance period ($50/kW for summer, $10/kW for non-summer).

17.2.1 PROGRAM CHANGES

There were no reported changes to this program in PY11.

17.2.2 TIMING OF PROJECTS

All projects occurred in August.

17.2.3 TRADE ALLIES

There were no reported trade allies in this program.

17.2.4 GOAL ACHIEVEMENT

The table below summarizes the programs' performance against goal.

TABLE 17-5 LARGE C&I DR PERFORMANCE TOWARDS GOAL

Ex post Gross Energy Savings (kWh) Goal	% to kWh Goal	*Ex post* Gross Energy Savings (kWh)	*Ex post* Gross Savings (kW) Target	% to kW Target	*Ex post* Gross Savings (kW)
0	N/A	4,029	3,918.00	11%	446.84

17.3 EM&V Methodology

The Evaluators employed the following approach to complete impact evaluation activities for the program. The Evaluator followed the Calculated Baseline approach outlined in the Midcontinent Independent System Operator, Inc. (MISO) Business Practices Manual (BPM)[128]. The following impact evaluation steps were taken to determine the suitability of the MISO Calculated Baseline approach:

- Developed an Unadjusted Consumption (UC) Baseline, a Symmetric Multiplicative Adjustment (SMA) Baseline, and a Weather Sensitive Adjustment (WSA) Baseline for each program participant. Loads were calculated utilizing 1-hour AMI data.

[128] *Ibid.*

- Determined days that will serve as proxy days for testing the suitability of the baseline approach. Proxy days represent days like demand response event days in terms of load shape and temperature profiles.
- Estimated bias (uncertainty) and error on proxy days for each model to assess baseline performance. Bias is assessed by examining the average percent error of the baseline predictions relative to the actual usage on proxy days. In a similar manner, error is assessed through various metrics such as Root Mean Squared Error (RRMSE) using baseline predictions and actual usage on proxy days.
- Assigned the model/baseline with the lowest bias to each customer.
- Assessed bias and error for the entire program population and customers with the largest nominated loads, with the goal of minimizing bias and error for the program overall.

17.3.1 GROSS IMPACT METHODOLOGIES

In the evaluation of demand response programs, energy savings are estimated by comparing a participant's load shape during a demand response event with a baseline load shape. This baseline load is assumed to be a good estimate of the counterfactual load—that is, the load that would have manifested had there not been an event called that day.

17.3.1.1 Data Sources

Data used for this evaluation include program tracking data that identifies which customers participated in the program and contains data fields such as contract curtailment amount, hourly usage, hourly baseline estimates, 15-minute interval meter data (AMI) for each customer participating in the program, and a full schedule of DR program events, including the time of the event.

17.3.1.2 MISO Calculated Baseline Approach (Customer Baselines)

The following details the general requirements for the MISO Calculated Baseline Approach. The Evaluators developed Customer Baselines (CBLs) in accordance with this approach. For a demand resource, the Consumption Baseline is a profile of hourly demand based on an averaged sample of historical data which may be adjusted for factors that reflect specific, on-the-day conditions, such as temperature.

The default consumption baseline is designed as follows:

- Separate hourly demand profiles for non-holiday weekdays and for weekends/holidays
- The "weekday" hourly profile is based on the average of the ten (10), but not less than five (5), most recent weekdays that are not holidays or other non-standard "event" days
- The "weekend/holiday" hourly profile is based on the average of the four (4), but not less than two (2), most recent weekend days or holidays that are not "event" days
- An "event" day is one during which there was, for the resource in question, a real- time energy or ancillary services dispatch, or a scheduled outage

- The maximum look-back window is limited to 45 days
- If the 45-day window contains insufficient days to meet the minimum number of days described above, the profiles are constructed based on the available days within the 45-day window that qualify, supplemented by the largest (MW) matching "event" day(s) values for that resource within that same window as necessary to obtain the minimum number of values.

Adjustment mechanisms to the default Consumption Baseline include:

- Symmetric Multiplicative Adjustment (SMA)
  - Adjusts each baseline hourly value (MW) during the event up or down by the ratio of
  - (a) the sum of hourly demands for the three hours beginning four hours prior to the event and (b) the sum of those same three hourly baseline demands
  - The adjustment is limited to a change in any individual baseline hour of plus or minus 20 percent.
  - If multiple events occur during the same day, the SMA is calculated only for the first event, but applied to all events that day.
- Weather Sensitive Adjustment (WSA)
  - Adjusts each baseline hourly value (MW) up or down by a Weather Adjustment Factor
  - The Weather Adjustment Factor is determined by a mathematical relationship derived through a regression analysis that considers the DRR load and historical hourly temperature data.

17.3.1.3 Evaluators MISO Models

The following CBL models were developed for each customer in accordance with MISO protocols.

For a 10-of-10 (or 5-of-5) unadjusted baseline, the Evaluators examine the load data from the most recent ten (or five) non-event, non-holiday weekdays relative to the event day and calculate the mean demand usage values of the ten (or five) highest load days. This baseline is then adjusted for the SMA and WSA models utilizing the method described in section

TABLE 17-6 EVALUATORS' MISO CBL MODELS

Model Type	Baseline Days	SMA	WSA
Unadjusted	10-of-10	No	No
SMA-Adjusted	10-of-10	Yes	No
WSA-Adjusted	10-of-10	No	Yes
Unadjusted	5-of-5	No	No
SMA-Adjusted	5-of-5	Yes	No
WSA-Adjusted	5-of-5	No	Yes

17.3.1.4 Baseline and Proxy Day Development

The Evaluators defined proxy days as the top four non-event, non-holiday, non-weekend days with the highest loads across all summer months. In addition, proxy days must display a maximum temperature of greater than or equal to the minimum temperature observed during normal curtailment hours during the events. The Evaluators used these defined proxy days to determine the ability of CBL models to predict actual usage for each customer.

17.3.2 NET IMPACT METHODOLOGIES

In demand response programs, it is typically assumed that there are neither spillover nor free-ridership effects (customers are not expected to curtail without participating). Although customers can find workarounds to make up for lost productivity due to demand response events, they are compensated only if they reduce their load during the peak demand window, the primary program goal. As such, the net-to-gross ratio for this program is assumed to be 100%.

17.4 Evaluation Findings

17.4.1 GROSS IMPACT FINDINGS

Four events were called during the summer of 2021 between the hours of 1400 and 1800, as shown in the table below.

TABLE 17-7 EVENT DATES AND TIMES

Event Dates	Event Times (CDT)
6/10/2021	1400-1800
7/23/2021	1600-1800
7/28/2021	1600-1800
8/23/2021	1600-1800

17.4.2 PERFORMANCE VERSUS NOMINATION COMPARISON

The Evaluator compared realized kW for each site with their nominated kW to summarize the extent to which participants have met their nominated load curtailments. The names of sites have been anonymized to protect customer confidentiality.

The verified kW curtailment as a percent of nominated load is 42%.

Site 1 and Site 3 had issues with their AMI meter data which prevented proper collection of their complete AMI meter data during events. However, both sites performed curtailment during the summer events for the partial meter data that was available, and the Evaluators, in consultation with Honeywell, set their verified savings at 50% of their nominated loads. In addition, Site 2 and Site 4 signed up in time to participate in the last event, but both sites were unable to perform the expected curtailment due to unexpected issues on site. The remaining two sites underperformed and hit 36% and 18% of their nominated kW loads.

TABLE 17-8 SITE LEVEL RESULTS

Site	Nominated kW	Verified kW	% of Nominated Load
Site 1	96.00	48.00	50%
Site 2	103.00	2.57	2%
Site 3	700.00	350.00	50%
Site 4	56.00	12.62	23%
Site 5	89.00	31.80	36%
Site 6	10.00	1.84	18%
Total	**1,054.00**	**446.84**	**42%**

17.4.3 LOAD SHAPES AND MODEL PERFORMANCE

The figures below are average load shapes for all sites on proxy and event days and depict actual kW and baseline kW. The figures show that baseline kW is a good match for actual kW during the hours of curtailment.

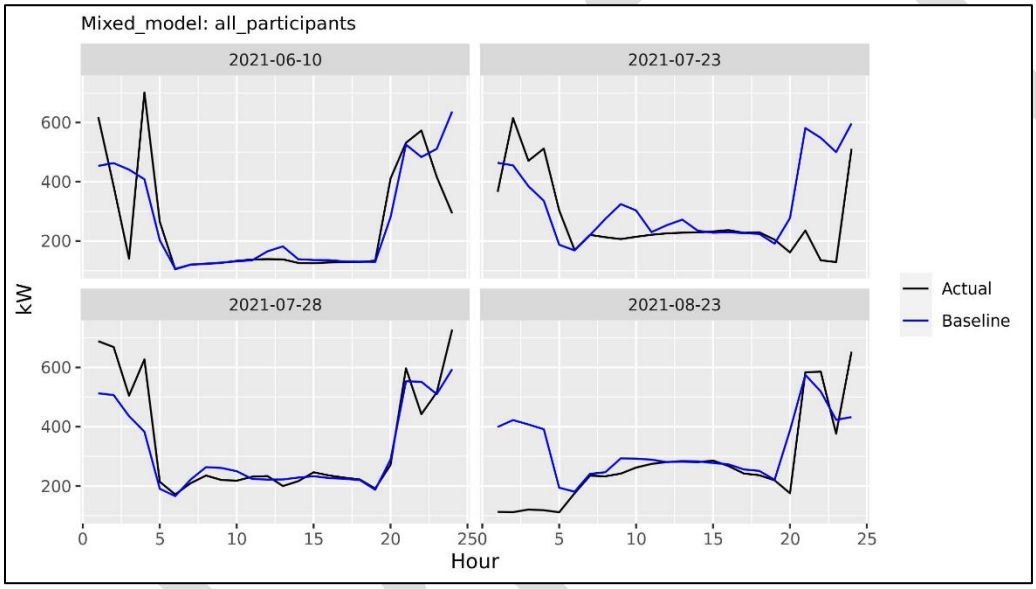

FIGURE 17-1 PROXY DAY LOAD SHAPES

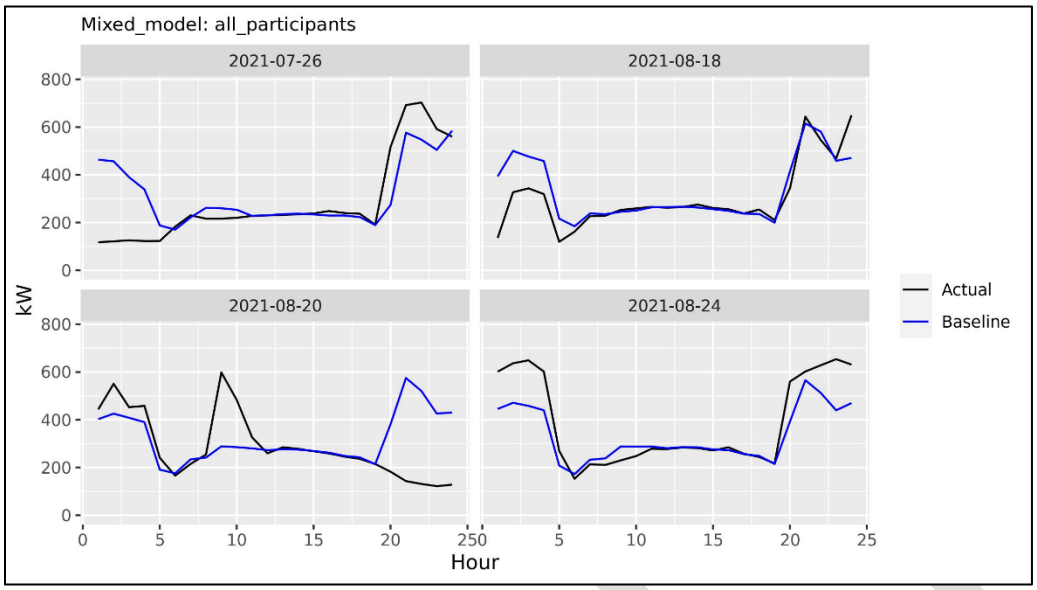

FIGURE 17-2 EVENT DAY LOAD SHAPES

The Evaluator estimated bias and error for the Evaluators MISO models across all sites and when applied on a site-specific basis and selecting for the model with the lowest bias (shown as the "Mixed Model CBL"). In addition, the Evaluator estimated and verified Honeywell's *ex ante* model for all sites. As shown in the table below, the Evaluator's site-specific Mixed Model CBLs perform the best and have the lowest bias and error. The Evaluator determined that the method of additive adjustment for Honeywell's CBL model does not match the approved adjustment factors in the MISO protocols which only allow for multiplicative or weather-sensitive adjustments[129].

TABLE 17-9 MODEL FIT

Model	Follow MISO Protocols	RRMSE	RMSE	Bias	Best Fit Model (Lowest Bias/Error)
Mixed Model CBL (site specific)	X	0.087	21.992	-0.008	X
Honeywell CBL 10-of-10 Additive Adjustment (2-Hour offset)		0.121	30.536	-0.019	
WSA Adjusted CBL 10-of-10	X	0.139	35.208	-0.025	
SMA Adjusted CBL 5-of-5	X	0.083	21.038	-0.027	
WSA Adjusted CBL 5-of-5	X	0.116	29.325	-0.031	
SMA Adjusted CBL 10-of-10	X	0.106	26.720	-0.043	
Unadjusted CBL 5-of-5	X	0.163	41.038	-0.079	
Unadjusted CBL 10-of-10	X	0.234	59.018	-0.117	

[129] Per MISO, the offset factor must also begin and end three hours prior to the event start time, whereas Honeywell's utilizes a one hour offset factor beginning two hours prior to the event start time.

17.4.4 GROSS IMPACT

Table 17-10 shows the expected savings, verified savings and realization rate for the Large C&I DR program. The realization rate of kWh is 202% because the site with the largest nominated load (700 kW) was not assigned an expected kW savings value in the tracking data.

TABLE 17-10 VERIFIED GROSS IMPACTS

Utility	Expected kWh	Expected kW	Verified Gross kWh	Verified Gross kW	Realization Rate kWh	kW Realization Rate
Program	1,993	459.11	4,029	446.84	202%	97%
Total	**1,993**	**459.11**	**4,029**	**446.84**	**202%**	**97%**

17.4.5 NET IMPACT

The NTG is assumed to be 100% for demand response programs. Program results can be found in tables in Section 17.1 Summary.

17.4.6 PROCESS FINDINGS

17.4.6.1 Program Management and Delivery

The Evaluators interviewed the Honeywell team in charge of implementing the program. Interviewees included a program manager from Honeywell's Smart Energy group, as well as an energy products manager; interviewees indicated the program employs one other full time staff member, as well as contracts with local trade allies to conduct the installs.

17.4.6.2 Program Background

The large demand response program kicked off in early 2020 right before the start of the COVID-19 pandemic. This unfortunate launch timing resulted in delays and setbacks for the program, as the pandemic hindered staff's ability to meet with customers in person. Staff explained that although the approach to every project is the same, the projects themselves vary as equipment size and usage patterns are very customer dependent. They noted that is easy to create demand curves and usage forecasts for office-building focused projects as these buildings have standard usage pattern, others building types like manufactures can be more complicated.

When beginning a new project, program staff conduct a demand response survey to understand their clients operational restrictions and typical utility usage. From there, they can make calculations the predict how much energy the customers can reduce during peak events. Customers then sign up for specific kilowatt reduction goals that they can meet over the course of the peak demand events. The program is completely voluntary; customers can opt out of events at any time.

Typically, customers are a warned of an upcoming event about 24 hours in advance via a notification. The program is automated, so unless the customer opts out of the event their usage will automatically be reduced once the event begins. Typically, events last about 2-3 hours and occur in the middle of heat waves or other predictable events; 2021 experienced four events, all of which occurred in the summer. Customers are told to expect anywhere from 4-8 events when they enroll. When enrolling in the program customers often express concern regarding comfort during events, however staff note that the

set points are so low that comfort is rarely impacted, and customers often do not even realize the event is happening.

Program staff encourage customers to plan for events and practice pre-cooling prior to an event. Staff underscored that this program is not an energy saving savings program but rather a load shifting, demand reduction program.

17.4.6.3 Program Goals

The overall goal for the demand response program is 9.3 megawatts. Thus far, the team has enrolled customers that cover 14 megawatts.

17.4.6.4 Marketing

Program marketing consists of handouts, information on the website, lunch-n-learns, and industry presentations. Staff note that word of mouth accounts for about half of their recruitment. Honeywell manages all program marketing, communicating for ENO's account managers to help with scheduling and logistics.

17.4.6.5 Communication & Data

Honeywell and ENO meet every other week to go over program updates; they also communicate as needed outside of meetings. Staff receive event data, in 15-minute interval, the day after an event. Before enrolling a customer in the program staff conduct a dry run in the building and verify the facility can perform during an event. Typically, local trade allies conduct the installs and verifications.

17.4.6.6 Successes

When asked what the biggest success of the program in 2021 staff talked about their success building relationships and conducting outreach. As a new program, the program is still getting its feet off the ground and enrolling participants. Staff note that buildings with more sophisticated control systems perform better in this program that buildings without more outdated systems. Staff often work with ENO's other C&I programs to enroll new customers once they have received upgraded equipment through the various other programs.

17.4.7 DATA TRACKING REVIEW

The Evaluators reviewed the tracking data provided and found the following issue. Advanced metering infrastructure (AMI) data was incomplete for two sites as it did not contain data for each meter included in the site.

17.4.8 FINDINGS AND RECOMMENDATIONS

Large C&I DR Key Findings and Recommendations

- **Key Finding 1: The Large Demand Response program launched in 2020 and, thus, is still new.** As a new program, the program is still getting its feet off the ground and enrolling participants. Staff often work with ENO's other C&I programs to enroll new customers once they have received upgraded equipment through the various other programs.

- ***Recommendation: Continue to build relationships with other C&I programs.*** *The program should continue to build off its partnership with ENO's other C&I programs as a means of recruiting interested customers in the demand response program. Staff noted that buildings with more updated equipment perform better in this program and thus participants who recently received updated equipment through the C&I program are prime candidates.*

- **Key Finding 2: Although the approach to each project is uniform, projects themselves vary based on customer.** As a demand response program, this program allows for flexibility and diversity across project plans. Demand curves and usage forecasts are based on each buildings equipment size and existing usage patterns. Staff have developed a system of surveying potential buildings and calculation predictions based on survey results.
- **Key Finding 3: Participants are given ample warning ahead of an event.** Participants are a warned of an upcoming event about 24 hours in advance via a notification. Typically, events last about 2-3 hours and occur in the middle of heat waves or other predictable events.
- **Key Finding 4: In response to concerns about comfort during events, staff recommend participants "pre-cool".** Program staff encourage customers to plan for events and practice pre-cooling prior to an event. Staff underscored that this program is not an energy saving program but rather a load shifting, demand reduction program.

18 EASYCOOL FOR BUSINESS

18.1 Summary

The tables below report *ex ante* gross, *ex post* gross, *ex post* net energy savings (kWh) (both annual and lifetime), demand reductions (kW), participation, and incentive spend, by measure, where applicable.

TABLE 18-1 PY11 EASYCOOL FOR BUSINESS ENERGY SAVINGS (KWH)

Measure	*Ex ante* Gross Savings (kWh)	Realization Rate (kWh)	*Ex post* Gross Savings (kWh)	NTG	*Ex post* Net Savings (kWh)
Event (x 42)	0	N/A	0	N/A	0
Total	**0**	**N/A**	**0**	**N/A**	**0**

Sums may differ due to rounding.

TABLE 18-2 PY11 EASYCOOL FOR BUSINESS DEMAND REDUCTIONS (KW)

Measure	*Ex ante* Gross Demand (kW)	Realization Rate (kW)	*Ex post* Gross Demand (kW)	NTG	*Ex post* Net Demand (kW)
Event (x 42)	0.00	N/A	34.42	100%	34.42
Total	**0.00**	**N/A**	**34.42**	**100%**	**34.42**

Sums may differ due to rounding.

TABLE 18-3 PY11 EASYCOOL FOR BUSINESS LIFETIME SAVINGS SUMMARY

Measure	EUL	*Ex post* Gross Lifetime Energy Savings (kWh)	*Ex post* Net Lifetime Energy Savings (kWh)
Event (x 42)	1	0	0
Total	**1**	**0**	**0**

Sums may differ due to rounding.

TABLE 18-4 PY11 EASYCOOL FOR BUSINESS PARTICIPATION AND INCENTIVE SUMMARY

Measure	Participation (Count of Measures)	Incentive Spend ($)
Event (x 42)	71	$4,140
Total	**71**	**$4,140**

Sums may differ due to rounding.

18.2 Program Description

EasyCool for Business uses a Distributed Energy Resource Management System (DERMS) to enroll, monitor, and to schedule load control events to reduce electricity consumption during periods of high demand. The DERMS system increases the temperature setting by a small amount on customer thermostats. These events may occur between June 1st and September 30th and are limited to a maximum of 15 adjustments per year. These events typically last no more than four hours and occur between noon and 8 p.m. To manage customer comfort, the system will pre-cool the business in advance of the event.

The offering works with a wide range of thermostats including those manufactured by ecobee, Honeywell, Nest, and Emerson. A complete list of qualifying thermostats is published on the program website.

Customers enroll in the offering by visiting a web-based portal. To qualify customers must be a small business ENOs electric customer, have an internet connected thermostat that controls central air conditioning, and agree to the terms and conditions. Customers may receive a $25 incentive for enrolling and $40 for each year they participate. Customers may unenroll by sending an email communication or they may opt-out of events using the web portal.

18.2.1 PROGRAM CHANGES

There were no reported changes to this program in PY11.

18.2.2 TIMING OF PROJECTS

All projects occurred in all months except January and November.

18.2.3 TRADE ALLIES

There were no reported trade allies in this program.

18.2.4 GOAL ACHIEVEMENT

The table below summarizes the programs' performance against goal.

TABLE 18-5 EASYCOOL FOR BUSINESS PERFORMANCE TOWARDS GOAL

Ex post Gross Energy Savings (kWh) Goal	% to kWh Goal	*Ex post* Gross Energy Savings (kWh)	*Ex post* Gross Savings (kW) Target	% to kW Target	*Ex post* Gross Savings (kW)
0	N/A	0	400.50	9%	34.42

18.3 EM&V Methodology

The Evaluators employed the following approach to complete impact evaluation activities for the program. The Evaluator followed the Calculated Baseline approach outlined in the Midcontinent

Independent System Operator, Inc. (MISO) Business Practices Manual (BPM)[130]. The following impact evaluation steps were taken to determine the suitability of the MISO Calculated Baseline approach:

- Developed an Unadjusted Consumption (UC) Baseline, a Symmetric Multiplicative Adjustment (SMA) Baseline, and a Weather Sensitive Adjustment (WSA) Baseline for each program participant. Loads were calculated utilizing 1-hour AMI data.
- Determined days that will serve as proxy days for testing the suitability of the baseline approach. Proxy days represent days like demand response event days in terms of load shape and temperature profiles.
- Estimated bias (uncertainty) and error on proxy days for each model to assess baseline performance. Bias is assessed by examining the average percent error of the baseline predictions relative to the actual usage on proxy days. In a similar manner, error is assessed through various metrics such as Root Mean Squared Error (RRMSE) using baseline predictions and actual usage on proxy days.
- Selected the baseline model with the lowest absolute bias.

18.3.1 GROSS IMPACT METHODOLOGIES

In the evaluation of demand response programs, energy savings are estimated by comparing a participant's load shape during a demand response event with a baseline load shape. This baseline load is assumed to be a good estimate of the counterfactual load—that is, the load that would have manifested had there not been an event called that day.

18.3.1.1 Data Sources

Data used for this evaluation include program tracking data that identifies which customers participated in the program and contains data fields such as hourly usage, hourly interval meter data (AMI) for each customer participating in the program, and a full schedule of DR program events, including the time of the event.

18.3.1.2 MISO Calculated Baseline Approach (Customer Baselines)

The following details the general requirements for the MISO Calculated Baseline Approach. The Evaluators developed Customer Baselines (CBLs) in accordance with this approach. For a demand resource, the Consumption Baseline is a profile of hourly demand based on an averaged sample of historical data which may be adjusted for factors that reflect specific, on-the-day conditions, such as temperature.

The default consumption baseline is designed as follows:

- Separate hourly demand profiles for non-holiday weekdays and for weekends/holidays
- The "weekday" hourly profile is based on the average of the ten (10), but not less than five (5), most recent weekdays that are not holidays or other non-standard "event" days

[130] *Ibid.*

- The “weekend/holiday” hourly profile is based on the average of the four (4), but not less than two (2), most recent weekend days or holidays that are not “event” days
- An “event” day is one during which there was, for the resource in question, a real- time energy or ancillary services dispatch, or a scheduled outage
- The maximum look-back window is limited to 45 days
- If the 45-day window contains insufficient days to meet the minimum number of days described above, the profiles are constructed based on the available days within the 45-day window that qualify, supplemented by the largest (MW) matching “event” day(s) values for that resource within that same window as necessary to obtain the minimum number of values.

Adjustment mechanisms to the default Consumption Baseline include:

- Symmetric Multiplicative Adjustment (SMA)
  - Adjusts each baseline hourly value (MW) during the event up or down by the ratio of
  - (a) the sum of hourly demands for the three hours beginning four hours prior to the event and (b) the sum of those same three hourly baseline demands
  - The adjustment is limited to a change in any individual baseline hour of plus or minus 20 percent.
  - If multiple events occur during the same day, the SMA is calculated only for the first event, but applied to all events that day.
- Weather Sensitive Adjustment (WSA)
  - Adjusts each baseline hourly value (MW) up or down by a Weather Adjustment Factor
  - The Weather Adjustment Factor is determined by a mathematical relationship derived through a regression analysis that considers the DRR load and historical hourly temperature data.

18.3.1.3 Evaluators MISO Models

The following CBL models were developed for each customer in accordance with MISO protocols.

For a 5-of-10 (or 5-of-5) unadjusted baseline, the Evaluators examine the load data from the most recent ten (or five) non-event, non-holiday weekdays relative to the event day and calculate the mean demand usage values of the five highest load days. This baseline is then adjusted for the SMA and WSA models utilizing the method described in Section 12.3.1.2.

TABLE 18-6 EVALUATORS’ MISO CBL MODELS

Model Type	Baseline Days	SMA	WSA
Unadjusted	5-of-10	No	No
SMA-Adjusted	5-of-10	Yes	No
WSA-Adjusted	5-of-10	No	Yes
Unadjusted	5-of-5	No	No
SMA-Adjusted	5-of-5	Yes	No
WSA-Adjusted	5-of-5	No	Yes

18.3.1.4 Baseline and Proxy Day Development

The Evaluators defined proxy days as the top eight non-event, non-holiday, non-weekend days with the highest loads across all summer months. In addition, proxy days must display a maximum temperature of greater than or equal to the minimum temperature observed during normal curtailment hours during the events. The Evaluators used these defined proxy days to determine the ability of CBL models to predict actual usage for each customer.

18.3.2 NET IMPACT METHODOLOGIES

In demand response programs, it is typically assumed that there are neither spillover nor free-ridership effects (customers are not expected to curtail without participating). Although customers can find workarounds to make up for lost productivity due to demand response events, they are compensated only if they reduce their load during the peak demand window, the primary program goal. As such, the net-to-gross ratio for this program is assumed to be 100%.

18.4 Evaluation Findings

TABLE 18-7 EVENT DATES AND TIMES

Event Dates	Event Times (CDT)
6/10/2021	1400-1800
7/23/2021	1400-1800
7/28/2021	1500-1800
8/23/2021	1600-1800

18.4.1 LOAD SHAPES AND MODEL PERFORMANCE

The figures below are average load shapes for each program on proxy and event days and depict actual kW and baseline kW for the selected baseline model. The figures show that baseline kW is a good match for actual kW during the hours of curtailment on the majority of proxy days.

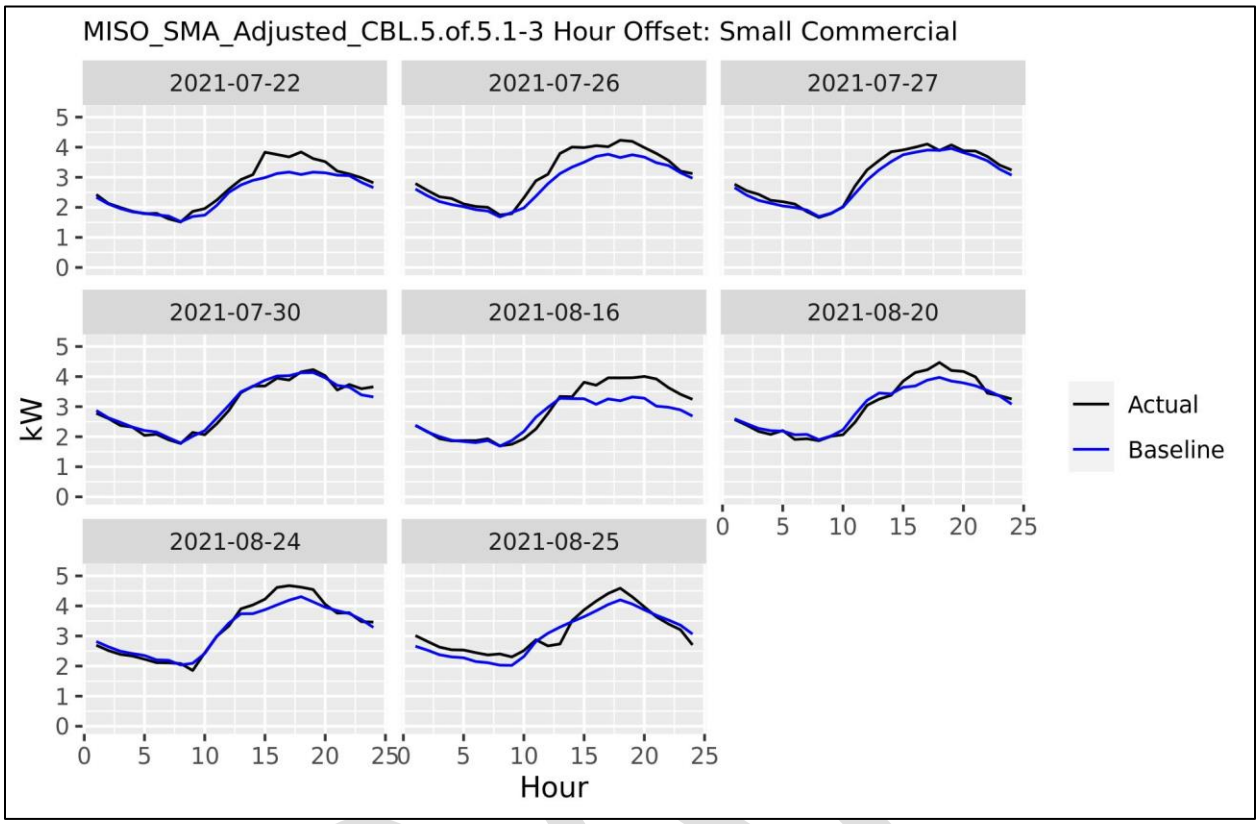

FIGURE 18-1 EASYCOOL SMALL COMMERCIAL PROXY DAY LOAD SHAPES

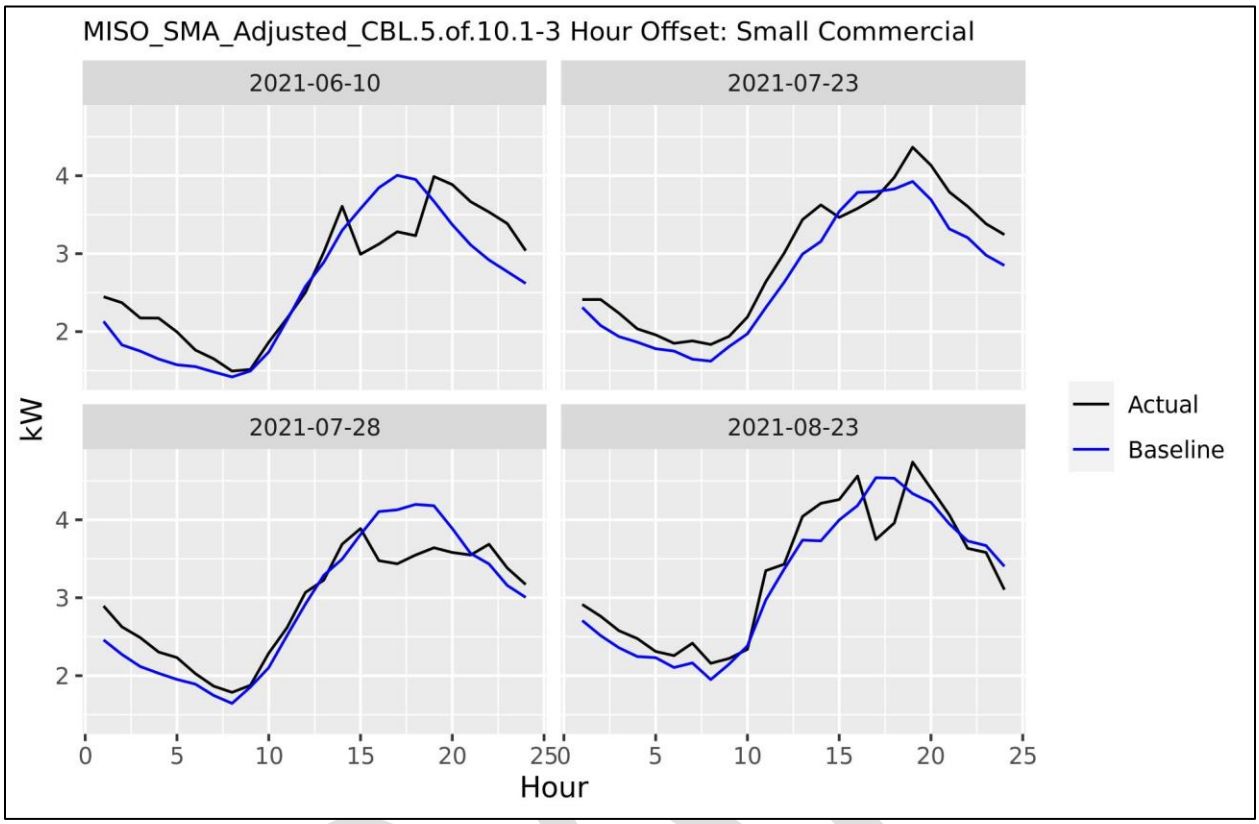

FIGURE 18-2 EASYCOOL SMALL COMMERCIAL EVENT DAY LOAD SHAPES

ADM estimated bias and error for ADM's MISO models across all sites and when applied on a site-specific basis and selecting for the model with the lowest bias. As shown in the table below, the MISO SMA Adjusted CBL 5-of-10 model performed the best and has the lowest bias and error (RRMSE) for the EasyCool for Business program.

TABLE 18-8 MODEL FIT AND BIAS

Model	Follow MISO Protocols	RRMSE	RMSE	Bias	Best Fit Model (Lowest Bias/Error)
MISO_SMA_Adjusted_CBL.5.of.10	X	0.047	0.192	-0.46%	X
MISO_WSA_Adjusted_CBL.5.of.5	X	0.089	0.361	-2.05%	
MISO_Unadjusted_CBL.5.of.10	X	0.065	0.263	-4.09%	
MISO_WSA_Adjusted_CBL.5.of.10	X	0.086	0.349	6.27%	
MISO_SMA_Adjusted_CBL.5.of.5	X	0.110	0.449	-9.01%	
MISO_Unadjusted_CBL.5.of.5	X	0.163	0.663	-14.47%	

18.4.2 GROSS IMPACT FINDINGS

Using results from the CBLs, the Evaluators calculated the PY11 kW reduction. Results are shown below in the table below.

TABLE 18-9 TOTAL EASYCOOL FOR BUSINESS DEMAND REDUCTIONS

Average Savings per Event per Unit (kW)	Average Savings per Event per Participant (kW)	Total Participating Systems	Number of Participants	Total Program kW Reduction
0.484759	0.484759	71	71	34.42

The overall verified kW reduction is 34.41 kW.

18.4.3 NET IMPACT FINDINGS

For demand response programs, net savings equals gross savings.

Program results can be found in tables in Section 18.1 Summary.

18.4.4 PROCESS FINDINGS

There were no process evaluation activities or findings in PY11.

18.4.5 DATA TRACKING REVIEW

The Evaluators reviewed the tracking data and found no issues. Advanced metering infrastructure (AMI) data was provided which allowed the Evaluators to complete the billing (CBL) analysis.

18.4.6 KEY FINDINGS AND CONCLUSIONS

There were no key findings or conclusions for this program.

18.4.7 RECOMMENDATIONS

There were no recommendations for this program.

19 APPENDIX A: COMMERCIAL SITE REPORTS

Project Number CIP 027

Program Large C&I

Project Background

The participant is an outdoor area that received incentives from Entergy New Orleans for retrofitting energy efficient lighting. The Evaluators verified that the following had been installed:

- MH100/1 with LED040-FIXT

Calculation Parameters

The Evaluators confirmed installation of all fixtures listed in the project application. Savings for the measures were calculated using prescriptive savings values listed in Section 10.2.2, which are based on the New Orleans TRM 4.0. The specific values used in calculating savings for this site are presented in the table below.

Table A. Prescriptive Savings and kW Reductions

Prescriptive Measure	*Per-Unit kWh Savings*	*Per-Unit kW Reduction*
MH100/1 with LED040-FIXT	328.18	0.00

Savings Calculations

Using values from the table above, the Evaluators calculated lighting savings as follows:

Table B. Lighting Retrofit kWh Savings Calculations

Prescriptive Measure	*Measure Quantity*	*Per-Unit kWh Savings*	*Expected kWh Savings*	*Realized kWh Savings*	*kWh Realization Rate*
MH100/1 with LED040-FIXT	100	328.18	32,818	36,280	110.5%
		Total:	**32,818**	**36,280**	**110.5%**

Results

The kWh and kW realization rates for project CIP 027 are 110.5%.

Table C. Verified Gross Savings & Realization Rates

Measure	*Verified*	
	kWh Savings	*kWh Realization Rate*
MH100/1 with LED040-FIXT	36,280	110.5%
Total:	**36,280**	**110.5%**

Project Number CIP 067

Program Large C&I

Project Background

The participant is a retail business that received incentives from Entergy New Orleans for retrofitting energy efficient lighting. The Evaluators verified that the following had been installed:

- (546) High Intensity Discharge (HID) [175 to 250W] with LED Lamp/Fixture
- (546) No Controls with Daylighting Controller (Controlling < 500 W)

Calculation Parameters

The Evaluators confirmed installation of all fixtures listed in the project application. Savings for the measures were calculated using prescriptive savings values listed in Section 10.2.2, which are based on the New Orleans TRM 4.0. The specific values used in calculating savings for this site are presented in the table below.

Table A. Prescriptive Savings and kW Reductions

Prescriptive Measure	*Per-Unit kWh Savings*	*Per-Unit kW Reduction*
High Intensity Discharge (HID) [175 to 250W] with LED Lamp/Fixture	373.60	0.07
No Controls with Daylighting Controller (Controlling < 500 W)	207.60	0.08

Savings Calculations

Using values from the table above, the Evaluators calculated lighting savings as follows:

Table B. Lighting Retrofit kWh Savings Calculations

Prescriptive Measure	*Measure Quantity*	*Per-Unit kWh Savings*	*Expected kWh Savings*	*Realized kWh Savings*	*kWh Realization Rate*

High Intensity Discharge (HID) [175 to 250W] with LED Lamp/Fixture	546	373.60	203,985	146,641.09	72%
No Controls with Daylighting Controller (Controlling < 500 W)	546	207.60	113,349.6	106,773.98	94%
Total:			**317,335.20**	**253,415.07**	**80%**

Table C. Lighting Retrofit kW Reduction Calculations

Prescriptive Measure	*Measure Quantity*	*Per-Unit kW Reduction*	*Expected kW Reduction*	*Realized kW Reduction*	*kW Realization Rate*
High Intensity Discharge (HID) [175 to 250W] with LED Lamp/Fixture	546	0.07	36.58	38.31	104%
No Controls with Daylighting Controller (Controlling < 500 W)	546	0.08	42.58	41.33	97%
Total:			**79.17**	**79.64**	**101%**

Results

The kWh and kW realization rates for project CIP 067 are 80% and 101%.

Table D. Verified Gross Savings & Realization Rates

Measure	*Verified*			
	kWh Savings	*kW Savings*	*kWh Realization Rate*	*kW Realization Rate*
High Intensity Discharge (HID) [175 to 250W] with LED Lamp/Fixture	146,641	38.31	72%	104%
No Controls with Daylighting Controller (Controlling < 500 W)	106,774	41.33		97%

			94%	
Total:	**253,415.07**	**79.64**	**80%**	**101%**

Project Number CIP-110

Program Large C&I Solutions

Project Background

The participant is a public assembly that received incentives from Entergy New Orleans for retrofitting energy efficient lighting indoors and outdoors. The Evaluators verified that the following had been installed:

- (639) MH1000/1 with (639) LED440-FIXT
- (556) MH250/1 with (556) LED057-FIXT
- (5) MH400/1 with (5) LED001-FIXT
- (3) MH1000/1 with (3) LED001-FIXT
- (352) MH1000/1 with (352) LED200-FIXT

Calculation Parameters

Savings calculations were performed using savings methodology described in section D.6.3 Commercial Lighting Efficiency of the New Orleans TRM 4.0. Deemed savings parameters applicable to this site are shown below:

Table A, Savings Parameters

Building Type	*Heating Type*	*Annual Hours*	*IEF_E*	*IEF_D*	*CF*
Public Assembly	Gas	2,638	1.09	1.20	0.56
Public Assembly	Gas	2,638	1.09	1.20	0.56
Public Assembly	Gas	2,638	1.09	1.20	0.56

Savings Calculations

Table B, Lighting Retrofit kWh Savings Calculations

Measure	*Quantity (Fixtures)*		*Wattage*		*Annual Operating Hours*	*Expected kWh Savings*	*Realized kWh Savings*	*IEF_E*	*Realization Rate*
	Base	*Post*	*Base*	*Post*					
MH1000 to LED440W	54	54	1,078	440	2,638	94,053	99,064	1.09	105.3%

MH250 to LED57W	40	32	288	57	2,638	26,470	27,880	1.09	105.3%
MH1000 to LED440W	72	72	1,078	440	2,638	125,404	132,085	1.09	105.3%
MH250 to LED57W	40	36	288	57	2,638	25,847	27,224	1.09	105.3%
MH1000 to LED440W	108	108	1,078	440	2,638	188,107	198,128	1.09	105.3%
MH250 to LED57W	60	54	288	57	2,638	38,771	40,837	1.09	105.3%
MH1000 to LED440W	108	108	1,078	440	2,638	188,107	198,128	1.09	105.3%
MH250 to LED57W	60	54	288	57	2,638	38,771	40,837	1.09	105.3%
MH1000 to LED440W	108	108	1,078	440	2,638	188,107	198,128	1.09	105.3%
MH250 to LED57W	60	54	288	57	2,638	38,771	40,837	1.09	105.3%
MH1000 to LED440W	36	36	1,078	440	4,312	109,729	107,951	1.09	98.4%
MH250 to LED57W	192	192	288	57	2,638	121,080	127,531	1.09	105.3%
MH1000 to LED440W	127	125	1,078	440	2,638	223,602	235,514	1.09	105.3%
MH250 to LED57W	32	30	288	57	2,638	20,491	21,583	1.09	105.3%
MH1000 to LED440W	28	28	1,078	440	4,312	85,345	83,962	1.09	98.4%
MH250 to LED57W	104	104	288	57	2,638	65,585	69,079	1.09	105.3%
MH400 to LED1W	16	1	453	1	2,638	19,784	20,838	1.09	105.3%
MH400 to LED1W	32	1	453	1	2,638	39,571	41,679	1.09	105.3%
MH400 to LED1W	48	1	453	1	2,638	63,550	62,520	1.09	98.4%
MH400 to LED1W	2	1	453	1	2,638	2,645	2,602	1.09	98.4%
					Total	**1,703,790**	**1,776,407**		**104.3%**

Table C, Lighting Retrofit kW Reduction Calculations

Measure	***Quantity (Fixtures)***		***Wattage***		***CF***	***Expected kW Savings***	***Realized kW Savings***	***IEF$_D$***	***Realization Rate***
	Base	***Post***	***Base***	***Post***					

MH1000 to LED440W	54	54	1,078	440	0.56	33.07	23.15	1.20	70.0%
MH250 to LED57W	40	32	288	57	0.56	9.31	6.52	1.20	70.0%
MH1000 to LED440W	72	72	1,078	440	0.56	44.10	30.87	1.20	70.0%
MH250 to LED57W	40	36	288	57	0.56	9.09	6.36	1.20	70.0%
MH1000 to LED440W	108	108	1,078	440	0.56	66.15	46.30	1.20	70.0%
MH250 to LED57W	60	54	288	57	0.56	13.63	9.54	1.20	70.0%
MH1000 to LED440W	108	108	1,078	440	0.56	66.15	46.30	1.20	70.0%
MH250 to LED57W	60	54	288	57	0.56	13.63	9.54	1.20	70.0%
MH1000 to LED440W	108	108	1,078	440	0.56	66.15	46.30	1.20	70.0%
MH250 to LED57W	60	54	288	57	0.56	13.63	9.54	1.20	70.0%
MH1000 to LED440W	36	36	1,078	440	0.90	27.56	24.81	1.20	90.0%
MH250 to LED57W	192	192	288	57	0.56	42.58	29.80	1.20	70.0%
MH1000 to LED440W	127	125	1,078	440	0.56	78.63	55.04	1.20	70.0%
MH250 to LED57W	32	30	288	57	0.56	7.21	5.04	1.20	69.9%
MH1000 to LED440W	28	28	1,078	440	0.90	21.44	19.29	1.20	90.0%
MH250 to LED57W	104	104	288	57	0.56	23.06	16.14	1.20	70.0%
MH400 to LED1W	16	1	453	1	0.56	6.96	4.87	1.20	70.0%
MH400 to LED1W	32	1	453	1	0.56	13.92	9.74	1.20	70.0%
MH400 to LED1W	48	1	453	1	0.56	16.23	14.61	1.20	90.0%
MH400 to LED1W	2	1	453	1	0.56	0.68	0.61	1.20	89.7%

Total	**573.18**	**414.37**		**72.3%**

Results

The kWh and kW realization rates for project CIP-110 are 104% and 72.3%.

Table D, Verified Gross Savings & Realization Rates

Measure	*Verified*			
	kWh Savings	*kW Savings*	*kWh Realization Rate*	*kW Realization Rate*
MH1000 to LED440W	99,064	23.15	105.3%	70.0%
MH250 to LED57W	27,880	6.52	105.3%	70.0%
MH1000 to LED440W	132,085	30.87	105.3%	70.0%
MH250 to LED57W	27,224	6.36	105.3%	70.0%
MH1000 to LED440W	198,128	46.30	105.3%	70.0%
MH250 to LED57W	40,837	9.54	105.3%	70.0%
MH1000 to LED440W	198,128	46.30	105.3%	70.0%
MH250 to LED57W	40,837	9.54	105.3%	70.0%
MH1000 to LED440W	198,128	46.30	105.3%	70.0%
MH250 to LED57W	40,837	9.54	105.3%	70.0%
MH1000 to LED440W	107,951	24.81	98.4%	90.0%
MH250 to LED57W	127,531	29.80	105.3%	70.0%
MH1000 to LED440W	235,514	55.04	105.3%	70.0%
MH250 to LED57W	21,583	5.04	105.3%	69.9%
MH1000 to LED440W	83,962	19.29	98.4%	90.0%
MH250 to LED57W	69,079	16.14	105.3%	70.0%

MH400 to LED1W	20,838	4.87	105.3%	70.0%
MH400 to LED1W	41,679	9.74	105.3%	70.0%
MH400 to LED1W	62,520	14.61	98.4%	90.0%
MH400 to LED1W	2,602	0.61	98.4%	89.7%
Total	**1,776,407**	**414.37**	**104.3%**	**72.3%**

Project Number CIP 194

Program Large C&I

Project Background

The participant is a parking structure that received incentives from Entergy New Orleans for retrofitting energy efficient lighting. The Evaluators verified that the following had been installed:

- CFM42/1-L with LED016-FIXT
- CFM26/1-L with LED011-FIXT
- F41IAL with LED018-FIXT
- F44IAL-R with LED018-FIXT
- FU1LL with LED018-FIXT

Calculation Parameters

The Evaluators confirmed installation of all fixtures listed in the project application. Savings for the measures were calculated using prescriptive savings values listed in Section 10.2.2, which are based on the New Orleans TRM 4.0. The specific values used in calculating savings for this site are presented in the table below.

Table A. Prescriptive Savings and kW Reductions

Prescriptive Measure	*Per-Unit kWh Savings*	*Per-Unit kW Reduction*
CFM42/1-L with LED016-FIXT	103.61	0.03
CFM26/1-L with LED011-FIXT	69.08	0.01
F41IAL with LED018-FIXT	58.10	0.01
F44IAL-R with LED018-FIXT	58.10	0.01
FU1LL with LED018-FIXT	78.90	0.01

Savings Calculations

Using values from the table above, the Evaluators calculated lighting savings as follows:

Table B. Lighting Retrofit kWh Savings Calculations

Prescriptive Measure	*Measure Quantity*	*Per-Unit kWh Savings*	*Expected kWh Savings*	*Realized kWh Savings*	*kWh Realization Rate*
CFM42/1-L with LED016-FIXT	9	103.61	933	933	100.1%
CFM26/1-L with LED011-FIXT	5	69.08	345	311	90.0%
F41IAL with LED018-FIXT	48	58.10	2,789	1,160	41.6%
F44IAL-R with LED018-FIXT	268	58.10	15,571	57,387	368.6%
FU1LL with LED018-FIXT	72	78.90	5,681	3,481	61.3%
		Total:	**25,318**	**63,272**	**250%**

Table C. Lighting Retrofit kW Reduction Calculations

Prescriptive Measure	*Measure Quantity*	*Per-Unit kW Reduction*	*Expected kW Reduction*	*Realized kW Reduction*	*kW Realization Rate*
CFM42/1-L with LED016-FIXT	9	0.03	0.25	0.25	101.7%
CFM26/1-L with LED011-FIXT	5	0.01	0.06	0.08	133.1%
F41IAL with LED018-FIXT	48	0.01	0.48	0.31	64.6%
F44IAL-R with LED018-FIXT	268	0.01	2.68	15.35	572.8%
FU1LL with LED018-FIXT	72	0.01	1.01	0.93	92.3%
		Total:	**4.47**	**16.92**	**378%**

Results

The kWh and kW realization rates for project CIP 194 are 250% and 378%.

Table D. Verified Gross Savings & Realization Rates

Measure	*Verified*			
	kWh Savings	*kW Savings*	*kWh Realization Rate*	*kW Realization Rate*
CFM42/1-L with LED016-FIXT	933	0.25	100.1%	101.7%
CFM26/1-L with LED011-FIXT	311	0.08	90.0%	133.1%
F41IAL with LED018-FIXT	1,160	0.31	41.6%	64.6%
F44IAL-R with LED018-FIXT	57,387	15.35	368.6%	572.8%
FU1LL with LED018-FIXT	3,481	0.93	61.3%	92.3%
Total:	**63,272**	**16.92**	**250%**	**378%**

Project Number CIP 198

Program Publicly Funded Institution

Project Background

The participant is a university that received incentives from Entergy New Orleans for retrofitting energy efficient lighting indoors and outdoors. The Evaluators verified that the following had been installed:

- F32T8-28W to LED15W
- F32T8-28W to LED15W
- F32T8-28W to LED15W
- F32T8-28W to LED15W
- F32T8-28W to LED15W
- F32T8-28W to LED15W
- F32T8-28W to LED15W
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- F32T8-28W to LED15W
- F32T8-28W to LED15W
- F32T8-28W to LED15W
- F32T8-28W to LED15W
- F32T8 to LED45W
- F32T8 to LED30W
- F32T8 to LED60W
- F32T8 to LED45W
- F32T8 to LED30W
- F32T8 to LED60W
- F32T8 to LED60W
- F32T8 to LED45W
- F32T8 to LED30W
- F32T8 to LED60W
- F32T8 to LED60W
- F32T8 to LED45W
- F32T8 to LED30W
- F32T8 to LED60W
- F32T8 to LED60W
- F32T8 to LED45W
- F32T8 to LED30W

- F32T8 to LED60W
- F32T8 to LED60W
- F32T8 to LED45W
- F32T8 to LED30W
- F32T8 to LED60W
- F32T8 to LED60W
- F32T8 to LED45W
- F32T8 to LED30W
- F32T8 to LED60W
- F32T8 to LED60W

Calculation Parameters

Savings calculations were performed using savings methodology described in section D.6.3 Commercial Lighting Efficiency of the New Orleans TRM 4.0. Deemed savings parameters applicable to this site are shown below:

Table A, Savings Parameters

Building Type	Heating Type	Annual Hours	IEF_E	IEF_D	CF
Education: College/University	HP	3,577	1.02	1.20	0.69
Education: College/University	HP	3,577	1.02	1.20	0.69
Education: College/University	HP	3,577	1.02	1.20	0.69

Savings Calculations

Table B, Lighting Retrofit kWh Savings Calculations

Measure	Quantity (Fixtures)		Wattage		Annual Operating Hours	Expected kWh Savings	Realized kWh Savings	IEF_E	Realization Rate
	Base	Post	Base	Post					
F32T8-28W to LED15W	139	139	28	14	3,577	8,076	7,100	1.02	87.9%
F32T8-28W to LED15W	132	132	28	14	3,577	7,669	6,743	1.02	87.9%
F32T8-28W to LED15W	274	274	28	14	3,577	15,919	13,996	1.02	87.9%

F32T8-28W to LED15W	259	259	28	14	3,577	15,048	13,230	1.02	87.9%
F32T8-28W to LED15W	50	50	28	14	3,577	2,905	2,554	1.02	87.9%
F32T8-28W to LED15W	401	401	28	14	3,577	23,298	20,483	1.02	87.9%
F32T8-28W to LED15W	48	48	28	14	3,577	2,789	2,452	1.02	87.9%
F32T8-28W to LED15W	272	272	28	14	3,577	15,803	13,894	1.02	87.9%
F32T8-28W to LED15W	40	40	28	14	3,577	2,324	2,043	1.02	87.9%
F32T8-28W to LED15W	484	484	28	14	3,577	28,120	24,723	1.02	87.9%
F32T8-28W to LED15W	416	416	28	14	3,577	24,170	21,249	1.02	87.9%
F32T8-28W to LED15W	196	196	28	14	3,577	11,388	10,012	1.02	87.9%
F32T8-28W to LED15W	38	38	28	14	3,577	2,208	1,941	1.02	87.9%
F32T8-28W to LED15W	427	427	28	14	3,577	24,809	21,811	1.02	87.9%
F32T8-28W to LED15W	488	488	28	14	3,577	28,353	24,927	1.02	87.9%
F32T8-28W to LED15W	332	332	28	14	3,577	19,289	16,958	1.02	87.9%
F32T8-28W to LED15W	38	38	28	14	3,577	2,208	1,941	1.02	87.9%
F32T8-28W to LED15W	369	369	28	14	3,577	21,439	18,848	1.02	87.9%
F32T8-28W to LED15W	408	408	28	14	3,577	23,705	20,840	1.02	87.9%
F32T8 to LED45W	35	35	93	45	8,760	15,011	15,011	1.02	100.0%
F32T8 to LED30W	23	23	60	30	8,760	6,165	6,165	1.02	100.0%
F32T8 to LED60W	14	14	118	60	8,760	7,255	7,255	1.02	100.0%
F32T8 to LED45W	63	63	93	45	8,760	2,702	27,020	1.02	1000.0%
F32T8 to LED30W	9	9	60	30	8,760	2,413	2,413	1.02	100.0%
F32T8 to LED60W	5	5	118	60	8,760	2,591	2,591	1.02	100.0%
F32T8 to LED60W	39	39	118	60	8,760	20,211	20,211	1.02	100.0%
F32T8 to LED45W	40	40	93	45	8,760	17,156	17,156	1.02	100.0%
F32T8 to LED30W	5	5	60	30	8,760	1,340	1,340	1.02	100.0%

F32T8 to LED60W	32	32	118	60	8,760	16,584	16,584	1.02	100.0%
F32T8 to LED60W	7	7	118	60	8,760	3,628	3,628	1.02	100.0%
F32T8 to LED45W	40	40	93	45	8,760	17,156	17,156	1.02	100.0%
F32T8 to LED30W	5	5	60	30	8,760	1,340	1,340	1.02	100.0%
F32T8 to LED60W	31	31	118	60	8,760	16,066	16,065	1.02	100.0%
F32T8 to LED60W	3	3	118	60	8,760	1,555	1,555	1.02	100.0%
F32T8 to LED45W	40	40	93	45	8,760	17,156	17,156	1.02	100.0%
F32T8 to LED30W	5	5	60	30	8,760	1,340	1,340	1.02	100.0%
F32T8 to LED60W	23	23	118	60	8,760	11,920	11,920	1.02	100.0%
F32T8 to LED60W	9	9	118	60	8,760	4,664	4,664	1.02	100.0%
F32T8 to LED45W	34	34	93	45	8,760	14,582	14,582	1.02	100.0%
F32T8 to LED30W	15	15	60	30	8,760	4,021	4,021	1.02	100.0%
F32T8 to LED60W	27	27	118	60	8,760	13,993	13,993	1.02	100.0%
F32T8 to LED60W	7	7	118	60	8,760	3,628	3,628	1.02	100.0%
F32T8 to LED45W	38	38	93	45	8,760	16,298	16,298	1.02	100.0%
F32T8 to LED30W	6	6	60	30	8,760	1,608	1,608	1.02	100.0%
F32T8 to LED60W	35	35	118	60	8,760	18,139	18,138	1.02	100.0%
F32T8 to LED60W	5	5	118	60	8,760	2,591	2,591	1.02	100.0%
					Total	**520,633**	**511,174**		**98.2%**

Table C, Lighting Retrofit kW Reduction Calculations

Measure	*Quantity (Fixtures)*		*Wattage*		*CF*	*Expected kW Savings*	*Realized kW Savings*	*IEF$_D$*	*Realization Rate*
	Base	*Post*	*Base*	*Post*					

F32T8-28W to LED15W	139	139	28	14	0.69	1.39	1.61	1.20	115.8%
F32T8-28W to LED15W	132	132	28	14	0.69	1.32	1.53	1.20	115.9%
F32T8-28W to LED15W	274	274	28	14	0.69	2.74	3.18	1.20	116.1%
F32T8-28W to LED15W	259	259	28	14	0.69	2.59	3.00	1.20	115.8%
F32T8-28W to LED15W	50	50	28	14	0.69	0.50	0.58	1.20	116.0%
F32T8-28W to LED15W	401	401	28	14	0.69	4.01	4.65	1.20	116.0%
F32T8-28W to LED15W	48	48	28	14	0.69	0.48	0.56	1.20	116.7%
F32T8-28W to LED15W	272	272	28	14	0.69	2.72	3.15	1.20	115.8%
F32T8-28W to LED15W	40	40	28	14	0.69	0.40	0.46	1.20	115.0%
F32T8-28W to LED15W	484	484	28	14	0.69	4.84	5.61	1.20	115.9%
F32T8-28W to LED15W	416	416	28	14	0.69	4.16	4.82	1.20	115.9%
F32T8-28W to LED15W	196	196	28	14	0.69	1.96	2.27	1.20	115.8%
F32T8-28W to LED15W	38	38	28	14	0.69	0.38	0.44	1.20	115.8%
F32T8-28W to LED15W	427	427	28	14	0.69	4.27	4.95	1.20	115.9%
F32T8-28W to LED15W	488	488	28	14	0.69	4.88	5.66	1.20	116.0%

F32T8-28W to LED15W	332	332	28	14	0.69	3.32	3.85	1.20	116.0%
F32T8-28W to LED15W	38	38	28	14	0.69	0.38	0.44	1.20	115.8%
F32T8-28W to LED15W	369	369	28	14	0.69	3.69	4.28	1.20	116.0%
F32T8-28W to LED15W	408	408	28	14	0.69	4.08	4.73	1.20	115.9%
F32T8 to LED45W	35	35	93	45	0.69	2.02	1.39	1.20	68.8%
F32T8 to LED30W	23	23	60	30	0.69	0.83	0.57	1.20	68.7%
F32T8 to LED60W	14	14	118	60	0.69	0.97	0.67	1.20	69.1%
F32T8 to LED45W	63	63	93	45	0.69	3.63	2.50	1.20	68.9%
F32T8 to LED30W	9	9	60	30	0.69	0.32	0.22	1.20	68.8%
F32T8 to LED60W	5	5	118	60	0.69	0.35	0.24	1.20	68.6%
F32T8 to LED60W	39	39	118	60	0.69	2.71	1.87	1.20	69.0%
F32T8 to LED45W	40	40	93	45	0.69	2.30	1.59	1.20	69.1%
F32T8 to LED30W	5	5	60	30	0.69	0.18	0.12	1.20	66.7%
F32T8 to LED60W	32	32	118	60	0.69	2.23	1.54	1.20	69.1%
F32T8 to LED60W	7	7	118	60	0.69	0.49	0.34	1.20	69.4%
F32T8 to LED45W	40	40	93	45	0.69	2.30	1.59	1.20	69.1%
F32T8 to LED30W	5	5	60	30	0.69	0.18	0.12	1.20	66.7%
F32T8 to LED60W	31	31	118	60	0.69	2.16	1.49	1.20	69.0%
F32T8 to LED60W	3	3	118	60	0.69	0.21	0.14	1.20	66.7%
F32T8 to LED45W	40	40	93	45	0.69	2.30	1.59	1.20	69.1%
F32T8 to LED30W	5	5	60	30	0.69	0.18	0.12	1.20	66.7%
F32T8 to LED60W	23	23	118	60	0.69	1.60	1.10	1.20	68.8%
F32T8 to LED60W	9	9	118	60	0.69	0.63	0.43	1.20	68.3%

F32T8 to LED45W	34	34	93	45	0.69	1.96	1.35	1.20	68.9%
F32T8 to LED30W	15	15	60	30	0.69	0.54	0.37	1.20	68.5%
F32T8 to LED60W	27	27	118	60	0.69	1.88	1.30	1.20	69.1%
F32T8 to LED60W	7	7	118	60	0.69	0.49	0.34	1.20	69.4%
F32T8 to LED45W	38	38	93	45	0.69	2.19	1.51	1.20	68.9%
F32T8 to LED30W	6	6	60	30	0.69	0.22	0.15	1.20	68.2%
F32T8 to LED60W	35	35	118	60	0.69	2.44	1.68	1.20	68.9%
F32T8 to LED60W	5	5	118	60	0.69	0.35	0.24	1.20	68.6%
					Total	**83.77**	**80.34**		**95.9%**

Results

The kWh and kW realization rates for project CIP 198 are 61.3% and 86.4%.

Table D, Verified Gross Savings & Realization Rates

Measure	***Verified***			
	kWh Savings	***kW Savings***	***kWh Realization Rate***	***kW Realization Rate***
F32T8-28W to LED15W	7,100	1.61	87.9%	115.8%
F32T8-28W to LED15W	6,743	1.53	87.9%	115.9%
F32T8-28W to LED15W	13,996	3.18	87.9%	116.1%
F32T8-28W to LED15W	13,230	3.00	87.9%	115.8%
F32T8-28W to LED15W	2,554	0.58	87.9%	116.0%
F32T8-28W to LED15W	20,483	4.65	87.9%	116.0%
F32T8-28W to LED15W	2,452	0.56	87.9%	116.7%
F32T8-28W to LED15W	13,894	3.15	87.9%	115.8%

F32T8-28W to LED15W	2,043	0.46	87.9%	115.0%
F32T8-28W to LED15W	24,723	5.61	87.9%	115.9%
F32T8-28W to LED15W	21,249	4.82	87.9%	115.9%
F32T8-28W to LED15W	10,012	2.27	87.9%	115.8%
F32T8-28W to LED15W	1,941	0.44	87.9%	115.8%
F32T8-28W to LED15W	21,811	4.95	87.9%	115.9%
F32T8-28W to LED15W	24,927	5.66	87.9%	116.0%
F32T8-28W to LED15W	16,958	3.85	87.9%	116.0%
F32T8-28W to LED15W	1,941	0.44	87.9%	115.8%
F32T8-28W to LED15W	18,848	4.28	87.9%	116.0%
F32T8-28W to LED15W	20,840	4.73	87.9%	115.9%
F32T8 to LED45W	15,011	1.39	100.0%	68.8%
F32T8 to LED30W	6,165	0.57	100.0%	68.7%
F32T8 to LED60W	7,255	0.67	100.0%	69.1%
F32T8 to LED45W	27,020	2.50	1000.0%	68.9%
F32T8 to LED30W	2,413	0.22	100.0%	68.8%
F32T8 to LED60W	2,591	0.24	100.0%	68.6%
F32T8 to LED60W	20,211	1.87	100.0%	69.0%
F32T8 to LED45W	17,156	1.59	100.0%	69.1%
F32T8 to LED30W	1,340	0.12	100.0%	66.7%
F32T8 to LED60W	16,584	1.54	100.0%	69.1%
F32T8 to LED60W	3,628	0.34	100.0%	69.4%
F32T8 to LED45W	17,156	1.59	100.0%	69.1%
F32T8 to LED30W	1,340	0.12	100.0%	66.7%
F32T8 to LED60W	16,065	1.49	100.0%	69.0%

F32T8 to LED60W	1,555	0.14	100.0%	66.7%
F32T8 to LED45W	17,156	1.59	100.0%	69.1%
F32T8 to LED30W	1,340	0.12	100.0%	66.7%
F32T8 to LED60W	11,920	1.10	100.0%	68.8%
F32T8 to LED60W	4,664	0.43	100.0%	68.3%
F32T8 to LED45W	14,582	1.35	100.0%	68.9%
F32T8 to LED30W	4,021	0.37	100.0%	68.5%
F32T8 to LED60W	13,993	1.30	100.0%	69.1%
F32T8 to LED60W	3,628	0.34	100.0%	69.4%
F32T8 to LED45W	16,298	1.51	100.0%	68.9%
F32T8 to LED30W	1,608	0.15	100.0%	68.2%
F32T8 to LED60W	18,138	1.68	100.0%	68.9%
F32T8 to LED60W	2,591	0.24	100.0%	68.6%
Total	**511,174**	**80.34**	**98.2%**	**95.9%**

Project Number CIP 201

Program Large C&I

Project Background

The participant is a parking structure that received incentives from Entergy New Orleans for retrofitting energy efficient lighting. The Evaluators verified that the following had been installed:

- Exterior HID 401 W to 1000 W with LED Lamp/Fixture
- Exterior HID 251 W to 400 W with LED Lamp/Fixture

Calculation Parameters

The Evaluators confirmed installation of all fixtures listed in the project application. Savings for the measures were calculated using prescriptive savings values listed in Section 10.2.2, which are based on the New Orleans TRM 4.0. The specific values used in calculating savings for this site are presented in the table below.

Table A. Prescriptive Savings and kW Reductions

Prescriptive Measure	*Per-Unit kWh Savings*	*Per-Unit kW Reduction*
Exterior HID 401 W to 1000 W with LED Lamp/Fixture	2029.90	0
Exterior HID 251 W to 400 W with LED Lamp/Fixture	885.40	0

Savings Calculations

Using values from the table above, the Evaluators calculated lighting savings as follows:

Table B. Lighting Retrofit kWh Savings Calculations

Prescriptive Measure	*Measure Quantity*	*Per-Unit kWh Savings*	*Expected kWh Savings*	*Realized kWh Savings*	*kWh Realization Rate*

Exterior HID 401 W to 1000 W with LED Lamp/Fixture	73	2029.90	148,182.70	234,258	158.9%
Exterior HID 251 W to 400 W with LED Lamp/Fixture	11	885.40	9,739.40	11,352	116.6%
		Total:	**157,922.10**	**245,610**	**155.50%**

Results

The kWh realization rate for project CIP 201 is 155.50%.

Table C. Verified Gross Savings & Realization Rates

Measure	***Verified***	
	kWh Savings	***kWh Realization Rate***
Exterior HID 401 W to 1000 W with LED Lamp/Fixture	234,258	158.09%
Exterior HID 251 W to 400 W with LED Lamp/Fixture	11,352	116.60%
Total:	**245,610**	**155.50%**

Project Number CIP_210

Program Large Commercial & Industrial Solutions

Project Background

The participant is a Large Office Space that received incentives from Entergy New Orleans for implementing cooling tower replacement.

Calculation Parameters

Savings calculations were performed using an energy simulation model and

billing data and the following algorithms:

$$kWh_{Savings} = kWh_{pre} - kWh_{post}$$

A billing regression simulation following a IPMVP Option C process.

Savings Calculations

Table 1 kWh Usage Results

System	*Baseline kWh*	*Optimal kWh*	*Savings*	*Percentage Savings*
Tower	12,758,795.11	12,180,344.13	578,450.98	4.5%

Billing data from the pre and post periods were collected, and regression was used to find the best fit lines for the pre and post periods. The Equations found through regression were then applied to the same set of test weather data appropriate for the region. The difference between the performance was taken as the savings.

Table B, kWh Saving Calculations

Measure	*Pre kWh Usage*	*Post kWh Usage*	*Model kWh Savings*		*Expected kWh Savings*	*Expected kW Savings*

				Model kW Savings		
Cooling Tower Replacement	12,758,795	12,180,344	578,450	66.03	327,724.80	12.9

Results

The kWh realization rate for project CIP_210 is 176% with 551% peak demand savings. The modeled and realized kWh savings are greater than the provided energy model, because the model simulates the theoretical savings based on a best fit line. The difference in savings are due to the difference in the models used.

Table C, Verified Gross Savings & Realization Rates

Measure	*Verified*			
	kWh Savings	*kW Savings*	*kWh Realization Rate*	*kW Realization Rate*
Cooling Tower Replacement	578,451	66.03	176.00%	551.86%
Total	**578,451**	**66.03**	**176.00%**	**551.86%**

Project Number CIP-217

Program Large C&I

Project Background

The participant is a manufacturing facility that received incentives from Entergy New Orleans for retrofitting energy efficient lighting. The Evaluators verified that the following had been installed:

- (622) High Intensity Discharge (HID) [251 to 400W] with (622) LED Lamp/Fixture
- (52) HPS400/1 with (52) LED237-FIXT

Calculation Parameters

The Evaluators confirmed installation of all fixtures listed in the project application. Savings for the measures were calculated using prescriptive savings values listed in Section 10.2.2, which are based on the New Orleans TRM 3.0. The specific values used in calculating savings for this site are presented in the table below.

Table A. Prescriptive Savings and kW Reductions

Prescriptive Measure	*Per-Unit kWh Savings*	*Per-Unit kW Reduction*
High Intensity Discharge (HID) [251 to 400W] with LED Lamp/Fixture	2,058.66	0.28
HPS400/1 with LED237-FIXT	2,177.03	0.27

Savings Calculations

Using values from the table above, the Evaluators calculated lighting savings as follows:

Table B. Lighting Retrofit kWh Savings Calculations

Prescriptive Measure	*Measure Quantity*	*Per-Unit kWh Savings*	*Expected kWh Savings*	*Realized kWh Savings*	*kWh Realization Rate*

HID400W to LED120-FIXT	145	2,058.66	298,506	302,100	101.2%
HID400W to LED120-FIXT	397	2,058.66	817,289	827,129	101.2%
HID400W to LED120-FIXT	80	2,058.66	164,693	166,676	101.2%
HPS400/1 to LED237-FIXT	52	2,177.03	113,206	113,206	100.0%
		Total:	**1,393,694**	**1,409,111**	**101.1%**

Table C. Lighting Retrofit kW Reduction Calculations

Prescriptive Measure	*Measure Quantity*	*Per-Unit kW Reduction*	*Expected kW Reduction*	*Realized kW Reduction*	*kW Realization Rate*
HID400W to LED120-FIXT	145	0.28	41.92	42.30	100.9%
HID400W to LED120-FIXT	397	0.28	114.78	115.81	100.9%
HID400W to LED120-FIXT	80	0.28	23.13	23.84	100.9%
HPS400/1 to LED237-FIXT	52	0.27	14.23	14.23	100.0%
		Total:	**194.06**	**195.68**	**100.8%**

Results

The kWh and kW realization rates for project CIP-217 are 101.1% and 100.8%.

Table D. Verified Gross Savings & Realization Rates

Measure	*Verified*			
	kWh Savings	*kW Savings*	*kWh Realization Rate*	*kW Realization Rate*
HID400W to LED120-FIXT	302,100	42.30	101.2%	100.9%

HID400W to LED120-FIXT	827,129	115.81	101.2%	100.9%
HID400W to LED120-FIXT	166,676	23.84	101.2%	100.9%
HPS400/1 to LED237-FIXT	113,206	14.23	100.0%	100.0%
	1,409,111	**195.68**	**101.1%**	**100.8%**

Project Number CIP 220

Program Large C&I

Project Background

The participant is a retail business that received incentives from Entergy New Orleans for retrofitting energy efficient lighting. The Evaluators verified that the following had been installed:

- MH70/1 with LED020-FIXT

Calculation Parameters

The Evaluators confirmed installation of all fixtures listed in the project application. Savings for the measures were calculated using prescriptive savings values listed in Section 10.2.2, which are based on the New Orleans TRM 4.0. The specific values used in calculating savings for this site are presented in the table below.

Table A. Prescriptive Savings and kW Reductions

Prescriptive Measure	*Per-Unit kWh Savings*	*Per-Unit kW Reduction*
MH70/1 with LED020-FIXT	541.11	0.09

Savings Calculations

Using values from the table above, the Evaluators calculated lighting savings as follows:

Table B. Lighting Retrofit kWh Savings Calculations

Prescriptive Measure	*Measure Quantity*	*Per-Unit kWh Savings*	*Expected kWh Savings*	*Realized kWh Savings*	*kWh Realization Rate*
MH70/1 with LED020-FIXT	91	541.11	89,282.36	89,282.36	100%
		Total:	**89,282.36**	**89,282.36**	**100%**

Table C. Lighting Retrofit kW Reduction Calculations

Prescriptive Measure	*Measure Quantity*	*Per-Unit kW Reduction*	*Expected kW Reduction*	*Realized kW Reduction*	*kW Realization Rate*
MH70/1 with LED020-FIXT	91	0.09	14.05	13.07	92.97%
		Total:	**14.05**	**13.07**	**92.97%**

Results

The kWh and kW realization rates for project CIP 220 are 100.0% and 92.97%.

Table D. Verified Gross Savings & Realization Rates

Measure	*Verified*			
	kWh Savings	*kW Savings*	*kWh Realization Rate*	*kW Realization Rate*
MH70/1 with LED020-FIXT	89,282.36	13.07	100%	92.97%
Total:	**89,282.36**	**13.07**	**100%**	**92.97%**

Project Number CIP_232

Program Large Commercial & Industrial Solutions

Project Background

The participant is a community college that received incentives from Entergy New Orleans for implementing a schedule change to reduce the equipment's energy consumption during hours when it isn't needed. The Evaluators verified that the following schedule change had been implemented:

- Baseline schedule of 5am to 9:59 pm Monday through Friday, changed to 6am – 3:59pm Monday through Friday.

Equipment Schedules					
Schedules	Equip On	Equip Off	Day On	Day Off	For which systems?
Schedule 1	5	22	2	6	AHU-4
Schedule 2	5	22	2	6	AHU-1
Schedule 3	5	22	2	6	AHU-3
Schedule 4	5	22	2	6	AHU-2
Schedule 5					
Schedule 6					
Schedule 7	6	16	2	6	Campus Normal Day
Schedule 8					

Calculation Parameters

Savings calculations were performed by finding the reduction in heating and cooling hours from the original schedule. Each equipment was then evaluated based on the airflow and temperature for the difference the schedule change would make to the power consumption.

Schedule change for this site are shown below:

Table A, Schedule Change

Unit Name	*Total Hours*	*Cooling hours*	*Heating Hours*
Baseline	4,644	3,161	1,483
As-built	2,838	1,967	871

Savings Calculations

Table B, kWh Usage Results

Equipment	*Baseline kWh*	*As-built kWh*	*Savings*	*Percentage Savings*
AHUCs	50,972	32,045	18,926	37%
AHUHs	19,371	11,481	7,889	40%
Chiller	305,889	190,346	115,543	37%
CWP	32,139	20,453	11,685	37%
HWP	7,964	4,782	3,182	40%
EF	1,180	751	429	36%

Heating and cooling systems are on at different times of the day. Savings from the schedule change depend on the temperature of the hours that were excluded from the schedule. Heating systems saw the most savings because the majority of hours cut were at night.

Table C, kWh Saving Calculations

Measure	*Pre kWh Usage*	*Post kWh Usage*	*Expected kWh Savings*	*Realized kWh Savings*	*Realization Rate*
BAS	417,518	259,861	127,429	157,657	124%

Results

The kWh realization rate for project CIP_232 is 124% with no peak demand savings since max usage is expected to be similar even after optimization.

Table D, Verified Gross Savings & Realization Rates

Measure	*Verified*			
	kWh Savings	*kW Savings*	*kWh Realization Rate*	*kW Realization Rate*
Central Plant Optimization	157,658	-	124%	-
Total	**157,658**	**-**	**124%**	**-**

Project Number CIP-237

Program Large C&I

Project Background

The participant is a college/university that received incentives from Entergy New Orleans for retrofitting energy efficient lighting. The Evaluators verified that the following had been installed:

- (792) LED015-FIXT replacing F41GLL

Calculation Parameters

The Evaluators confirmed installation of all fixtures listed in the project application. Savings for the measures were calculated using prescriptive savings values listed in Section 10.2.2, which are based on the New Orleans TRM 4.0. The specific values used in calculating savings for this site are presented in the table below.

Table A. Prescriptive Savings and kW Reductions

Prescriptive Measure	*Per-Unit kWh Savings*	*Per-Unit kW Reduction*
F41GLL with LED015-FIXT	143.22	0.018

Savings Calculations

Using values from the table above, the Evaluators calculated lighting savings as follows:

Table B. Lighting Retrofit kWh Savings Calculations

Prescriptive Measure	*Measure Quantity*	*Per-Unit kWh Savings*	*Expected kWh Savings*	*Realized kWh Savings*	*kWh Realization Rate*
F41GLL with LED015-FIXT	792	143.22	113,435	94,983	83.7%
		Total:	**113,435**	**94,983**	**83.7%**

Table C. Lighting Retrofit kW Reduction Calculations

Prescriptive Measure	*Measure Quantity*	*Per-Unit kW Reduction*	*Expected kW Reduction*	*Realized kW Reduction*	*kW Realization Rate*
F41GLL with LED015-FIXT	792	0.018	14.26	13.69	96%
		Total:	**14.26**	**13.69**	**96%**

Results

The kWh and kW realization rates for project CIP-237 are 59.7% and 90.1%.

Table D. Verified Gross Savings & Realization Rates

Measure	*Verified*			
	kWh Savings	*kW Savings*	*kWh Realization Rate*	*kW Realization Rate*
F41GLL with LED015-FIXT	94,983	13.69	83.7%	96%
Total:	**94,983**	**13.69**	**83.7%**	**96%**

Project Number CIP 239

Program Large C&I

Project Background

The participant is a school that received incentives from Entergy New Orleans for retrofitting energy efficient lighting. The Evaluators verified that the following had been installed:

- MH400/1 with LED200-FIXT
- MH400/1 with LED135-FIXT

Calculation Parameters

The Evaluators confirmed installation of all fixtures listed in the project application. Savings for the measures were calculated using prescriptive savings values listed in Section 10.2.2, which are based on the New Orleans TRM 4.0. The specific values used in calculating savings for this site are presented in the table below.

Table A. Prescriptive Savings and kW Reductions

Prescriptive Measure	*Per-Unit kWh Savings*	*Per-Unit kW Reduction*
MH400/1 with LED200-FIXT	1,157.70	0.25
MH400/1 with LED135-FIXT	23.85	0.01

Savings Calculations

Using values from the table above, the Evaluators calculated lighting savings as follows:

Table B. Lighting Retrofit kWh Savings Calculations

Prescriptive Measure	*Measure Quantity*	*Per-Unit kWh Savings*	*Expected kWh Savings*	*Realized kWh Savings*	*kWh Realization Rate*
MH400/1 with LED200-FIXT	40	1,157.70	46,308	25,735	55.60%
MH400/1 with LED135-FIXT	28	23.85	668	22,643	3391.70%

Total:	**46,975**	**48,378**	**103%**

Table C. Lighting Retrofit kW Reduction Calculations

Prescriptive Measure	*Measure Quantity*	*Per-Unit kW Reduction*	*Expected kW Reduction*	*Realized kW Reduction*	*kW Realization Rate*
MH400/1 with LED200-FIXT	40	0.25	10.30	5.71	55.40%
MH400/1 with LED135-FIXT	28	0.01	0.18	5.02	2841.00%
Total:			**10.48**	**10.73**	**102.4%**

Results

The kWh and kW realization rates for project CIP 239 are 103.0% and 102.4%.

Table D. Verified Gross Savings & Realization Rates

Measure	*Verified*			
	kWh Savings	*kW Savings*	*kWh Realization Rate*	*kW Realization Rate*
MH400/1 with LED200-FIXT	25,735	5.71	55.60%	55.40%
MH400/1 with LED135-FIXT	22,643	5.02	3391.70%	2841.00%
	48,378	**10.73**	**103%**	**102.4%**

Project Number CIP 240

Program Large C&I

Project Background

The participant is a college that received incentives from Entergy New Orleans for retrofitting energy efficient lighting. The Evaluators verified that the following had been installed:

- (706) T8/T12 4ft Linear Fluorescent with (706) 4' Linear LED
- (111) T8/T12 2ft Linear Fluorescent with (111) 2' Linear LED
- (6) F46ILL/2 with (6) LED060-FIXT
- (124) F41ILL with (124) LED010-FIXT
- (22) F44ILL with (22) LED040-FIXT
- (143) F42ILL with (143) LED020-FIXT
- (80) F41ILL with (80) LED015-FIXT
- (57) F22ILL with (57) LED016-FIXT
- (23) FU2ILL with (23) LED032-FIXT

Calculation Parameters

The Evaluators confirmed installation of all fixtures listed in the project application. Savings for the measures were calculated using prescriptive savings values listed in Section 10.2.2, which are based on the New Orleans TRM 4.0. The specific values used in calculating savings for this site are presented in the table below.

Table A. Prescriptive Savings and kW Reductions

Prescriptive Measure	*Per-Unit kWh Savings*	*Per-Unit kW Reduction*
T8/T12 4ft Linear Fluorescent with 4' Linear LED	49.06	0.011
T8/T12 2ft Linear Fluorescent with 2' Linear LED	24.57	0.0055
F46ILL/2 with LED060-FIXT	1,050.31	0.132
F41ILL with LED010-FIXT	200.51	0.0252
F44ILL with LED040-FIXT	687.48	0.0864
F42ILL with LED020-FIXT	389.28	0.0456
F41ILL with LED015-FIXT	152.775	0.0192

F22ILL with LED016-FIXT	162.32	0.0204
FU2ILL with LED032-FIXT	257.80	0.0324

Savings Calculations

Using values from the table above, the Evaluators calculated lighting savings as follows:

Table B. Lighting Retrofit kWh Savings Calculations

Prescriptive Measure	*Measure Quantity*	*Per-Unit kWh Savings*	*Expected kWh Savings*	*Realized kWh Savings*	*kWh Realization Rate*
T8/T12 4ft Linear Fluorescent with 4' Linear LED	706	49.06	34,640.5	37,664	108.7%
T8/T12 2ft Linear Fluorescent with 2' Linear LED	111	24.57	2,727.8	23,947	877.9%
F46ILL/2 with LED060-FIXT	6	1,050.31	6,301.9	6,302	100%
F41ILL with LED010-FIXT	124	200.51	24,864.0	8,823	35.5%
F44ILL with LED040-FIXT	22	687.48	15,124.7	15,125	100%
F42ILL with LED020-FIXT	143	389.28	55,667.2	27,939	50.2%
F41ILL with LED015-FIXT	80	152.775	12,222.0	12,222	100%
F22ILL with LED016-FIXT	57	162.32	9,252.4	9,252	100%
FU2ILL with LED032-FIXT	23	257.80	5,929.6	5,930	100%
		Total:	**166,730.1**	**164,609**	**98.7%**

Table C. Lighting Retrofit kW Reduction Calculations

Prescriptive Measure	*Measure Quantity*	*Per-Unit kW Reduction*	*Expected kW Reduction*	*Realized kW Reduction*	*kW Realization Rate*
T8/T12 4ft Linear Fluorescent with 4' Linear LED	706	0.011	7.82	8.00	102.3%
T8/T12 2ft Linear Fluorescent with 2' Linear LED	111	0.0055	0.61	3.01	489.2%
F46ILL/2 with LED060-FIXT	6	0.132	0.79	0.79	99.7
F41ILL with LED010-FIXT	124	0.0252	3.12	1.11	35.5%
F44ILL with LED040-FIXT	22	0.0864	1.90	1.90	100%
F42ILL with LED020-FIXT	143	0.0456	6.52	3.51	53.8%
F41ILL with LED015-FIXT	80	0.0192	1.53	1.54	100.3%
F22ILL with LED016-FIXT	57	0.0204	1.16	1.16	99.8%
FU2ILL with LED032-FIXT	23	0.0324	0.74	0.75	100.6%
		Total:	**24.22**	**24.08**	**99.4%**

Results

The kWh and kW realization rates for project CIP 240 are 98.7% and 99.4%.

Table D. Verified Gross Savings & Realization Rates

Measure	*Verified*			
	kWh Savings	*kW Savings*	*kWh Realization Rate*	*kW Realization Rate*
T8/T12 4ft Linear Fluorescent with 4' Linear LED	37,664	8.00	108.7%	102.3%
T8/T12 2ft Linear Fluorescent with 2' Linear LED	23,947	3.01	877.9%	489.2%

F46ILL/2 with LED060-FIXT	6,302	0.79	100%	99.7
F41ILL with LED010-FIXT	8,823	1.11	35.5%	35.5%
F44ILL with LED040-FIXT	15,125	1.90	100%	100%
F42ILL with LED020-FIXT	27,939	3.51	50.2%	53.8%
F41ILL with LED015-FIXT	12,222	1.54	100%	100.3%
F22ILL with LED016-FIXT	9,252	1.16	100%	99.8%
FU2ILL with LED032-FIXT	5,930	0.75	100%	100.6%
Total:	**125,581**	**15.79**	**98.7%**	**99.4%**

Project Number CIP 242

Program Large C&I

Project Background

The participant is a hotel that received incentives from Entergy New Orleans for retrofitting energy efficient lighting. The Evaluators verified that the following had been installed:

- (181) T8/T12 4ft Linear Fluorescent with 4' Linear LED
- (4) T8/T12 8ft Linear Fluorescent with 8' Linear LED
- (2) T8/T12 U-Tube Fluorescent with U-Tube LED
- (8) Exterior HID <175 W with LED Lamp/Fixture
- (4) Incandescent/CFL Screw-In Lamp with Exterior 7-12 Watt LED Screw-In
- (1) Exterior HID 175 W to 250 W with LED Lamp/Fixture
- (9) Incandescent/CFL Screw-In Lamp with 7-12 Watt LED Screw-In
- (74) F44ILL with LED056-FIXT
- (10) F42ILL with LED028-FIXT
- (1) MH250/1 with LED027-FIXT
- (350) F42ILL with LED024-FIXT
- (4) F82ILL with LED048-FIXT
- (166) F44ILL with LED048-FIXT
- (18) FU2ILL with LED030-FIXT
- (56) F43ILL with LED036-FIXT
- (2)H40/1 with LED006-FIXT
- (1) F22GPL-H with LED020-FIXT
- (41) F22ILL with LED020-FIXT
- (1) MH250/1 with LED001-FIXT
- (5) MH175/1 with LED027-FIXT
- (1) F44ILL with LED027-FIXT
- (1) F32ILL with LED030-FIXT

Calculation Parameters

The Evaluators confirmed installation of all fixtures listed in the project application. Savings for the measures were calculated using prescriptive savings values listed in Section 10.2.2, which are based on the New Orleans TRM 4.0. The specific values used in calculating savings for this site are presented in the table below.

Table A. Prescriptive Savings and kW Reductions

Prescriptive Measure	*Per-Unit kWh Savings*	*Per-Unit kW Reduction*
T8/T12 4ft Linear Fluorescent with 4' Linear LED	62.98	0.01
T8/T12 8ft Linear Fluorescent with 8' Linear LED	135.00	0.03
T8/T12 U-Tube Fluorescent with U-Tube LED	85.50	0.02
Exterior HID <175 W with LED Lamp/Fixture	630.45	0.00
Incandescent/CFL Screw-In Lamp with Exterior 7-12 Watt LED Screw-In	133.90	0.00
Exterior HID 175 W to 250 W with LED Lamp/Fixture	1215.80	0.00
Incandescent/CFL Screw-In Lamp with 7-12 Watt LED Screw-In	139.44	0.03
F44ILL with LED056-FIXT	530.34	0.06
F42ILL with LED028-FIXT	8.76	0.00
MH250/1 with LED027-FIXT	4809.20	0.55
F42ILL with LED024-FIXT	318.46	0.04
F82ILL with LED048-FIXT	579.78	0.07
F44ILL with LED048-FIXT	608.36	0.08
FU2ILL with LED030-FIXT	276.91	0.03
F43ILL with LED036-FIXT	464.42	0.05
H40/1 with LED006-FIXT	324.65	0.04
F22GPL-H with LED020-FIXT	124.10	0.02
F22ILL with LED020-FIXT	114.63	0.01
MH250/1 with LED001-FIXT	2740.40	0.34
MH175/1 with LED027-FIXT	1585.56	0.00
F44ILL with LED027-FIXT	744.60	0.00
F32ILL with LED030-FIXT	152.80	0.02

Savings Calculations

Using values from the table above, the Evaluators calculated lighting savings as follows:

Table B. Lighting Retrofit kWh Savings Calculations

Prescriptive Measure	*Measure Quantity*	*Per-Unit kWh Savings*	*Expected kWh Savings*	*Realized kWh Savings*	*kWh Realization Rate*
T8/T12 4ft Linear Fluorescent with 4' Linear LED	181	62.98	11,399.3 0	22198.00	194.73%
T8/T12 8ft Linear Fluorescent with 8' Linear LED	4	135.00	540.00	1065.00	197.22%
T8/T12 U-Tube Fluorescent with U-Tube LED	2	85.50	171.00	333.00	194.74%
Exterior HID <175 W with LED Lamp/Fixture	8	630.45	5,043.60	3854.00	76.41%
Incandescent/CFL Screw-In Lamp with Exterior 7-12 Watt LED Screw-In	4	133.90	535.60	1086.00	202.76%
Exterior HID 175 W to 250 W with LED Lamp/Fixture	1	1215.80	1,215.80	788.00	64.81%
Incandescent/CFL Screw-In Lamp with 7-12 Watt LED Screw-In	9	139.44	1,255.00	2444.00	194.74%
F44ILL with LED056-FIXT	74	0	39,244.80	36301.00	92.50%
F42ILL with LED028-FIXT	10	530.34	87.60	2628.00	3000.00%
MH250/1 with LED027-FIXT	1	8.76	4,809.20	2286.00	47.53%
F42ILL with LED024-FIXT	350	4809.20	111,460.50	104244.00	93.53%
F82ILL with LED048-FIXT	4	318.46	2,319.10	2172.00	93.66%
F44ILL with LED048-FIXT	166	579.78	100,988.10	93066.00	92.16%
FU2ILL with LED030-FIXT	18	608.36	4,984.30	4573.00	91.75%

F43ILL with LED036-FIXT	56	276.91	26,007.70	24037.00	92.42%
H40/1 with LED006-FIXT	2	464.42	649.30	596.00	91.79%
F22GPL-H with LED020-FIXT	1	324.65	124.10	114.00	91.86%
F22ILL with LED020-FIXT	41	124.10	4,699.80	4669.00	99.34%
MH250/1 with LED001-FIXT	1	114.63	2,740.40	2514.00	91.74%
MH175/1 with LED027-FIXT	5	2740.40	7,927.80	7928.00	100.00%
F44ILL with LED027-FIXT	1	1585.56	744.60	745.00	100.05%
F32ILL with LED030-FIXT	1	744.60	152.80	140.00	91.62%
		Total:	**327,100.40**	**317,781.00**	**97.15%**

Table C. Lighting Retrofit kW Reduction Calculations

Prescriptive Measure	*Measure Quantity*	*Per-Unit kW Reduction*	*Expected kW Reduction*	*Realized kW Reduction*	*kW Realization Rate*
T8/T12 4ft Linear Fluorescent with 4' Linear LED	181	0.01	2.5753	2.53	98.24%
T8/T12 8ft Linear Fluorescent with 8' Linear LED	4	0.03	0.1186	0.12	101.18%
T8/T12 U-Tube Fluorescent with U-Tube LED	2	0.02	0.0379	0.04	105.54%
Exterior HID <175 W with LED Lamp/Fixture	8	0.00	0.0000	0.44	0
Incandescent/CFL Screw-In Lamp with Exterior 7-12 Watt LED Screw-In	4	0.00	0.0000	0.12	0
Exterior HID 175 W to 250 W with LED Lamp/Fixture	1	0.00	0.0000	0.09	0

Incandescent/CFL Screw-In Lamp with 7-12 Watt LED Screw-In	9	0.03	0.2703	0.28	103.59%
F44ILL with LED056-FIXT	74	0.06	4.4800	4.14	92.41%
F42ILL with LED028-FIXT	10	0.00	0.0100	0.30	3000.00%
MH250/1 with LED027-FIXT	1	0.55	0.5490	0.26	47.36%
F42ILL with LED024-FIXT	350	0.04	13.6390	11.90	87.25%
F82ILL with LED048-FIXT	4	0.07	0.2852	0.25	87.66%
F44ILL with LED048-FIXT	166	0.08	12.6336	10.62	84.06%
FU2ILL with LED030-FIXT	18	0.03	0.6264	0.52	83.01%
F43ILL with LED036-FIXT	56	0.05	2.9988	2.74	91.37%
H40/1 with LED006-FIXT	2	0.04	0.0816	0.07	85.78%
F22GPL-H with LED020-FIXT	1	0.02	0.0156	0.01	64.10%
F22ILL with LED020-FIXT	41	0.01	0.5408	0.53	98.00%
MH250/1 with LED001-FIXT	1	0.34	0.3444	0.29	84.20%
MH175/1 with LED027-FIXT	5	0.00	0.0000	0.91	0
F44ILL with LED027-FIXT	1	0.00	0.0000	0.09	0
F32ILL with LED030-FIXT	1	0.02	0.0192	0.02	104.17%
		Total:	**39.22**	**36.27**	**92.46%**

Results

The kWh and kW realization rates for project CIP 242 are 97.15% and 92.46%.

Table D. Verified Gross Savings & Realization Rates

Measure	*Verified*

	kWh Savings	*kW Savings*	*kWh Realization Rate*	*kW Realization Rate*
T8/T12 4ft Linear Fluorescent with 4' Linear LED	22198.00	2.53	194.73%	98.24%
T8/T12 8ft Linear Fluorescent with 8' Linear LED	1065.00	0.12	197.22%	101.18%
T8/T12 U-Tube Fluorescent with U-Tube LED	333.00	0.04	194.74%	105.54%
Exterior HID <175 W with LED Lamp/Fixture	3854.00	0.44	76.41%	0
Incandescent/CFL Screw-In Lamp with Exterior 7-12 Watt LED Screw-In	1086.00	0.12	202.76%	0
Exterior HID 175 W to 250 W with LED Lamp/Fixture	788.00	0.09	64.81%	0
Incandescent/CFL Screw-In Lamp with 7-12 Watt LED Screw-In	2444.00	0.28	194.74%	103.59%
F44ILL with LED056-FIXT	36301.00	4.14	92.50%	92.41%
F42ILL with LED028-FIXT	2628.00	0.30	3000.00%	3000.00%
MH250/1 with LED027-FIXT	2286.00	0.26	47.53%	47.36%
F42ILL with LED024-FIXT	104244.00	11.90	93.53%	87.25%
F82ILL with LED048-FIXT	2172.00	0.25	93.66%	87.66%
F44ILL with LED048-FIXT	93066.00	10.62	92.16%	84.06%
FU2ILL with LED030-FIXT	4573.00	0.52	91.75%	83.01%
F43ILL with LED036-FIXT	24037.00	2.74	92.42%	91.37%
H40/1 with LED006-FIXT	596.00	0.07	91.79%	85.78%
F22GPL-H with LED020-FIXT	114.00	0.01	91.86%	64.10%
F22ILL with LED020-FIXT	4669.00	0.53	99.34%	98.00%
MH250/1 with LED001-FIXT	2514.00	0.29	91.74%	84.20%
MH175/1 with LED027-FIXT	7928.00	0.91	100.00%	0
F44ILL with LED027-FIXT	745.00	0.09	100.05%	0

F32ILL with LED030-FIXT	140.00	0.02	91.62%	104.17%
Total:	**317,781.00**	**36.27**	**97.15%**	**92.46%**

Project Number CIP-243

Program Large C&I

Project Background

The participant is a church that received incentives from Entergy New Orleans for retrofitting energy efficient lighting. The Evaluators verified that the following had been installed:

- (60) T8/T12 U-Tube Fluorescent with (60) U-Tube LED
- (589) T8/T12 4ft Linear Fluorescent with (589) 4' Linear LED
- (130) Incandescent/CFL Screw-In Lamp with (130) >=18 Watt LED Screw-In
- (3) Incandescent/CFL Screw-In Lamp with (3) 13-17 Watt LED Screw-In
- (2) Incandescent/CFL Screw-In Lamp with (2) Exterior >=18 Watt LED Screw-In
- (34) Incandescent/CFL Screw-In Lamp with (34) 7-12 Watt LED Screw-In

Calculation Parameters

The Evaluators confirmed installation of all fixtures listed in the project application. Savings for the measures were calculated using prescriptive savings values listed in Section 10.2.2, which are based on the New Orleans TRM 4.0. The specific values used in calculating savings for this site are presented in the table below.

Table A. Prescriptive Savings and kW Reductions

Prescriptive Measure	*Per-Unit kWh Savings*	*Per-Unit kW Reduction*
T8/T12 U-Tube Fluorescent with U-Tube LED	96.1	0.017
T8/T12 4ft Linear Fluorescent with 4' Linear LED	70.76	0.012
Incandescent/CFL Screw-In Lamp with >=18 Watt LED Screw-In	237.63	0.043
Incandescent/CFL Screw-In Lamp with 13-17 Watt LED Screw-In	182.1	0.033
Incandescent/CFL Screw-In Lamp with Exterior >=18 Watt LED Screw-In	203	0.000
Incandescent/CFL Screw-In Lamp with 7-12 Watt LED Screw-In	156.75	0.028

Savings Calculations

Using values from the table above, the Evaluators calculated lighting savings as follows:

Table B. Lighting Retrofit kWh Savings Calculations

Prescriptive Measure	*Measure Quantity*	*Per-Unit kWh Savings*	*Expected kWh Savings*	*Realized kWh Savings*	*kWh Realization Rate*
T8/T12 U-Tube Fluorescent with U-Tube LED	60	96.1	5,766	3,148	54.6%
T8/T12 4ft Linear Fluorescent with 4' Linear LED	589	70.76	41,681	22,770	54.6%
Incandescent/CFL Screw-In Lamp with >=18 Watt LED Screw-In	130	237.63	30,892	16,872	54.6%
Incandescent/CFL Screw-In Lamp with 13-17 Watt LED Screw-In	3	182.1	546	298	54.5%
Incandescent/CFL Screw-In Lamp with Exterior >=18 Watt LED Screw-In	2	203	406	353	86.9%
Incandescent/CFL Screw-In Lamp with 7-12 Watt LED Screw-In	34	156.75	5,330	2,910	54.6%
		Total:	**84,622**	**46,351**	**54.8%**

Table C. Lighting Retrofit kW Reduction Calculations

Prescriptive Measure	*Measure Quantity*	*Per-Unit kW Reduction*	*Expected kW Reduction*	*Realized kW Reduction*	*kW Realization Rate*

T8/T12 U-Tube Fluorescent with U-Tube LED	60	0.017	1.04	0.73	70.2%
T8/T12 4ft Linear Fluorescent with 4' Linear LED	589	0.012	7.29	5.24	71.9%
Incandescent/CFL Screw-In Lamp with >=18 Watt LED Screw-In	130	0.043	5.63	3.89	69.1%
Incandescent/CFL Screw-In Lamp with 13-17 Watt LED Screw-In	3	0.033	0.10	0.07	69.9%
Incandescent/CFL Screw-In Lamp with Exterior >=18 Watt LED Screw-In	2	0.000			
Incandescent/CFL Screw-In Lamp with 7-12 Watt LED Screw-In	34	0.028	0.97	0.67	69.3%
		Total:	**15.02**	**10.60**	**70.6%**

Results

The kWh and kW realization rates for project CIP-243 are 54.8% and 70.6%.

Table D. Verified Gross Savings & Realization Rates

Measure	***Verified***			
	kWh Savings	***kW Savings***	***kWh Realization Rate***	***kW Realization Rate***
U-Tube LED (T8/T12 U-Tube Fluorescent Baseline)	3,148	0.73	54.6%	70.2%
4' Linear LED (T8/T12 4ft Linear Fluorescent Baseline)	22,770	5.24	54.6%	71.9%
>=18 Watt LED Screw-In	16,872	3.89	54.6%	69.1%
13-17 Watt LED Screw-In	298	0.07	54.5%	69.9%
Exterior: >=18 Watt LED Screw-In	353		86.9%	

7-12 Watt LED Screw-In	2,910	0.67	54.6%	69.3%

Project Number CIP 244

Program Large C&I

Project Background

The participant is an office that received incentives from Entergy New Orleans for retrofitting energy efficient lighting. The Evaluators verified that the following had been installed:

- F42ILL with LED024-FIXT

Calculation Parameters

The Evaluators confirmed installation of all fixtures listed in the project application. Savings for the measures were calculated using prescriptive savings values listed in Section 10.2.2, which are based on the New Orleans TRM 4.0. The specific values used in calculating savings for this site are presented in the table below.

Table A. Prescriptive Savings and kW Reductions

Prescriptive Measure	*Per-Unit kWh Savings*	*Per-Unit kW Reduction*
F42ILL with LED024-FIXT	259.12	0.04

Savings Calculations

Using values from the table above, the Evaluators calculated lighting savings as follows:

Table B. Lighting Retrofit kWh Savings Calculations

Prescriptive Measure	*Measure Quantity*	*Per-Unit kWh Savings*	*Expected kWh Savings*	*Realized kWh Savings*	*kWh Realization Rate*
F42ILL with LED024-FIXT	45	259.12	11,660	11,660	100%
		Total:	**11,660**	**11,660**	**100%**

Table C. Lighting Retrofit kW Reduction Calculations

Prescriptive Measure	*Measure Quantity*	*Per-Unit kW Reduction*	*Expected kW Reduction*	*Realized kW Reduction*	*kW Realization Rate*
F42ILL with LED024-FIXT	45	0.04	1.83	1.84	100.5%
		Total:	**1.83**	**1.84**	**100.5%**

Results

The kWh and kW realization rates for project CIP 244 are 100.0% and 100.5%.

Table D. Verified Gross Savings & Realization Rates

Measure	*Verified*			
	kWh Savings	*kW Savings*	*kWh Realization Rate*	*kW Realization Rate*
F42ILL with LED024-FIXT	11,660	1.84	100%	100.5%
Total:	**11,660**	**1.84**	**100%**	**100.5%**

Project Number CIP 246

Program Large C&I

Project Background

The participant is a college that received incentives from Entergy New Orleans for retrofitting energy efficient lighting. The Evaluators verified that the following had been installed:

- (920) CFT40/3-L with (920) LED069-FIXT
- (199) F42LL with (199) LED025-FIXT
- (160) FU2LL with (160) LED030-FIXT
- (139) F43LL with (139) LED038-FIXT
- (431) CFM26/2-L with (431) LED020-FIXT
- (11) CFT18/2 with (11) LED014-FIXT
- (17) CFT13/2 with (17) LED018-FIXT
- (57) H65/1 with (57) LED015-FIXT

Calculation Parameters

The Evaluators confirmed installation of all fixtures listed in the project application. Savings for the measures were calculated using prescriptive savings values listed in Section 10.2.2, which are based on the New Orleans TRM 4.0. The specific values used in calculating savings for this site are presented in the table below.

Table A. Prescriptive Savings and kW Reductions

Prescriptive Measure	*Per-Unit kWh Savings*	*Per-Unit kW Reduction*
CFT40/3-L with LED069-FIXT	343.74	0.0432
F42LL with LED025-FIXT	334.19	0.042
FU2LL with LED030-FIXT	286.45	0.036
F43LL with LED038-FIXT	214.44	0.045
CFM26/2-L with LED020-FIXT	162.72	0.028
CFT18/2 with LED014-FIXT	229.16	0.0288
CFT13/2 with LED018-FIXT	124.13	0.0156
H65/1 with LED015-FIXT	477.42	0.06

Savings Calculations

Using values from the table above, the Evaluators calculated lighting savings as follows:

Table B. Lighting Retrofit kWh Savings Calculations

Prescriptive Measure	*Measure Quantity*	*Per-Unit kWh Savings*	*Expected kWh Savings*	*Realized kWh Savings*	*kWh Realization Rate*
CFT40/3-L with LED069-FIXT	920	343.74	316,243.0	316,242	100%
F42LL with LED025-FIXT	199	334.19	66,504.6	66,504.6	100%
FU2LL with LED030-FIXT	160	286.45	45,832.3	45,832.3	100%
F43LL with LED038-FIXT	139	214.44	29,807.3	29,806	100%
CFM26/2-L with LED020-FIXT	431	162.72	70,132.4	70,132.4	100%
CFT18/2 with LED014-FIXT	11	229.16	2,520.8	2,521	100%
CFT13/2 with LED018-FIXT	17	124.13	2,110.2	2,110	100%
H65/1 with LED015-FIXT	57	477.42	27,212.9	27,213	100%
		Total:	**560,363.5**	**560,363.5**	**100%**

Table C. Lighting Retrofit kW Reduction Calculations

Prescriptive Measure	*Measure Quantity*	*Per-Unit kW Reduction*	*Expected kW Reduction*	*Realized kW Reduction*	*kW Realization Rate*
CFT40/3-L with LED069-FIXT	920	0.0432	39.74	38.20	98%
F42LL with LED025-FIXT	199	0.042	8.35	8.35	100%
FU2LL with LED030-FIXT	160	0.036	5.760	5.760	100%

F43LL with LED038-FIXT	139	0.045	6.33	6.33	100%
CFM26/2-L with LED020-FIXT	431	0.028	12.25	12.25	100%
CFT18/2 with LED014-FIXT	11	0.0288	0.31	0.31	100%
CFT13/2 with LED018-FIXT	17	0.0156	0.26	0.26	100%
H65/1 with LED015-FIXT	57	0.06	3.42	3.42	100%
		Total:	**76.44**	**74.90**	**98%**

Results

The kWh and kW realization rates for project CIP 246 are 100% and 98%.

Table D. Verified Gross Savings & Realization Rates

Measure	*Verified*			
	kWh Savings	*kW Savings*	*kWh Realization Rate*	*kW Realization Rate*
CFT40/3-L with LED069-FIXT	316,242	38.20	100%	98%
F42LL with LED025-FIXT	66,504.6	8.35	100%	100%
FU2LL with LED030-FIXT	45,832.3	5.760	100%	100%
F43LL with LED038-FIXT	29,806	6.33	100%	100%
CFM26/2-L with LED020-FIXT	70,132.4	12.25	100%	100%
CFT18/2 with LED014-FIXT	2,521	0.31	100%	100%
CFT13/2 with LED018-FIXT	2,110	0.26	100%	100%
H65/1 with LED015-FIXT	27,213	3.42	100%	100%

Total:	**560,363.5**	**74.90**	**100%**	**98%**

Project Number CIP_254

Program Large C&I Solutions

Project Background

The participant is a store that received incentives from Entergy New Orleans for retrofitting energy efficient lighting indoors. The Evaluators verified that the following had been installed:

- (787) 74W LED - Non-Int. Ballast replaced (787) 4' 4-Lamp T8

Calculation Parameters

Savings calculations were performed using savings methodology described in section D.6. Commercial Lighting of the New Orleans TRM 4.0. Deemed savings parameters applicable to this site are shown below:

Table A, Savings Parameters

Building Type	*Heating Type*	*Annual Hours*	*IEF_E*	*IEF_D*	*CF*
Retail: Freestanding	Gas	3,515	1.09	1.20	0.90

Savings Calculations

Table B, Lighting Retrofit kWh Savings Calculations

Measure	*Quantity (Fixtures)*		*Wattage*		*Annual Operating Hours*	*Expected kWh Savings*	*Realized kWh Savings*	*IEF_E*	*Realization Rate*
	Base	*Post*	*Base*	*Post*					
F32T8 to LED74W	787	787	112	74	3,515	114,580	114,580	1.09	100.0%
					Total	**32.30**	**32.30**		**100.0%**

Table C, Lighting Retrofit kW Reduction Calculations

Measure	Quantity (Fixtures)		Wattage		CF	Expected kW Savings	Realized kW Savings	IEF_D	Realization Rate
	Base	Post	Base	Post					
F32T8 to LED74W	787	787	112	74	0.90	32.30	32.30	1.20	100.0%
					Total	**32.30**	**32.30**		**100.0%**

Results

The kWh and kW realization rates for project CIP_254 are 100%.

Table D, Verified Gross Savings & Realization Rates

Measure	Verified			
	kWh Savings	kW Savings	kWh Realization Rate	kW Realization Rate
F32T8 to LED74W	114,580	32.30	100.0%	100.0%
Total	**114,580**	**32.30**	**100.0%**	**100.0%**

Project Number LN8-083

Program Large C&I Solutions

Project Background

The participant is a university that received incentives from Entergy New Orleans for retrofitting energy efficient lighting indoors and outdoors. The Evaluators verified that the following had been installed:

- F32T8-28W to LED13W
- F32T8 to LED37W
- CFM26W to LED9W

Calculation Parameters

Savings calculations were performed using savings methodology described in section D.6.3 Commercial Lighting Efficiency of the New Orleans TRM 4.0. Deemed savings parameters applicable to this site are shown below:

Table A, Savings Parameters

Building Type	*Heating Type*	*Annual Hours*	*IEF_E*	*IEF_D*	*CF*
Office	ER	5,159	0.87	1.20	0.77
Office	ER	5,159	0.87	1.20	0.77

Savings Calculations

Table B, Lighting Retrofit kWh Savings Calculations

Measure	*Quantity (Fixtures)*		*Wattage*		*Annual Operating Hours*	*Expected kWh Savings*	*Realized kWh Savings*	*IEF_E*	*Realization Rate*
	Base	*Post*	*Base*	*Post*					
F32T8-28W to LED13W	22	20	27	13	5,159	1,557	1,499	0.87	96.3%
F32T8 to LED37W	12	12	93	37	5,159	5,121	3,016	0.87	58.9%

CFM26W to LED9W	28	26	29	9	5,159	4,207	2,594	0.87	61.7%
					Total	**10,885**	**7,109**		**65.3%**

Table C, Lighting Retrofit kW Reduction Calculations

Measure	*Quantity (Fixtures)*		*Wattage*		*CF*	*Expected kW Savings*	*Realized kW Savings*	*IEF$_D$*	*Realization Rate*
	Base	*Post*	*Base*	*Post*					
F32T8-28W to LED13W	22	20	27	13	0.77	0.27	0.31	1.20	114.8%
F32T8 to LED37W	12	12	93	37	0.77	0.81	0.62	1.20	76.5%
CFM26W to LED9W	28	26	29	9	0.77	0.66	0.53	1.20	80.3%
					Total	**1.74**	**1.46**		**83.9%**

Results

The kWh and kW realization rates for project LN8-083 are 100%.

Table D, Verified Gross Savings & Realization Rates

Measure	*Verified*			
	kWh Savings	*kW Savings*	*kWh Realization Rate*	*kW Realization Rate*
F32T8-28W to LED13W	1,499	0.31	96.3%	114.8%
F32T8 to LED37W	3,016	0.62	58.9%	76.5%

CFM26W to LED9W	2,594	0.53	61.7%	80.3%
Total	**7,109**	**1.46**	**65.3%**	**83.9%**

Project Number CIP 258

Program Large C&I

Project Background

The participant is an exterior area that received incentives from Entergy New Orleans for retrofitting energy efficient lighting. The Evaluators verified that the following had been installed:

- Exterior HID >1000 W with LED Lamp/Fixture
- Exterior HID 401 W to 1000 W with LED Lamp/Fixture
- Exterior HID 251 W to 400 W with LED Lamp/Fixture
- Exterior HID <175 W with LED Lamp/Fixture
- Exterior T8/T12 4ft Linear Fluorescent with 4' Linear LED
- Exterior T8/T12 (HO) 8ft Linear Fluorescent with 8' Linear LED

Calculation Parameters

The Evaluators confirmed installation of all fixtures listed in the project application. Savings for the measures were calculated using prescriptive savings values listed in Section 10.2.2, which are based on the New Orleans TRM 4.0. The specific values used in calculating savings for this site are presented in the table below.

Table A. Prescriptive Savings and kW Reductions

Prescriptive Measure	*Per-Unit kWh Savings*	*Per-Unit kW Reduction*
Exterior HID >1000 W with LED Lamp/Fixture	3023.30	0.00
Exterior HID 401 W to 1000 W with LED Lamp/Fixture	2029.90	0.00
Exterior HID 251 W to 400 W with LED Lamp/Fixture	885.40	0.00
Exterior HID <175 W with LED Lamp/Fixture	237.50	0.00
Exterior T8/T12 4ft Linear Fluorescent with 4' Linear LED	60.50	0.00
Exterior T8/T12 (HO) 8ft Linear Fluorescent with 8' Linear LED	241.90	0.00

Savings Calculations

Using values from the table above, the Evaluators calculated lighting savings as follows:

Table B. Lighting Retrofit kWh Savings Calculations

Prescriptive Measure	*Measure Quantity*	*Per-Unit kWh Savings*	*Expected kWh Savings*	*Realized kWh Savings*	*kWh Realization Rate*
Exterior HID >1000 W with LED Lamp/Fixture	44	3023.30	133,025.20	133,025.20	100.00%
Exterior HID 401 W to 1000 W with LED Lamp/Fixture	4	2029.90	8,119.60	8,119.60	100.00%
Exterior HID 251 W to 400 W with LED Lamp/Fixture	85	885.40	75,259.00	75,259.00	100.00%
Exterior HID <175 W with LED Lamp/Fixture	20	237.50	4,750.00	4,750.00	100.00%
Exterior T8/T12 4ft Linear Fluorescent with 4' Linear LED	12	60.50	726	726	100.00%
Exterior T8/T12 (HO) 8ft Linear Fluorescent with 8' Linear LED	2	241.90	483.8	483.8	100.00%
		Total:	**222,363.60**	**222,363.60**	**100%**

Results

The kWh realization rate for project CIP 258 is 100%.

Table C. Verified Gross Savings & Realization Rates

Measure	*Verified*

	kWh Savings	*kWh Realization Rate*
Exterior HID >1000 W with LED Lamp/Fixture	133,025.20	100.00%
Exterior HID 401 W to 1000 W with LED Lamp/Fixture	8,119.60	100.00%
Exterior HID 251 W to 400 W with LED Lamp/Fixture	75,259.00	100.00%
Exterior HID <175 W with LED Lamp/Fixture	4,750.00	100.00%
Exterior T8/T12 4ft Linear Fluorescent with 4' Linear LED	726	100.00%
Exterior T8/T12 (HO) 8ft Linear Fluorescent with 8' Linear LED	483.8	100.00%
Total:	**222,363.60**	**100%**

Project Number CIP 261

Program Large C&I

Project Background

The participant is an office building that received incentives from Entergy New Orleans for retrofitting energy efficient lighting. The Evaluators verified that the following had been installed:

- T8/T12 4ft Linear Fluorescent with 4' Linear LED
- F42ILL with LED024-FIXT
- F43ILL with LED036-FIXT
- FU2ILL with LED030-FIXT
- CFM42/1-L with LED015-FIXT
- F41ILL with LED012-FIXT
- CFT40/2-L with LED034-FIXT
- F31ILL with LED015-FIXT
- F42ILL with LED012-FIXT
- CFQ26/3 with LED030-FIXT
- F32ILL with LED030-FIXT

Calculation Parameters

The Evaluators confirmed installation of all fixtures listed in the project application. Savings for the measures were calculated using prescriptive savings values listed in Section 10.2.2, which are based on the New Orleans TRM 4.0. The specific values used in calculating savings for this site are presented in the table below.

Table A. Prescriptive Savings and kW Reductions

Prescriptive Measure	*Per-Unit kWh Savings*	*Per-Unit kW Reduction*
T8/T12 4ft Linear Fluorescent with 4' Linear LED	70.77	0.01
F42ILL with LED024-FIXT	259.12	0.04
F43ILL with LED036-FIXT	369.46	0.06
FU2ILL with LED030-FIXT	221.03	0.03
CFM42/1-L with LED015-FIXT	236.25	0.04
F41ILL with LED012-FIXT	144.80	0.02

CFT40/2-L with LED034-FIXT	289.60	0.05
F31ILL with LED015-FIXT	83.84	0.01
F42ILL with LED012-FIXT	350.60	0.06
CFQ26/3 with LED030-FIXT	525.86	0.08
F32ILL with LED030-FIXT	121.95	0.02

Savings Calculations

Using values from the table above, the Evaluators calculated lighting savings as follows:

Table B. Lighting Retrofit kWh Savings Calculations

Prescriptive Measure	*Measure Quantity*	*Per-Unit kWh Savings*	*Expected kWh Savings*	*Realized kWh Savings*	*kWh Realization Rate*
T8/T12 4ft Linear Fluorescent with 4' Linear LED	231	70.77	16,347.00	24647	150.77%
F42ILL with LED024-FIXT	31	259.12	8,032.70	16032	199.58%
F43ILL with LED036-FIXT	163	369.46	60,222.70	60870.52	101.08%
FU2ILL with LED030-FIXT	4	221.03	884.1	884.06	100.00%
CFM42/1-L with LED015-FIXT	13	236.25	3,071.30	3071.34	100.00%
F41ILL with LED012-FIXT	124	144.80	17,955.50	23603.55	131.46%
CFT40/2-L with LED034-FIXT	7	289.60	2,027.20	2027.24	100.00%
F31ILL with LED015-FIXT	8	83.84	670.7	670.67	100.00%
F42ILL with LED012-FIXT	1	350.60	350.6	350.58	99.99%
CFQ26/3 with LED030-FIXT	15	525.86	7,887.90	7887.94	100.00%
F32ILL with LED030-FIXT	4	121.95	487.8	487.76	99.99%
		Total:	**117,937**	**140532.7**	**119.16%**

Table C. Lighting Retrofit kW Reduction Calculations

Prescriptive Measure	*Measure Quantity*	*Per-Unit kW Reduction*	*Expected kW Reduction*	*Realized kW Reduction*	*kW Realization Rate*
T8/T12 4ft Linear Fluorescent with 4' Linear LED	231	0.01	2.8577	6.01	210.31%
F42ILL with LED024-FIXT	31	0.04	1.2648	1.26	99.62%
F43ILL with LED036-FIXT	163	0.06	9.4824	9.58	101.03%
FU2ILL with LED030-FIXT	4	0.03	0.1392	0.14	100.57%
CFM42/1-L with LED015-FIXT	13	0.04	0.4836	0.48	99.26%
F41ILL with LED012-FIXT	124	0.02	2.8272	2.83	100.10%
CFT40/2-L with LED034-FIXT	7	0.05	0.3192	0.32	100.25%
F31ILL with LED015-FIXT	8	0.01	0.1056	0.11	104.17%
F42ILL with LED012-FIXT	1	0.06	0.0552	0.06	108.70%
CFQ26/3 with LED030-FIXT	15	0.08	1.242	1.24	99.84%
F32ILL with LED030-FIXT	4	0.02	0.0768	0.08	104.17%
		Total:	**18.85**	**22.11**	**117.27%**

Results

The kWh and kW realization rates for project CIP 261 are 119.16% and 117.27%.

Table D. Verified Gross Savings & Realization Rates

Measure	*Verified*

	kWh Savings	*kW Savings*	*kWh Realization Rate*	*kW Realization Rate*
T8/T12 4ft Linear Fluorescent with 4' Linear LED	24647	6.01	150.77%	210.31%
F42ILL with LED024-FIXT	16032	1.26	199.58%	99.62%
F43ILL with LED036-FIXT	60870.52	9.58	101.08%	101.03%
FU2ILL with LED030-FIXT	884.06	0.14	100.00%	100.57%
CFM42/1-L with LED015-FIXT	3071.34	0.48	100.00%	99.26%
F41ILL with LED012-FIXT	23603.55	2.83	131.46%	100.10%
CFT40/2-L with LED034-FIXT	2027.24	0.32	100.00%	100.25%
F31ILL with LED015-FIXT	670.67	0.11	100.00%	104.17%
F42ILL with LED012-FIXT	350.58	0.06	99.99%	108.70%
CFQ26/3 with LED030-FIXT	7887.94	1.24	100.00%	99.84%
F32ILL with LED030-FIXT	487.76	0.08	99.99%	104.17%
Total:	**140532.7**	**22.11**	**119.16%**	**117.27%**

Project Number CIP 267

Program Large C&I

Project Background

The participant is a school that received incentives from Entergy New Orleans for retrofitting energy efficient lighting. The Evaluators verified that the following had been installed:

- Incandescent/CFL Screw-In Lamp with >=18Watt LED Screw-In
- Exterior HID 175 W to 250 W with LED Lamp/Fixture
- Exterior HID <175 W with LED Lamp/Fixture
- T8/T12 4ft Linear Fluorescent with 4' Linear LED
- Incandescent/CFL Screw-In Lamp with 7–12-Watt LED Screw-In

Calculation Parameters

The Evaluators confirmed installation of all fixtures listed in the project application. Savings for the measures were calculated using prescriptive savings values listed in Section 10.2.2, which are based on the New Orleans TRM 4.0. The specific values used in calculating savings for this site are presented in the table below.

Table A. Prescriptive Savings and kW Reductions

Prescriptive Measure	*Per-Unit kWh Savings*	*Per-Unit kW Reduction*
Incandescent/CFL Screw-In Lamp with >=18-Watt LED Screw-In	107.45	0.03
Exterior HID 175 W to 250 W with LED Lamp/Fixture	388.70	0.00
Exterior HID <175 W with LED Lamp/Fixture	237.50	0.00
T8/T12 4ft Linear Fluorescent with 4' Linear LED	32.00	0.01
Incandescent/CFL Screw-In Lamp with 7–12-Watt LED Screw-In	70.88	0.02

Savings Calculations

Using values from the table above, the Evaluators calculated lighting savings as follows:

Table B. Lighting Retrofit kWh Savings Calculations

Prescriptive Measure	*Measure Quantity*	*Per-Unit kWh Savings*	*Expected kWh Savings*	*Realized kWh Savings*	*kWh Realization Rate*
Incandescent/CFL Screw-In Lamp with >=18-Watt LED Screw-In	72	107.45	429.80	382	88.88%
Exterior HID 175 W to 250 W with LED Lamp/Fixture	200	388.70	1,943.50	913	46.98%
Exterior HID <175 W with LED Lamp/Fixture	85	237.50	237.50	112	47.16%
T8/T12 4ft Linear Fluorescent with 4' Linear LED	28	32.00	121,319.20	107725	88.79%
Incandescent/CFL Screw-In Lamp with 7–12-Watt LED Screw-In	43	70.88	354.40	315	88.88%
		Total:	**124,284.50**	**109447**	**88.06%**

Table C. Lighting Retrofit kW Reduction Calculations

Prescriptive Measure	*Measure Quantity*	*Per-Unit kW Reduction*	*Expected kW Reduction*	*Realized kW Reduction*	*kW Realization Rate*
Incandescent/CFL Screw-In Lamp with >=18-Watt LED Screw-In	72	0.03	0.11	0.11	104.07%

Exterior HID 175 W to 250 W with LED Lamp/Fixture	200	0.00	0	0.25	#DIV/0!
Exterior HID <175 W with LED Lamp/Fixture	85	0.00	0	0.03	#DIV/0!
T8/T12 4ft Linear Fluorescent with 4' Linear LED	28	0.01	28.63	29.93	104.55%
Incandescent/CFL Screw-In Lamp with 7–12-Watt LED Screw-In	43	0.02	0.09	0.09	103.69%
		Total:	**28.81**	**30.41**	**105.52%**

Results

The kWh and kW realization rates for project CIP 267 are88.06% and 105.52%.

Table D. Verified Gross Savings & Realization Rates

Measure	*Verified*			
	kWh Savings	*kW Savings*	*kWh Realization Rate*	*kW Realization Rate*
Incandescent/CFL Screw-In Lamp with >=18-Watt LED Screw-In	382	0.11	88.88%	104.07%
Exterior HID 175 W to 250 W with LED Lamp/Fixture	913	0.25	46.98%	#DIV/0!
Exterior HID <175 W with LED Lamp/Fixture	112	0.03	47.16%	#DIV/0!
T8/T12 4ft Linear Fluorescent with 4' Linear LED	107725	29.93	88.79%	104.55%

Incandescent/CFL Screw-In Lamp with 7–12-Watt LED Screw-In	315	0.09	88.88%	103.69%
Total:	**109,447**	**30.41**	**88.06%**	**105.52%**

Project Number CIP-278

Program Large C&I Solutions

Project Background

The participant is a public assembly that received incentives from Entergy New Orleans for retrofitting energy efficient lighting indoors and outdoors. The Evaluators verified that the following had been installed:

- (639) MH1000/1 with (639) LED440-FIXT
- (556) MH250/1 with (556) LED057-FIXT
- (5) MH400/1 with (5) LED001-FIXT
- (3) MH1000/1 with (3) LED001-FIXT
- (352) MH1000/1 with (352) LED200-FIXT

Calculation Parameters

Savings calculations were performed using savings methodology described in section D.6.3 Commercial Lighting Efficiency of the New Orleans TRM 4.0 Deemed savings parameters applicable to this site are shown below:

Table A, Savings Parameters

Building Type	*Heating Type*	*Annual Hours*	*IEF_E*	*IEF_D*	*CF*
Public Assembly	Gas	2638	1.09	1.20	0.56
Public Assembly	Gas	2638	1.09	1.20	0.56
Public Assembly	Gas	2638	1.09	1.20	0.56

Savings Calculations

Table B, Lighting Retrofit kWh Savings Calculations

Measure	*Quantity (Fixtures)*		*Wattage*		*Annual Operating Hours*	*Expected kWh Savings*	*Realized kWh Savings*	*IEF_E*	*Realization Rate*
	Base	*Post*	*Base*	*Post*					

MH1000 to LED440W	54	54	1,078	440	2,638	99,064	99,064	1.09	100.0%
MH250 to LED57W	40	32	288	57	2,638	27,880	27,880	1.09	100.0%
MH1000 to LED440W	72	72	1,078	440	2,638	132,085	132,085	1.09	100.0%
MH250 to LED57W	40	36	288	57	2,638	27,224	27,224	1.09	100.0%
MH1000 to LED440W	108	108	1,078	440	2,638	198,128	198,128	1.09	100.0%
MH250 to LED57W	60	54	288	57	2,638	40,837	40,837	1.09	100.0%
MH1000 to LED440W	108	108	1,078	440	2,638	198,128	198,128	1.09	100.0%
MH250 to LED57W	60	54	288	57	2,638	40,837	40,837	1.09	100.0%
MH1000 to LED440W	108	108	1,078	440	2,638	198,128	198,128	1.09	100.0%
MH250 to LED57W	60	54	288	57	2,638	40,837	40,837	1.09	100.0%
MH1000 to LED440W	36	36	1,078	440	4,312	107,951	107,951	1.09	100.0%
MH250 to LED57W	192	192	288	57	2,638	127,531	127,531	1.09	100.0%
MH1000 to LED440W	127	125	1,078	440	2,638	235,514	235,514	1.09	100.0%
MH250 to LED57W	32	30	288	57	2,638	21,583	21,583	1.09	100.0%
MH1000 to LED440W	28	28	1,078	440	4,312	83,962	83,962	1.09	100.0%
MH250 to LED57W	104	104	288	57	2,638	69,079	69,079	1.09	100.0%
MH400 to LED1W	16	1	453	1	2,638	20,838	20,838	1.09	100.0%
MH400 to LED1W	32	1	453	1	2,638	41,679	41,679	1.09	100.0%
MH400 to LED1W	48	1	453	1	2,638	62,520	62,520	1.09	100.0%
MH1000 to LED1W	216	1	1,078	1	2,058	522,327	522,327	1.09	100.0%
					Total	**2,296,132**	**2,296,132**		**100.0%**

Table C, Lighting Retrofit kW Reduction Calculations

Measure	***Quantity (Fixtures)***	***Wattage***	***CF***			***IEFD***	

	Base	*Post*	*Base*	*Post*		*Expected kW Savings*	*Realized kW Savings*		*Realization Rate*
MH1000 to LED440W	54	54	1,078	440	0.56	23.15	23.15	1.20	100.0%
MH250 to LED57W	40	32	288	57	0.56	6.52	6.52	1.20	100.0%
MH1000 to LED440W	72	72	1,078	440	0.56	30.87	30.87	1.20	100.0%
MH250 to LED57W	40	36	288	57	0.56	6.36	6.36	1.20	100.0%
MH1000 to LED440W	108	108	1,078	440	0.56	46.30	46.30	1.20	100.0%
MH250 to LED57W	60	54	288	57	0.56	9.54	9.54	1.20	100.0%
MH1000 to LED440W	108	108	1,078	440	0.56	46.30	46.30	1.20	100.0%
MH250 to LED57W	60	54	288	57	0.56	9.54	9.54	1.20	100.0%
MH1000 to LED440W	108	108	1,078	440	0.56	46.30	46.30	1.20	100.0%
MH250 to LED57W	60	54	288	57	0.56	9.54	9.54	1.20	100.0%
MH1000 to LED440W	36	36	1,078	440	0.90	24.81	24.81	1.20	100.0%
MH250 to LED57W	192	192	288	57	0.56	29.80	29.80	1.20	100.0%
MH1000 to LED440W	127	125	1,078	440	0.56	55.04	55.04	1.20	100.0%
MH250 to LED57W	32	30	288	57	0.56	5.04	5.04	1.20	100.0%
MH1000 to LED440W	28	28	1,078	440	0.90	19.29	19.29	1.20	100.0%
MH250 to LED57W	104	104	288	57	0.56	16.14	16.14	1.20	100.0%
MH400 to LED1W	16	1	453	1	0.56	4.87	4.87	1.20	100.0%
MH400 to LED1W	32	1	453	1	0.56	9.74	9.74	1.20	100.0%

MH400 to LED1W	48	1	453	1	0.56	14.61	14.61	1.20	100.0%
MH1000 to LED1W	216	1	1,078	1	0.56	265.45	156.47	1.20	58.9%
					Total	**679.21**	**570.23**		**84.0%**

Results

The kWh and kW realization rates for project CIP-278 are 100% and 84%.

Table D, Verified Gross Savings & Realization Rates

Measure	*Verified*			
	kWh Savings	*kW Savings*	*kWh Realization Rate*	*kW Realization Rate*
MH1000 to LED440W	99,064	23.15	100.0%	100.0%
MH250 to LED57W	27,880	6.52	100.0%	100.0%
MH1000 to LED440W	132,085	30.87	100.0%	100.0%
MH250 to LED57W	27,224	6.36	100.0%	100.0%
MH1000 to LED440W	198,128	46.30	100.0%	100.0%
MH250 to LED57W	40,837	9.54	100.0%	100.0%
MH1000 to LED440W	198,128	46.30	100.0%	100.0%
MH250 to LED57W	40,837	9.54	100.0%	100.0%
MH1000 to LED440W	198,128	46.30	100.0%	100.0%
MH250 to LED57W	40,837	9.54	100.0%	100.0%

MH1000 to LED440W	107,951	24.81	100.0%	100.0%
MH250 to LED57W	127,531	29.80	100.0%	100.0%
MH1000 to LED440W	235,514	55.04	100.0%	100.0%
MH250 to LED57W	21,583	5.04	100.0%	100.0%
MH1000 to LED440W	83,962	19.29	100.0%	100.0%
MH250 to LED57W	69,079	16.14	100.0%	100.0%
MH400 to LED1W	20,838	4.87	100.0%	100.0%
MH400 to LED1W	41,679	9.74	100.0%	100.0%
MH400 to LED1W	62,520	14.61	100.0%	100.0%
MH1000 to LED1W	522,327	156.47	100.0%	58.9%
Total	**2,296,132**	**570.23**	**100.0%**	**84.0%**

Project Number CIP 282

Program Large C&I

Project Background

The participant is a parking structure that received incentives from Entergy New Orleans for retrofitting energy efficient lighting. The Evaluators verified that the following had been installed:

- CFQ26/1-L with LED009-FIXT
- CFQ26/1-L with LED014-FIXT
- CFQ26/1-L with LED017-FIXT

Calculation Parameters

The Evaluators confirmed installation of all fixtures listed in the project application. Savings for the measures were calculated using prescriptive savings values listed in Section 10.2.2, which are based on the New Orleans TRM 4.0. The specific values used in calculating savings for this site are presented in the table below.

Table A. Prescriptive Savings and kW Reductions

Prescriptive Measure	*Per-Unit kWh Savings*	*Per-Unit kW Reduction*
CFQ26/1-L with LED009-FIXT	62.17	0.02
CFQ26/1-L with LED014-FIXT	46.45	0.01
CFQ26/1-L with LED017-FIXT	63.07	0.02

Savings Calculations

Using values from the table above, the Evaluators calculated lighting savings as follows:

Table B. Lighting Retrofit kWh Savings Calculations

Prescriptive Measure	*Measure Quantity*	*Per-Unit kWh Savings*	*Expected kWh Savings*	*Realized kWh Savings*	*kWh Realization Rate*
CFQ26/1-L with LED009-FIXT	47	62.17	2,922	2,922	100%

CFQ26/1-L with LED014-FIXT	324	46.45	15,049	14,547	97%
CFQ26/1-L with LED017-FIXT	72	63.07	4,541	2,487	55%
		Total:	**22,512**	**19,956**	**89%**

Table C. Lighting Retrofit kW Reduction Calculations

Prescriptive Measure	*Measure Quantity*	*Per-Unit kW Reduction*	*Expected kW Reduction*	*Realized kW Reduction*	*kW Realization Rate*
CFQ26/1-L with LED009-FIXT	47	0.02	0.78	0.78	100%
CFQ26/1-L with LED014-FIXT	324	0.01	4.01	3.89	97%
CFQ26/1-L with LED017-FIXT	72	0.02	1.25	0.67	54%
		Total:	**6.04**	**5.34**	**89%**

Results

The kWh and kW realization rates for project CIP 282 are 89%.

Table D. Verified Gross Savings & Realization Rates

Measure	*Verified*			
	kWh Savings	*kW Savings*	*kWh Realization Rate*	*kW Realization Rate*
CFQ26/1-L with LED009-FIXT	2,922	0.78	100%	100%
CFQ26/1-L with LED014-FIXT	14,547	3.89	97%	97%
CFQ26/1-L with LED017-FIXT	2,487	0.67	55%	54%
Total:	**19,956**	**5.34**	**89%**	**89%**

Project Number CIP 298

Program Large C&I

Project Background

The participant is an office that received incentives from Entergy New Orleans for retrofitting energy efficient lighting. The Evaluators verified that the following had been installed:

- CFT40/2 with LED034-FIXT
- H150/1 with LED007-FIXT
- H150/1 with LED023-FIXT
- H100/1 with LED007-FIXT

Calculation Parameters

The Evaluators confirmed installation of all fixtures listed in the project application. Savings for the measures were calculated using prescriptive savings values listed in Section 10.2.2, which are based on the New Orleans TRM 4.0. The specific values used in calculating savings for this site are presented in the table below.

Table A. Prescriptive Savings and kW Reductions

Prescriptive Measure	*Per-Unit kWh Savings*	*Per-Unit kW Reduction*
CFT40/2 with LED034-FIXT	228.90	0.05
H150/1 with LED007-FIXT	1063.28	0.17
H150/1 with LED023-FIXT	575.13	0.13
H100/1 with LED007-FIXT	340.40	0.09

Savings Calculations

Using values from the table above, the Evaluators calculated lighting savings as follows:

Table B. Lighting Retrofit kWh Savings Calculations

Prescriptive Measure	*Measure Quantity*	*Per-Unit kWh Savings*	*Expected kWh Savings*	*Realized kWh Savings*	*kWh Realization Rate*
CFT40/2 with LED034-FIXT	500	228.90	114,452.40	114452	100.00%
H150/1 with LED007-FIXT	128	1063.28	136,099.80	119498	87.80%
H150/1 with LED023-FIXT	32	575.13	18,404.10	14502	78.80%
H100/1 with LED007-FIXT	4	340.40	1,361.60	1362	100.03%
		Total:	**270,317.90**	**249,814**	**92.41%**

Table C. Lighting Retrofit kW Reduction Calculations

Prescriptive Measure	*Measure Quantity*	*Per-Unit kW Reduction*	*Expected kW Reduction*	*Realized kW Reduction*	*kW Realization Rate*
CFT40/2 with LED034-FIXT	500	0.05	23.562	21.65	91.89%
H150/1 with LED007-FIXT	128	0.17	21.728	19.96	91.86%
H150/1 with LED023-FIXT	32	0.13	4.1514	4.39	105.75%
H100/1 with LED007-FIXT	4	0.09	0.3437	0.45	130.93%
		Total:	**49.78**	**46.45**	**93.30**

Results

The kWh and kW realization rates for project CIP 298 are 92.41% and 93.30%.

Table D. Verified Gross Savings & Realization Rates

Measure	*Verified*			
	kWh Savings	*kW Savings*	*kWh Realization Rate*	*kW Realization Rate*

CFT40/2 with LED034-FIXT	114452	21.65	100.00%	91.89%
H150/1 with LED007-FIXT	119498	19.96	87.80%	91.86%
H150/1 with LED023-FIXT	14502	4.39	78.80%	105.75%
H100/1 with LED007-FIXT	1362	0.45	100.03%	130.93%
Total:	**249,814**	**46.45**	**92.41%**	**93.30**

Project Number CIP 317

Program Large C&I

Project Background

The participant is a hotel that received incentives from Entergy New Orleans for retrofitting energy efficient lighting. The Evaluators verified that the following had been installed:

- (8) MH400/1 with (8) LED100-FIXT
- (461) F42ILL with (461) LED022-FIXT
- (15) F82ILL with (15) LED060-FIXT
- (5) F42GPHL-H with (5) LED050-FIXT
- (204) CFQ26/1 with (204) LED009-FIXT
- (155) CFQ26/2 with (155) LED018-FIXT
- (12) F41ILL with (12) LED013-FIXT
- (23) F44ILL with (23) LED052-FIXT
- (3) FU2ILL with (3) LED028-FIXT
- (2) F21ILL with (2) LED008-FIXT
- (3) F43ILL with (3) LED039-FIXT
- (8) F23ILL with (8) LED024-FIXT

Calculation Parameters

The Evaluators confirmed installation of all fixtures listed in the project application. Savings for the measures were calculated using prescriptive savings values listed in Section 10.2.2, which are based on the New Orleans TRM 4.0. The specific values used in calculating savings for this site are presented in the table below.

Table A. Prescriptive Savings and kW Reductions

Prescriptive Measure	*Per-Unit kWh Savings*	*Per-Unit kW Reduction*
MH400/1 with LED100-FIXT	3370.59	0.42
F42ILL with LED022-FIXT	343.74	0.04
F82ILL with LED060-FIXT	477.42	0.06
F42GPHL-H with LED050-FIXT	639.74	0.08
CFQ26/1 with LED009-FIXT	229.16	0.03

CFQ26/2 with LED018-FIXT	458.32	0.06
F41ILL with LED013-FIXT	171.87	0.02
F44ILL with LED052-FIXT	572.90	0.07
FU2ILL with LED028-FIXT	296.00	0.04
F21ILL with LED008-FIXT	95.48	0.01
F43ILL with LED039-FIXT	439.23	0.06
F23ILL with LED024-FIXT	219.61	0.03

Savings Calculations

Using values from the table above, the Evaluators calculated lighting savings as follows:

Table B. Lighting Retrofit kWh Savings Calculations

Prescriptive Measure	*Measure Quantity*	*Per-Unit kWh Savings*	*Expected kWh Savings*	*Realized kWh Savings*	*kWh Realization Rate*
MH400/1 with LED100-FIXT	8	3370.59	26964.68	26965	100.00%
F42ILL with LED022-FIXT	461	343.74	158465.20	158465	100.00%
F82ILL with LED060-FIXT	15	477.42	7161.30	7161	100.00%
F42GPHL-H with LED050-FIXT	5	639.74	3198.71	3199	100.01%
CFQ26/1 with LED009-FIXT	204	229.16	46748.97	46749	100.00%
CFQ26/2 with LED018-FIXT	155	458.32	71040.10	71040	100.00%
F41ILL with LED013-FIXT	12	171.87	2062.45	2062	99.98%
F44ILL with LED052-FIXT	23	572.90	13176.79	13177	100.00%
FU2ILL with LED028-FIXT	3	296.00	888	888	100.00%
F21ILL with LED008-FIXT	2	95.48	190.96	191	100.02%

F43ILL with LED039-FIXT	3	439.23	1317.67	1318	100.02%
F23ILL with LED024-FIXT	8	219.61	1756.91	1757	100.01%
		Total:	**332,971.80**	**332,972**	**100%**

Table C. Lighting Retrofit kW Reduction Calculations

Prescriptive Measure	*Measure Quantity*	*Per-Unit kW Reduction*	*Expected kW Reduction*	*Realized kW Reduction*	*kW Realization Rate*
MH400/1 with LED100-FIXT	8	0.42	3.38	3.39	100.04%
F42ILL with LED022-FIXT	461	0.04	19.91	19.92	100.02%
F82ILL with LED060-FIXT	15	0.06	0.90	0.90	100.00%
F42GPHL-H with LED050-FIXT	5	0.08	0.40	0.40	99.50%
CFQ26/1 with LED009-FIXT	204	0.03	5.87	5.88	100.08%
CFQ26/2 with LED018-FIXT	155	0.06	8.92	8.93	100.02%
F41ILL with LED013-FIXT	12	0.02	0.25	0.26	100.31%
F44ILL with LED052-FIXT	23	0.07	1.65	1.66	100.24%
FU2ILL with LED028-FIXT	3	0.04	0.11	0.11	98.57%
F21ILL with LED008-FIXT	2	0.01	0.02	0.02	83.33%
F43ILL with LED039-FIXT	3	0.06	0.16	0.17	102.66%
F23ILL with LED024-FIXT	8	0.03	0.22	0.22	99.64%
		Total:	**41.84**	**41.86**	**100%**

Results

The kWh and kW realization rates for project CIP 317 are 100%.

Table D. Verified Gross Savings & Realization Rates

Measure	*Verified*			
	kWh Savings	*kW Savings*	*kWh Realization Rate*	*kW Realization Rate*
MH400/1 with LED100-FIXT	26965	3.39	100.00%	100.04%
F42ILL with LED022-FIXT	158465	19.92	100.00%	100.02%
F82ILL with LED060-FIXT	7161	0.90	100.00%	100.00%
F42GPHL-H with LED050-FIXT	3199	0.40	100.01%	99.50%
CFQ26/1 with LED009-FIXT	46749	5.88	100.00%	100.08%
CFQ26/2 with LED018-FIXT	71040	8.93	100.00%	100.02%
F41ILL with LED013-FIXT	2062	0.26	99.98%	100.31%
F44ILL with LED052-FIXT	13177	1.66	100.00%	100.24%
FU2ILL with LED028-FIXT	888	0.11	100.00%	98.57%
F21ILL with LED008-FIXT	191	0.02	100.02%	83.33%
F43ILL with LED039-FIXT	1318	0.17	100.02%	102.66%
F23ILL with LED024-FIXT	1757	0.22	100.01%	99.64%
Total:	**332,972**	**41.86**	**100%**	**100%**

Project Number CIP 320

Program Large C&I

Project Background

The participant is a hotel that received incentives from Entergy New Orleans for retrofitting energy efficient lighting. The Evaluators verified that the following had been installed:

- F41ILL with LED012-FIXT
- F42ILL with LED012-FIXT
- FU2ILL with LED009-FIXT
- F44ILL with LED012-FIXT
- F82ILL with LED018-FIXT
- F43ILL with LED012-FIXT
- MH250/1 with LED032-FIXT
- MH175/1 with LED032-FIXT
- H40/1 with LED004-FIXT
- H60/1 with LED009-FIXT
- CFT13/1 with LED009-FIXT

Calculation Parameters

The Evaluators confirmed installation of all fixtures listed in the project application. Savings for the measures were calculated using prescriptive savings values listed in Section 10.2.2, which are based on the New Orleans TRM 4.0. The specific values used in calculating savings for this site are presented in the table below.

Table A. Prescriptive Savings and kW Reductions

Prescriptive Measure	*Per-Unit kWh Savings*	*Per-Unit kW Reduction*
F41ILL with LED012-FIXT	164.67	0.02
F42ILL with LED012-FIXT	132.58	0.02
FU2ILL with LED009-FIXT	156.23	0.02
F44ILL with LED012-FIXT	121.94	0.02
F82ILL with LED018-FIXT	291.90	0.04
F43ILL with LED012-FIXT	124.48	0.02

MH250/1 with LED032-FIXT	1951.03	0.31
MH175/1 with LED032-FIXT	1541.76	0.18
H40/1 with LED004-FIXT	274.36	0.04
H60/1 with LED009-FIXT	388.68	0.06
CFT13/1 with LED009-FIXT	60.97	0.01

Savings Calculations

Using values from the table above, the Evaluators calculated lighting savings as follows:

Table B. Lighting Retrofit kWh Savings Calculations

Prescriptive Measure	*Measure Quantity*	*Per-Unit kWh Savings*	*Expected kWh Savings*	*Realized kWh Savings*	*kWh Realization Rate*
F41ILL with LED012-FIXT	722	164.67	118,893.1	118,893.1	100%
F42ILL with LED012-FIXT	308	132.58	40,833.9	40,833.9	100%
FU2ILL with LED009-FIXT	184	156.23	28,747.2	28,747.2	100%
F44ILL with LED012-FIXT	100	121.94	12,193.9	12,193.9	100%
F82ILL with LED018-FIXT	34	291.90	9,924.6	9,924.6	100%
F43ILL with LED012-FIXT	66	124.48	8,215.7	8,215.7	100%
MH250/1 with LED032-FIXT	2	1951.03	3,902.1	3,902.1	100%
MH175/1 with LED032-FIXT	2	1541.76	3,083.5	3,083.5	100%
H40/1 with LED004-FIXT	14	274.36	3,841.1	3,841.1	100%
H60/1 with LED009-FIXT	9	388.68	3,498.1	3,498.1	100%
CFT13/1 with LED009-FIXT	2	60.97	121.9	121.9	100%
		Total:	**233,255**	**233,255**	**100%**

Table C. Lighting Retrofit kW Reduction Calculations

Prescriptive Measure	*Measure Quantity*	*Per-Unit kW Reduction*	*Expected kW Reduction*	*Realized kW Reduction*	*kW Realization Rate*
F41ILL with LED012-FIXT	722	0.02	13.94	13.94	100%
F42ILL with LED012-FIXT	308	0.02	6.12	6.12	100%
FU2ILL with LED009-FIXT	184	0.02	4.52	4.52	100%
F44ILL with LED012-FIXT	100	0.02	1.92	1.92	100%
F82ILL with LED018-FIXT	34	0.04	1.45	1.45	100%
F43ILL with LED012-FIXT	66	0.02	1.29	1.29	100%
MH250/1 with LED032-FIXT	2	0.31	0.61	0.61	100%
MH175/1 with LED032-FIXT	2	0.18	0.35	0.35	100%
H40/1 with LED004-FIXT	14	0.04	0.60	0.60	100%
H60/1 with LED009-FIXT	9	0.06	0.55	0.55	100%
CFT13/1 with LED009-FIXT	2	0.01	0.01	0.01	100%
		Total:	**31.39**	**31.39**	**100%**

Results

The kWh and kW realization rates for project CIP 320 are 100.0%.

Table D. Verified Gross Savings & Realization Rates

Measure	*Verified*

	kWh Savings	*kW Savings*	*kWh Realization Rate*	*kW Realization Rate*
F41ILL with LED012-FIXT	118,893.1	13.94	100%	100%
F42ILL with LED012-FIXT	40,833.9	6.12	100%	100%
FU2ILL with LED009-FIXT	28,747.2	4.52	100%	100%
F44ILL with LED012-FIXT	12,193.9	1.92	100%	100%
F82ILL with LED018-FIXT	9,924.6	1.45	100%	100%
F43ILL with LED012-FIXT	8,215.7	1.29	100%	100%
MH250/1 with LED032-FIXT	3,902.1	0.61	100%	100%
MH175/1 with LED032-FIXT	3,083.5	0.35	100%	100%
H40/1 with LED004-FIXT	3,841.1	0.60	100%	100%
H60/1 with LED009-FIXT	3,498.1	0.55	100%	100%
CFT13/1 with LED009-FIXT	121.9	0.01	100%	100%
Total:	**233,255**	**31.39**	**100%**	**100%**

Project Number CIP 322

Program Large C&I

Project Background

The participant is a parking lot that received incentives from Entergy New Orleans for retrofitting energy efficient lighting. The Evaluators verified that the following had been installed:

- Exterior HID 401 W to 1000 W with LED Lamp/Fixture
- Exterior HID 251 W to 400 W with LED Lamp/Fixture

Calculation Parameters

The Evaluators confirmed installation of all fixtures listed in the project application. Savings for the measures were calculated using prescriptive savings values listed in Section 10.2.2, which are based on the New Orleans TRM 4.0. The specific values used in calculating savings for this site are presented in the table below.

Table A. Prescriptive Savings and kW Reductions

Prescriptive Measure	*Per-Unit kWh Savings*	*Per-Unit kW Reduction*
Exterior HID 401 W to 1000 W with LED Lamp/Fixture	2,030	0.00
Exterior HID 251 W to 400 W with LED Lamp/Fixture	885	0.00

Savings Calculations

Using values from the table above, the Evaluators calculated lighting savings as follows:

Table B. Lighting Retrofit kWh Savings Calculations

Prescriptive Measure	*Measure Quantity*	*Per-Unit kWh Savings*	*Expected kWh Savings*	*Realized kWh Savings*	*kWh Realization Rate*

Exterior HID 401 W to 1000 W with LED Lamp/Fixture	12	2,030	24,359	24,359	100%
Exterior HID 251 W to 400 W with LED Lamp/Fixture	17	885	15,052	15,052	100%
		Total:	**39,410**	**39,410**	**100%**

Results

The kWh realization rate for project CIP 322 is 100.0%.

Table C. Verified Gross Savings & Realization Rates

Measure	***Verified***	
	kWh Savings	***kWh Realization Rate***
Exterior HID 401 W to 1000 W with LED Lamp/Fixture	24,359	100%
Exterior HID 251 W to 400 W with LED Lamp/Fixture	15,052	100%
Total:	**39,410**	**100%**

Project Number CIP 334

Program Large C&I

Project Background

The participant is a hotel that received incentives from Entergy New Orleans for retrofitting energy efficient lighting. The Evaluators verified that the following had been installed:

- FU2ILU with LED009-FIXT
- F42ILU with LED012-FIXT
- F44ILU with LED012-FIXT
- H65/1 with LED011-FIXT
- F82ILU with LED012-FIXT
- H50/1 with LED007-FIXT
- H75/1 with LED017-FIXT
- F41ILU with LED012-FIXT

Calculation Parameters

The Evaluators confirmed installation of all fixtures listed in the project application. Savings for the measures were calculated using prescriptive savings values listed in Section 10.2.2, which are based on the New Orleans TRM 4.0. The specific values used in calculating savings for this site are presented in the table below.

Table A. Prescriptive Savings and kW Reductions

Prescriptive Measure	*Per-Unit kWh Savings*	*Per-Unit kW Reduction*
FU2ILU with LED009-FIXT	140.99	0.02
F42ILU with LED012-FIXT	114.32	0.02
F44ILU with LED012-FIXT	112.41	0.02
H65/1 with LED011-FIXT	411.54	0.06
F82ILU with LED012-FIXT	112.41	0.02
H50/1 with LED007-FIXT	327.71	0.05
H75/1 with LED017-FIXT	508.08	0.00

F41ILU with LED012-FIXT	121.94	0.02

Savings Calculations

Using values from the table above, the Evaluators calculated lighting savings as follows:

Table B. Lighting Retrofit kWh Savings Calculations

Prescriptive Measure	*Measure Quantity*	*Per-Unit kWh Savings*	*Expected kWh Savings*	*Realized kWh Savings*	*kWh Realization Rate*
FU2ILU with LED009-FIXT	104	140.99	14663.19	14,663	100.0%
F42ILU with LED012-FIXT	188	114.32	21491.78	21,492	100.0%
F44ILU with LED012-FIXT	80	112.41	8993.016	8,993	100.0%
H65/1 with LED011-FIXT	7	411.54	2880.814	2,881	100.0%
F82ILU with LED012-FIXT	4	112.41	449.6508	450	100.1%
H50/1 with LED007-FIXT	6	327.71	1966.27	1,966	100.0%
H75/1 with LED017-FIXT	18	508.08	9145.44	9,145	100.0%
F41ILU with LED012-FIXT	25	121.94	3048.48	3,048	100.0%
		Total:	**62,638.60**	**62,638**	**100%**

Table C. Lighting Retrofit kW Reduction Calculations

Prescriptive Measure	*Measure Quantity*	*Per-Unit kW Reduction*	*Expected kW Reduction*	*Realized kW Reduction*	*kW Realization Rate*
FU2ILU with LED009-FIXT	104	0.02	2.31	2.31	100.1%
F42ILU with LED012-FIXT	188	0.02	3.38	3.38	99.9%
F44ILU with LED012-FIXT	80	0.02	1.41	1.42	100.3%
H65/1 with LED011-FIXT	7	0.06	0.45	0.45	99.2%
F82ILU with LED012-FIXT	4	0.02	0.07	0.07	98.9%
H50/1 with LED007-FIXT	6	0.05	0.30	0.31	100.1%
H75/1 with LED017-FIXT	18	0.00	0	1.04	0%
F41ILU with LED012-FIXT	25	0.02	0.48	0.48	100.0%
		Total:	**8.42**	**9.46**	**112.3%**

Results

The kWh and kW realization rates for project CIP 334 are 100.0% and 112.3%.

Table D. Verified Gross Savings & Realization Rates

Measure	*Verified*			
	kWh Savings	*kW Savings*	*kWh Realization Rate*	*kW Realization Rate*
FU2ILU with LED009-FIXT	14663.19	2.31	100.0%	100.1%
F42ILU with LED012-FIXT	21491.78	3.38	100.0%	99.9%
F44ILU with LED012-FIXT	8993.016	1.42	100.0%	100.3%
H65/1 with LED011-FIXT	2880.814	0.45	100.0%	99.2%

F82ILU with LED012-FIXT	449.6508	0.07	100.1%	98.9%
H50/1 with LED007-FIXT	1966.27	0.31	100.0%	100.1%
H75/1 with LED017-FIXT	9145.44	1.04	100.0%	100%
F41ILU with LED012-FIXT	3048.48	0.48	100.0%	100.0%
Total:	**62,638.60**	**9.46**	**100%**	**112.3%**

Project Number CIP 343

Program Large C&I

Project Background

The participant is a retail business that received incentives from Entergy New Orleans for retrofitting energy efficient lighting. The Evaluators verified that the following had been installed:

- T8/T12 U-Tube Fluorescent with U-Tube LED
- BLANK WITH LCAT24-35MLG-EDU & LCAT22-35MLG-EDU
- Incandescent/CFL Screw-In Lamp with >=18-Watt LED Screw-In

Calculation Parameters

The Evaluators confirmed installation of all fixtures listed in the project application. Savings for the measures were calculated using prescriptive savings values listed in Section 10.2.2, which are based on the New Orleans TRM 4.0. The specific values used in calculating savings for this site are presented in the table below.

Table A. Prescriptive Savings and kW Reductions

Prescriptive Measure	*Per-Unit kWh Savings*	*Per-Unit kW Reduction*
T8/T12 U-Tube Fluorescent with U-Tube LED	96.10	0.02
BLANK WITH LCAT24-35MLG-EDU & LCAT22-35MLG-EDU	146.65	0.03
Incandescent/CFL Screw-In Lamp with >=18-Watt LED Screw-In	237.63	0.04

Savings Calculations

Using values from the table above, the Evaluators calculated lighting savings as follows:

Table B. Lighting Retrofit kWh Savings Calculations

Prescriptive Measure	*Measure Quantity*	*Per-Unit kWh Savings*	*Expected kWh Savings*	*Realized kWh Savings*	*kWh Realization Rate*

T8/T12 U-Tube Fluorescent with U-Tube LED	104	96.10	9,994.50	8869	88.74%
BLANK WITH LCAT24-35MLG-EDU & LCAT22-35MLG-EDU	24	146.65	3,519.60	3124	88.76%
Incandescent/CFL Screw-In Lamp with >=18-Watt LED Screw-In	10	237.63	2,376.30	2110	88.79%
		Total:	**15,890.40**	**14,103**	**88.75%**

Table C. Lighting Retrofit kW Reduction Calculations

Prescriptive Measure	*Measure Quantity*	*Per-Unit kW Reduction*	*Expected kW Reduction*	*Realized kW Reduction*	*kW Realization Rate*
T8/T12 U-Tube Fluorescent with U-Tube LED	104	0.02	1.80	1.83	101.60%
BLANK WITH LCAT24-35MLG-EDU & LCAT22-35MLG-EDU	24	0.03	0.65	0.64	97.98%
Incandescent/CFL Screw-In Lamp with >=18-Watt LED Screw-In	10	0.04	0.43	0.43	99.31%
		Total:	**2.88**	**2.90**	**100.44%**

Results

The kWh and kW realization rates for project CIP 343 are 88.75% and 100.0%.

Table D. Verified Gross Savings & Realization Rates

Measure	*Verified*			
	kWh Savings	*kW Savings*	*kWh Realization Rate*	*kW Realization Rate*
T8/T12 U-Tube Fluorescent with U-Tube LED	8869	1.83	88.74%	101.60%

BLANK WITH LCAT24-35MLG-EDU & LCAT22-35MLG-EDU	3124	0.64	88.76%	97.98%
Incandescent/CFL Screw-In Lamp with >=18-Watt LED Screw-In	2110	0.43	88.79%	99.31%
Total:	**14,103**	**2.90**	**88.75%**	**100.44%**

Project Number CIP 347

Program Large C&I

Project Background

The participant is a hotel/motel/dorm that received incentives from Entergy New Orleans for retrofitting energy efficient lighting. The Evaluators verified that the following had been installed:

- (110) Incandescent/CFL Screw-In Lamp with (110) 7-12 Watt LED Screw-In
- (642) Incandescent/CFL Screw-In Lamp with (642) 1-6 Watt LED Screw-In
- (214) T8/T12 4ft Linear Fluorescent with (214) 4' Linear LED
- (285) T8/T12 2ft Linear Fluorescent with (285) 2' Linear LED
- (513) F42ILL with (513) LED024-FIXT
- (167) F43ILL with (167) LED036-FIXT
- (8) CFM42/1-L with (8) LED020-FIXT
- (20) CFT40/2-L with (20) LED030-FIXT
- (28) CFM42/1-L with (28) LED010-FIXT
- (5) CFM42/1-L with (5) LED009-FIXT
- (20) F44ILL with (20) LED048-FIXT
- (4) MH400/1 with (4) LED140-FIXT
- (9) MH250/1 with (9) LED070-FIXT

Calculation Parameters

The Evaluators confirmed installation of all fixtures listed in the project application. Savings for the measures were calculated using prescriptive savings values listed in Section 10.2.2, which are based on the New Orleans TRM 4.0. The specific values used in calculating savings for this site are presented in the table below.

Table A. Prescriptive Savings and kW Reductions

Prescriptive Measure	*Per-Unit kWh Savings*	*Per-Unit kW Reduction*
Incandescent/CFL Screw-In Lamp with 7-12 Watt LED Screw-In	237.02	0.05
Incandescent/CFL Screw-In Lamp with 1-6 Watt LED Screw-In	159.14	0.03

T8/T12 4ft Linear Fluorescent with 4' Linear LED	71.98	0.016
T8/T12 2ft Linear Fluorescent with 2' Linear LED	45.06	0.009
F42ILL with LED024-FIXT	324.65	0.04
F43ILL with LED036-FIXT	467.87	0.058
CFM42/1-L with LED020-FIXT	248.26	0.03
CFT40/2-L with LED030-FIXT	401.03	0.050
CFM42/1-L with LED010-FIXT	343.74	0.0432
CFM42/1-L with LED009-FIXT	353.3	0.044
F44ILL with LED048-FIXT	611.1	0.0768
MH400/1 with LED140-FIXT	2,988.65	0.3756
MH250/1 with LED070-FIXT	2,081.55	0.2616

Savings Calculations

Using values from the table above, the Evaluators calculated lighting savings as follows:

Table B. Lighting Retrofit kWh Savings Calculations

Prescriptive Measure	*Measure Quantity*	*Per-Unit kWh Savings*	*Expected kWh Savings*	*Realized kWh Savings*	*kWh Realization Rate*
Incandescent/CFL Screw-In Lamp with 7-12 Watt LED Screw-In	110	237.02	26,072.2	32,560	124%
Incandescent/CFL Screw-In Lamp with 1-6 Watt LED Screw-In	642	159.14	102,167	140,992	138%
T8/T12 4ft Linear Fluorescent with 4' Linear LED	214	71.98	15,403.7	28,607	185%

T8/T12 2ft Linear Fluorescent with 2' Linear LED	285	45.06	12,842	19,049	148%
F42ILL with LED024-FIXT	513	324.65	166,545.5	166,543	100%
F43ILL with LED036-FIXT	167	467.87	78,134	78,135	100%
CFM42/1-L with LED020-FIXT	8	248.26	1,986.1	1,986	100%
CFT40/2-L with LED030-FIXT	20	401.03	8,020.6	8,021	100%
CFM42/1-L with LED010-FIXT	28	343.74	9,624	9,625	100%
CFM42/1-L with LED009-FIXT	5	353.3	1,766.5	1,766	100%
F44ILL with LED048-FIXT	20	611.1	12,222	12,222	100%
MH400/1 with LED140-FIXT	4	2,988.65	11,954	11,955	100%
MH250/1 with LED070-FIXT	9	2,081.55	18,733	18,734	100%
		Total:	**465,470**	**530,195**	**114%**

Table C. Lighting Retrofit kW Reduction Calculations

Prescriptive Measure	*Measure Quantity*	*Per-Unit kW Reduction*	*Expected kW Reduction*	*Realized kW Reduction*	*kW Realization Rate*
Incandescent/CFL Screw-In Lamp with 7-12 Watt LED Screw-In	110	0.05	5.5	4.09	74%
Incandescent/CFL Screw-In Lamp with 1-6 Watt LED Screw-In	642	0.03	19.26	17.72	92%
T8/T12 4ft Linear Fluorescent with 4' Linear LED	214	0.016	3.424	3.60	105%
T8/T12 2ft Linear Fluorescent with 2' Linear LED	285	0.009	2.565	2.39	93%

F42ILL with LED024-FIXT	513	0.04	20.52	20.93	101.9%
F43ILL with LED036-FIXT	167	0.058	9.686	9.82	101%
CFM42/1-L with LED020-FIXT	8	0.03	0.24	0.25	100%
CFT40/2-L with LED030-FIXT	20	0.050	1	1	100%
CFM42/1-L with LED010-FIXT	28	0.0432	1.2096	1.21	100%
CFM42/1-L with LED009-FIXT	5	0.044	0.22	0.22	100%
F44ILL with LED048-FIXT	20	0.0768	1.536	1.54	100%
MH400/1 with LED140-FIXT	4	0.3756	1.5024	1.50	100%
MH250/1 with LED070-FIXT	9	0.2616	2.3544	2.35	100%
		Total:	**72.36**	**66.63**	**92.08%**

Results

The kWh and kW realization rates for project CIP-347 are 114% and 92.08%.

Table D. Verified Gross Savings & Realization Rates

Measure	*Verified*			
	kWh Savings	*kW Savings*	*kWh Realization Rate*	*kW Realization Rate*
Incandescent/CFL Screw-In Lamp with 7-12 Watt LED Screw-In	32,560	4.09	124%	74%
Incandescent/CFL Screw-In Lamp with 1-6 Watt LED Screw-In	140,992	17.72	138%	92%
T8/T12 4ft Linear Fluorescent with 4' Linear LED	28,607	3.60	185%	105%
T8/T12 2ft Linear Fluorescent with 2' Linear LED	19,049	2.39	148%	93%

F42ILL with LED024-FIXT	166,543	20.93	100%	101.9%
F43ILL with LED036-FIXT	78,135	9.82	100%	101%
CFM42/1-L with LED020-FIXT	1,986	0.25	100%	100%
CFT40/2-L with LED030-FIXT	8,021	1	100%	100%
CFM42/1-L with LED010-FIXT	9,625	1.21	100%	100%
CFM42/1-L with LED009-FIXT	1,766	0.22	100%	100%
F44ILL with LED048-FIXT	12,222	1.54	100%	100%
MH400/1 with LED140-FIXT	11,955	1.50	100%	100%
MH250/1 with LED070-FIXT	18,734	2.35	100%	100%
Total:	**530,195**	**66.63**	**114%**	**92.08%**

Project Number CIP 353

Program Large C&I

Project Background

The participant is a hotel that received incentives from Entergy New Orleans for retrofitting energy efficient lighting. The Evaluators verified that the following had been installed:

- (395) H65/1 with (395) LED009-FIXT
- (159) F44ILL with (159) LED048-FIXT
- (682) F42ILL with (682) LED024-FIXT
- (102) F82ILL with (102) LED048-FIXT
- (3) F42ILL with (3) LED012-FIXT
- (93) H60/1 with (93) LED009-FIXT
- (9) FU2ILL with (9) LED030-FIXT
- (1) F41ILL with (1) LED012-FIXT
- (9) F41ILL with (9) LED009-FIXT
- (2) CFM26/1-L with (2) LED006-FIXT
- (57) CFM26/2-L with (57) LED010-FIXT
- (1) MH250/1 with (1) LED045-FIXT
- (10) CFM26/2-L with (10) LED030-FIXT
- (2) MH250/1 with (2) LED060-FIXT
- (20) MH400/1 with (20) LED200-FIXT
- (2) MH400/1 with (2) LED090-FIXT

Calculation Parameters

The Evaluators confirmed installation of all fixtures listed in the project application. Savings for the measures were calculated using prescriptive savings values listed in Section 10.2.2, which are based on the New Orleans TRM 4.0. The specific values used in calculating savings for this site are presented in the table below.

Table A. Prescriptive Savings and kW Reductions

Prescriptive Measure	*Per-Unit kWh Savings*	*Per-Unit kW Reduction*
H65/1 with LED009-FIXT	412.18	0.07
F44ILL with LED048-FIXT	348.82	0.07

F42ILL with LED024-FIXT	257.53	0.03
F82ILL with LED048-FIXT	395.51	0.06
F42ILL with LED012-FIXT	331.86	0.05
H60/1 with LED009-FIXT	402.23	0.06
FU2ILL with LED030-FIXT	221.03	0.03
F41ILL with LED012-FIXT	79.933	0.02
F41ILL with LED009-FIXT	125.94	0.02
CFM26/1-L with LED006-FIXT	201.48	0.02
CFM26/2-L with LED010-FIXT	293.05	0.05
MH250/1 with LED045-FIXT	2128.7	0.00
CFM26/2-L with LED030-FIXT	183.96	0.00
MH250/1 with LED060-FIXT	1997.3	0.23
MH400/1 with LED200-FIXT	2216.3	0.25
MH400/1 with LED090-FIXT	1527.1	0.28

Savings Calculations

Using values from the table above, the Evaluators calculated lighting savings as follows:

Table B. Lighting Retrofit kWh Savings Calculations

Prescriptive Measure	*Measure Quantity*	*Per-Unit kWh Savings*	*Expected kWh Savings*	*Realized kWh Savings*	*kWh Realization Rate*
H65/1 with LED009-FIXT	395	412.18	162,809.3	168,581	103.55%
F44ILL with LED048-FIXT	159	348.82	55,461.9	45,673	82.35%
F42ILL with LED024-FIXT	682	257.53	175,637.4	176,720	100.62%

F82ILL with LED048-FIXT	102	395.51	40,341.9	48,196	119.47%
F42ILL with LED012-FIXT	3	331.86	995.6	1,052	105.67%
H60/1 with LED009-FIXT	93	402.23	37,407.4	36,147	96.63%
FU2ILL with LED030-FIXT	9	221.03	1,989.3	1,989	99.99%
F41ILL with LED012-FIXT	1	79.933	79.9	70	87.57%
F41ILL with LED009-FIXT	9	125.94	1,133.4	1,509	133.14%
CFM26/1-L with LED006-FIXT	2	201.48	403.0	351	87.11%
CFM26/2-L with LED010-FIXT	57	293.05	16,703.9	6,852	41.02%
MH250/1 with LED045-FIXT	1	2128.7	2,128.7	1,852	87.00%
CFM26/2-L with LED030-FIXT	10	183.96	1,839.6	1,600	86.98%
MH250/1 with LED060-FIXT	2	1997.3	3,994.6	3,475	86.99%
MH400/1 with LED200-FIXT	20	2216.3	44,325.6	38,563	87.00%
MH400/1 with LED090-FIXT	2	1527.1	3,054.3	5,533	181.16%
		Total:	**548,305.7**	**541,128**	**98.69%**

Table C. Lighting Retrofit kW Reduction Calculations

Prescriptive Measure	*Measure Quantity*	*Per-Unit kW Reduction*	*Expected kW Reduction*	*Realized kW Reduction*	*kW Realization Rate*
H65/1 with LED009-FIXT	395	0.07	25.9632	26.54	102.22%
F44ILL with LED048-FIXT	159	0.07	9.9052	9.00	90.86%
F42ILL with LED024-FIXT	682	0.03	23.2341	19.20	82.64%
F82ILL with LED048-FIXT	102	0.06	5.8095	5.50	94.67%
F42ILL with LED012-FIXT	3	0.05	0.1345	0.17	126.39%

H60/1 with LED009-FIXT	93	0.06	5.4947	5.69	103.55%
FU2ILL with LED030-FIXT	9	0.03	0.2535	0.26	102.58%
F41ILL with LED012-FIXT	1	0.02	0.0146	0.02	136.71%
F41ILL with LED009-FIXT	9	0.02	0.1903	0.24	126.12%
CFM26/1-L with LED006-FIXT	2	0.02	0.0460	0.06	130.43%
CFM26/2-L with LED010-FIXT	57	0.05	2.5748	1.90	73.79%
MH250/1 with LED045-FIXT	1	0.00	0.0000	0.29	0%
CFM26/2-L with LED030-FIXT	10	0.00	0.0000	0.25	0%
MH250/1 with LED060-FIXT	2	0.23	0.4560	0.55	120.61%
MH400/1 with LED200-FIXT	20	0.25	5.0600	4.69	92.69%
MH400/1 with LED090-FIXT	2	0.28	0.5590	0.45	80.50%
		Total:	**79.69**	**74.61**	**93.61%**

Results

The kWh and kW realization rates for project CIP-353 are 98.69% and 93.61%.

Table D. Verified Gross Savings & Realization Rates

Measure	*Verified*			
	kWh Savings	*kW Savings*	*kWh Realization Rate*	*kW Realization Rate*
H65/1 with LED009-FIXT	168,581	26.54	103.55%	102.22%
F44ILL with LED048-FIXT	45,673	9.00	82.35%	90.86%
F42ILL with LED024-FIXT	176,720	19.20	100.62%	82.64%
F82ILL with LED048-FIXT	48,196	5.50	119.47%	94.67%
F42ILL with LED012-FIXT	1,052	0.17	105.67%	126.39%

H60/1 with LED009-FIXT	36,147	5.69	96.63%	103.55%
FU2ILL with LED030-FIXT	1,989	0.26	99.99%	102.58%
F41ILL with LED012-FIXT	70	0.02	87.57%	136.71%
F41ILL with LED009-FIXT	1,509	0.24	133.14%	126.12%
CFM26/1-L with LED006-FIXT	351	0.06	87.11%	130.43%
CFM26/2-L with LED010-FIXT	6,852	1.90	41.02%	73.79%
MH250/1 with LED045-FIXT	1,852	0.29	87.00%	0%
CFM26/2-L with LED030-FIXT	1,600	0.25	86.98%	0%
MH250/1 with LED060-FIXT	3,475	0.55	86.99%	120.61%
MH400/1 with LED200-FIXT	38,563	4.69	87.00%	92.69%
MH400/1 with LED090-FIXT	5,533	0.45	181.16%	80.50%
Total:	**541,128**	**74.61**	**98.69%**	**93.61%**

Project Number CIP 357

Program Large C&I

Project Background

The participant is an exterior area that received incentives from Entergy New Orleans for retrofitting energy efficient lighting. The Evaluators verified that the following had been installed:

- MH1000/1 with LED280-FIXT
- MH400/1 with LED280-FIXT
- MH400/1 with LED135-FIXT
- F42ILL with LED028-FIXT

Calculation Parameters

The Evaluators confirmed installation of all fixtures listed in the project application. Savings for the measures were calculated using prescriptive savings values listed in Section 10.2.2, which are based on the New Orleans TRM 4.0. The specific values used in calculating savings for this site are presented in the table below.

Table A. Prescriptive Savings and kW Reductions

Prescriptive Measure	*Per-Unit kWh Savings*	*Per-Unit kW Reduction*
MH1000/1 with LED280-FIXT	6990.48	0.80
MH400/1 with LED280-FIXT	1515.50	0.17
MH400/1 with LED135-FIXT	2785.68	0.32
F42ILL with LED028-FIXT	262.80	0.03

Savings Calculations

Using values from the table above, the Evaluators calculated lighting savings as follows:

Table B. Lighting Retrofit kWh Savings Calculations

Prescriptive Measure	*Measure Quantity*	*Per-Unit kWh Savings*	*Expected kWh Savings*	*Realized kWh Savings*	*kWh Realization Rate*
MH1000/1 with LED280-FIXT	29	6990.48	202,723.90	202724	100.00%
MH400/1 with LED280-FIXT	2	1515.50	3,031.00	3031	100.00%
MH400/1 with LED135-FIXT	8	2785.68	22,285.40	22285	100.00%
F42ILL with LED028-FIXT	34	262.80	8,935.20	8935	100.00%
		Total:	**236,975.5**	**236,975**	**100.00%**

Table C. Lighting Retrofit kW Reduction Calculations

Prescriptive Measure	*Measure Quantity*	*Per-Unit kW Reduction*	*Expected kW Reduction*	*Realized kW Reduction*	*kW Realization Rate*
MH1000/1 with LED280-FIXT	29	0.80	23.14	23.14	100.00%
MH400/1 with LED280-FIXT	2	0.17	0.34	0.35	101.16%
MH400/1 with LED135-FIXT	8	0.32	2.54	2.54	100.00%
F42ILL with LED028-FIXT	34	0.03	1.02	1.02	100.00%
		Total:	**27.05**	**27.05**	**100%**

Results

The kWh and kW realization rates for project CIP 357 are 100.0%.

Table D. Verified Gross Savings & Realization Rates

Measure	*Verified*			
	kWh Savings	*kW Savings*	*kWh Realization Rate*	*kW Realization Rate*

MH1000/1 with LED280-FIXT	202724	23.14	100.00%	100.00%
MH400/1 with LED280-FIXT	3031	0.35	100.00%	101.16%
MH400/1 with LED135-FIXT	22285	2.54	100.00%	100.00%
F42ILL with LED028-FIXT	8935	1.02	100.00%	100.00%
Total:	**236,975**	**27.05**	**100.00%**	**100%**

Project Number CIP 360

Program Large C&I

Project Background

The participant is a hotel that received incentives from Entergy New Orleans for retrofitting energy efficient lighting. The Evaluators verified that the following had been installed:

- F42ILL with LED024-FIXT
- F43ILL with LED036-FIXT
- H60/1 with LED009-FIXT
- FU2ILL with LED030-FIXT
- F44ILL with LED048-FIXT
- F23ILL with LED045-FIXT
- F41ILL with LED012-FIXT
- F22ILL with LED030-FIXT
- F21ILL with LED015-FIXT
- CFT13/2 with LED012-FIXT
- F46ILL/2 with LED060-FIXT
- CFM26/1-L with LED006-FIXT

Calculation Parameters

The Evaluators confirmed installation of all fixtures listed in the project application. Savings for the measures were calculated using prescriptive savings values listed in Section 10.2.2, which are based on the New Orleans TRM 4.0. The specific values used in calculating savings for this site are presented in the table below.

Table A. Prescriptive Savings and kW Reductions

Prescriptive Measure	*Per-Unit kWh Savings*	*Per-Unit kW Reduction*
F42ILL with LED024-FIXT	263.87	0.04
F43ILL with LED036-FIXT	373.44	0.06
H60/1 with LED009-FIXT	415.69	0.06
FU2ILL with LED030-FIXT	188.56	0.03
F44ILL with LED048-FIXT	126.63	0.02
F23ILL with LED045-FIXT	15.24	0.00
F41ILL with LED012-FIXT	144.80	0.02
F22ILL with LED030-FIXT	22.76	0.00
F21ILL with LED015-FIXT	22.90	0.00
CFT13/2 with LED012-FIXT	144.81	0.02
F46ILL/2 with LED060-FIXT	838.30	0.13
CFM26/1-L with LED006-FIXT	175.29	0.03

Savings Calculations

Using values from the table above, the Evaluators calculated lighting savings as follows:

Table B. Lighting Retrofit kWh Savings Calculations

Prescriptive Measure	*Measure Quantity*	*Per-Unit kWh Savings*	*Expected kWh Savings*	*Realized kWh Savings*	*kWh Realization Rate*
F42ILL with LED024-FIXT	758	263.87	200,010.00	196414	98.20%
F43ILL with LED036-FIXT	117	373.44	43,692.30	43692	100.00%
H60/1 with LED009-FIXT	44	415.69	18,290.40	17102	93.50%

FU2ILL with LED030-FIXT	14	188.56	2,639.90	3094	117.20%
F44ILL with LED048-FIXT	26	126.63	3,292.40	7682	233.33%
F23ILL with LED045-FIXT	20	15.24	304.80	305	100.07%
F41ILL with LED012-FIXT	9	144.80	1,303.20	1303	99.98%
F22ILL with LED030-FIXT	94	22.76	2,139.80	2149	100.43%
F21ILL with LED015-FIXT	1	22.90	22.90	23	100.44%
CFT13/2 with LED012-FIXT	18	144.81	2,606.50	2606	99.98%
F46ILL/2 with LED060-FIXT	1	838.30	838.30	838	99.96%
CFM26/1-L with LED006-FIXT	8	175.29	1,402.30	1402	99.98%
		Total:	**276,542.80**	**276,610**	**100.02%**

Table C. Lighting Retrofit kW Reduction Calculations

Prescriptive Measure	*Measure Quantity*	*Per-Unit kW Reduction*	*Expected kW Reduction*	*Realized kW Reduction*	*kW Realization Rate*
F42ILL with LED024-FIXT	758	0.04	30.6888	27.10	88.31%
F43ILL with LED036-FIXT	117	0.06	6.8796	6.88	100.01%
H60/1 with LED009-FIXT	44	0.06	2.7107	2.69	99.24%
FU2ILL with LED030-FIXT	14	0.03	0.4472	0.49	109.57%
F44ILL with LED048-FIXT	26	0.02	0.5184	1.20	231.48%
F23ILL with LED045-FIXT	20	0.00	0.048	0.05	104.17%
F41ILL with LED012-FIXT	9	0.02	0.2052	0.21	102.34%
F22ILL with LED030-FIXT	94	0.00	0.3376	0.34	100.71%
F21ILL with LED015-FIXT	1	0.00	0.0036	0.00	0.00%
CFT13/2 with LED012-FIXT	18	0.02	0.4104	0.41	99.90%

F46ILL/2 with LED060-FIXT	1	0.13	0.132	0.13	98.48%
CFM26/1-L with LED006-FIXT	8	0.03	0.2208	0.22	99.64%
		Total:	**42.60**	**39.72**	**93.23%**

Results

The kWh and kW realization rates for project CIP 360 are 100% and 93%.

Table D. Verified Gross Savings & Realization Rates

Measure	*Verified*			
	kWh Savings	*kW Savings*	*kWh Realization Rate*	*kW Realization Rate*
F42ILL with LED024-FIXT	196414	27.10	98.20%	88.31%
F43ILL with LED036-FIXT	43692	6.88	100.00%	100.01%
H60/1 with LED009-FIXT	17102	2.69	93.50%	99.24%
FU2ILL with LED030-FIXT	3094	0.49	117.20%	109.57%
F44ILL with LED048-FIXT	7682	1.20	233.33%	231.48%
F23ILL with LED045-FIXT	305	0.05	100.07%	104.17%
F41ILL with LED012-FIXT	1303	0.21	99.98%	102.34%
F22ILL with LED030-FIXT	2149	0.34	100.43%	100.71%
F21ILL with LED015-FIXT	23	0.00	100.44%	0.00%
CFT13/2 with LED012-FIXT	2606	0.41	99.98%	99.90%
F46ILL/2 with LED060-FIXT	838	0.13	99.96%	98.48%
CFM26/1-L with LED006-FIXT	1402	0.22	99.98%	99.64%
Total:	**276,610**	**39.72**	**100.02%**	**93.23%**

Project Number CIP 372

Program Large C&I

Project Background

The participant is a manufacturing facility that received incentives from Entergy New Orleans for retrofitting energy efficient lighting. The Evaluators verified that the following had been installed:

- (51) High Intensity Discharge (HID) [251 to 400W] with (51) LED Lamp/Fixture
- (8) Exterior HID 251 W to 400 W with (8) LED Lamp/Fixture
- (12) F46ILL/2 with (12) LED031-FIXT
- (120) F44ILL with (120) LED039-FIXT

Calculation Parameters

The Evaluators confirmed installation of all fixtures listed in the project application. Savings for the measures were calculated using prescriptive savings values listed in Section 10.2.2, which are based on the New Orleans TRM 4.0. The specific values used in calculating savings for this site are presented in the table below.

Table A. Prescriptive Savings and kW Reductions

Prescriptive Measure	*Per-Unit kWh Savings*	*Per-Unit kW Reduction*
High Intensity Discharge (HID) [251 to 400W] with LED Lamp/Fixture	1,373.45	0.24
Exterior HID 251 W to 400 W with LED Lamp/Fixture	829.25	-
F46ILL/2 with LED031-FIXT	716.34	0.128
F44ILL with LED039-FIXT	376.2	0.067

Savings Calculations

Using values from the table above, the Evaluators calculated lighting savings as follows:

Table B. Lighting Retrofit kWh Savings Calculations

Prescriptive Measure	*Measure Quantity*	*Per-Unit kWh Savings*	*Expected kWh Savings*	*Realized kWh Savings*	*kWh Realization Rate*
High Intensity Discharge (HID) [251 to 400W] with LED Lamp/Fixture	51	1,373.45	70,046.2	38,562	55.1%
Exterior HID 251 W to 400 W with LED Lamp/Fixture	8	829.25	6,634	6,634	100%
F46ILL/2 with LED031-FIXT	12	716.34	8,596.1	8,596	100%
F44ILL with LED039-FIXT	120	376.2	45,144.8	45,145	100%
		Total:	**130,421**	**98,937**	**75.9%**

Table C. Lighting Retrofit kW Reduction Calculations

Prescriptive Measure	*Measure Quantity*	*Per-Unit kW Reduction*	*Expected kW Reduction*	*Realized kW Reduction*	*kW Realization Rate*
High Intensity Discharge (HID) [251 to 400W] with LED Lamp/Fixture	51	0.24	12.3248	13.52	109.7%
Exterior HID 251 W to 400 W with LED Lamp/Fixture	8	-	-	-	-
F46ILL/2 with LED031-FIXT	12	0.128	1.5412	1.54	99.9%
F44ILL with LED039-FIXT	120	0.067	8.0942	8.09	99.9%
		Total:	**21.96**	**23.15**	**105.4%**

Results

The kWh and kW realization rates for project CIP-372 are 75.9% and 105.4%.

Table D. Verified Gross Savings & Realization Rates

Measure	*Verified*			
	kWh Savings	*kW Savings*	*kWh Realization Rate*	*kW Realization Rate*
High Intensity Discharge (HID) [251 to 400W] with LED Lamp/Fixture	38,562	13.52	55.1%	109.7%
Exterior HID 251 W to 400 W with LED Lamp/Fixture	6,634	-	100%	-
F46ILL/2 with LED031-FIXT	8,596	1.54	100%	99.9%
F44ILL with LED039-FIXT	45,145	8.09	100%	99.9%
Total:	**98,937**	**23.15**	**75.9%**	**105.4%**

Project Number CIP 374

Program Large C&I

Project Background

The participant is an exterior area that received incentives from Entergy New Orleans for retrofitting energy efficient lighting. The Evaluators verified that the following had been installed:

- MH1000/1 with LED500-FIXT

Calculation Parameters

The Evaluators confirmed installation of all fixtures listed in the project application. Savings for the measures were calculated using prescriptive savings values listed in Section 10.2.2, which are based on the New Orleans TRM 4.0. The specific values used in calculating savings for this site are presented in the table below.

Table A. Prescriptive Savings and kW Reductions

Prescriptive Measure	*Per-Unit kWh Savings*	*Per-Unit kW Reduction*
MH1000/1 with LED500-FIXT	781.45	0.00

Savings Calculations

Using values from the table above, the Evaluators calculated lighting savings as follows:

Table B. Lighting Retrofit kWh Savings Calculations

Prescriptive Measure	*Measure Quantity*	*Per-Unit kWh Savings*	*Expected kWh Savings*	*Realized kWh Savings*	*kWh Realization Rate*
MH1000/1 with LED500-FIXT	40	781.45	31,258.20	31,258.20	100%
		Total:	**31,258.20**	**31,258.20**	**100%**

Results

The kWh realization rate for project CIP 374 is 100.0%.

Table D. Verified Gross Savings & Realization Rates

Measure	*Verified*	
	kWh Savings	*kWh Realization Rate*
MH1000/1 with LED500-FIXT	31,258.20	100%
Total:	**31,258.20**	**100%**

Project Number CIP 375

Program Large C&I

Project Background

The participant is a health care facility that received incentives from Entergy New Orleans for retrofitting energy efficient lighting. The Evaluators verified that the following had been installed:

Calculation Parameters

The Evaluators confirmed installation of all fixtures listed in the project application. Savings for the measures were calculated using prescriptive savings values listed in Section 10.2.2, which are based on the New Orleans TRM 3.0. The specific values used in calculating savings for this site are presented in the table below.

Table A. Prescriptive Savings and kW Reductions

Prescriptive Measure	*Per-Unit kWh Savings*	*Per-Unit kW Reduction*
Exterior HID <175 W with LED Lamp/Fixture	546.47	0.00
T8/T12 4ft Linear Fluorescent with 4' Linear LED	315.37	0.04
CFQ13/2 with LED011-FIXT	171.51	0.02
F42ILL with LED024-FIXT	297.84	0.03
CFQ26/2-L with LED030-FIXT	65.70	0.00
CFQ26/1-L with LED010-FIXT	148.92	0.017
H20/1 with LED012-FIXT	70.08	0.01
F41ILL with LED015-FIXT	140.16	0.02
F21ILL with LED015-FIXT	26.27	0.00
F31ILL with LED015-FIXT	96.36	0.01
MH100/1 with LED045-FIXT	692.04	0.08
CFM70/1-L with LED045-FIXT	884.76	0.10
LED054-FIXT with LED045-FIXT	78.84	0.01
MH400/1 with LED140-FIXT	2741.88	0.31
F21GPL-H with LED010-FIXT	70.08	0.01
F41GNLL-R with LED015-FIXT	52.56	0.01

Savings Calculations

Using values from the table above, the Evaluators calculated lighting savings as follows:

Table B. Lighting Retrofit kWh Savings Calculations

Prescriptive Measure	*Measure Quantity*	*Per-Unit kWh Savings*	*Expected kWh Savings*	*Realized kWh Savings*	*kWh Realization Rate*
Exterior HID <175 W with LED Lamp/Fixture	64	546.47	34,947.0	30835.2	88%
T8/T12 4ft Linear Fluorescent with 4' Linear LED	48	315.37	15,137.7	5886.72	38%
CFQ13/2 with LED011-FIXT	221	171.51	37,904.5	38719.2	102%
F42ILL with LED024-FIXT	9	297.84	2,680.6	2680.56	1
CFQ26/2-L with LED030-FIXT	4	65.70	262.8	700.8	266%
CFQ26/1-L with LED010-FIXT	40	148.92	5,956.8	5956.8	100%
H20/1 with LED012-FIXT	27	70.08	1,892.2	1892.16	100%
F41ILL with LED015-FIXT	51	140.16	7,148.2	7148.16	100%
F21ILL with LED015-FIXT	18	26.27	473.0	473.04	100%
F31ILL with LED015-FIXT	30	96.36	2,890.8	2890.8	100%
MH100/1 with LED045-FIXT	421	692.04	291,348.8	291348.8	100%
CFM70/1-L with LED045-FIXT	139	884.76	122,981.6	34093.92	100%
LED054-FIXT with LED045-FIXT	13	78.84	1,024.9	1024.92	27%
MH400/1 with LED140-FIXT	53	2741.88	145,319.6	145319.6	100%
F21GPL-H with LED010-FIXT	15	70.08	1,051.2	1051.2	100%
F41GNLL-R with LED015-FIXT	15	52.56	788.4	788.4	100%
		Total	**671,808**	**652,821**	**97.17%**

Table C. Lighting Retrofit kW Reduction Calculations

Prescriptive Measure	*Measure Quantity*	*Per-Unit kW Reduction*	*Expected kW Reduction*	*Realized kW Reduction*	*kW Realization Rate*
Exterior HID <175 W with LED Lamp/Fixture	64	0.00	0.0000	3.52	0
T8/T12 4ft Linear Fluorescent with 4' Linear LED	48	0.04	1.9830	0.67	33%
CFQ13/2 with LED011-FIXT	221	0.02	4.3270	4.42	0
F42ILL with LED024-FIXT	9	0.03	0.3060	0.31	102%
CFQ26/2-L with LED030-FIXT	4	0.00	0.0000	0.08	101%
CFQ26/1-L with LED010-FIXT	40	0.017	0.6800	0.68	0
H20/1 with LED012-FIXT	27	0.01	0.2160	0.22	100%
F41ILL with LED015-FIXT	51	0.02	0.8160	0.82	101%
F21ILL with LED015-FIXT	18	0.00	0.0540	0.05	100%
F31ILL with LED015-FIXT	30	0.01	0.3300	0.33	92%
MH100/1 with LED045-FIXT	421	0.08	33.2590	33.26	100%
CFM70/1-L with LED045-FIXT	139	0.10	14.0390	3.89	100%
LED054-FIXT with LED045-FIXT	13	0.01	0.1170	0.12	27%
MH400/1 with LED140-FIXT	53	0.31	16.5890	16.59	102%
F21GPL-H with LED010-FIXT	15	0.01	0.1200	0.12	100%
F41GNLL-R with LED015-FIXT	15	0.01	0.0900	0.09	100%
		Total:	**72.92**	**74.54**	**102.21%**

Results

The kWh and kW realization rates for project CIP 375 are 97.17% and 100.0%.

Table D. Verified Gross Savings & Realization Rates

Measure	Verified			
	kWh Savings	kW Savings	kWh Realization Rate	kW Realization Rate
Exterior HID <175 W with LED Lamp/Fixture	30835.2	3.52	88%	0
T8/T12 4ft Linear Fluorescent with 4' Linear LED	5886.72	0.67	38%	33%
CFQ13/2 with LED011-FIXT	38719.2	4.42	102%	0
F42ILL with LED024-FIXT	2680.56	0.31	1	102%
CFQ26/2-L with LED030-FIXT	700.8	0.08	266%	101%
CFQ26/1-L with LED010-FIXT	5956.8	0.68	100%	0
H20/1 with LED012-FIXT	1892.16	0.22	100%	100%
F41ILL with LED015-FIXT	7148.16	0.82	100%	101%
F21ILL with LED015-FIXT	473.04	0.05	100%	100%
F31ILL with LED015-FIXT	2890.8	0.33	100%	92%
MH100/1 with LED045-FIXT	291348.8	33.26	100%	100%
CFM70/1-L with LED045-FIXT	34093.92	3.89	100%	100%
LED054-FIXT with LED045-FIXT	1024.92	0.12	27%	27%
MH400/1 with LED140-FIXT	145319.6	16.59	100%	102%
F21GPL-H with LED010-FIXT	1051.2	0.12	100%	100%
F41GNLL-R with LED015-FIXT	788.4	0.09	100%	100%
Total:	**652,821**	**74.54**	**97.17%**	**102.21%**

Project Number PN9-012

Program Publicly Funded Institutions

Project Background

The participant is a large office building that received incentives from Entergy New Orleans for a retro commissioning study.

Calculation Parameters

Savings calculations were performed using an energy simulation model and

billing data and the following algorithms:

$$kWh_{Savings} = kWh_{pre} - kWh_{post}$$

A billing regression simulation was used to calculate savings following a IPMVP Option C (Whole Facility) process.

Savings Calculations

Table A, kWh Usage Results

System	*Baseline kWh*	*Optimal kWh*	*Savings*	*Percentage Savings*
Whole Facility	1,769,772	1,571,483	1,197,786	68%

Billing data from the pre and post periods were collected, and regression was used to find the best fit lines for the pre and post periods. The Equations found through regression were then applied to the same set of test weather data appropriate for the region. The difference between the performance was taken as the savings.

Table B, kWh Saving Calculations

Measure	*Pre kWh Usage*	*Post kWh Usage*	*Model kWh Savings*	Model kW Savings	*Expected kWh Savings*	*Expected kW Savings*
Whole Facility	1,769,000	1,197,786.89	898,389	102.56	1,769,000	122.00

Results

The kWh realization rate for project PN9-010 is 68%, and 112% for peak demand savings. The modeled and realized kWh savings are less than the provided energy model, because the data used for the modeling lacks winter months. Additional months of billing data were added to the post period so the analysis could evaluate the effectiveness of the upgrades.

Table C, Verified Gross Savings & Realization Rates

Measure	*Verified*			
	kWh Savings	*kW Savings*	*kWh Realization Rate*	*kW Realization Rate*
Whole Facility	1,197,786.89	136.73	68%	112%
Total	**1,197,786.89**	**136.73**	**68%**	**112%**

Project Number CIP 191

Program Publicly Funded Institution

Project Background

The participant is a school that received incentives from Entergy New Orleans for retrofitting energy efficient lighting indoors and outdoors. The Evaluators verified that the following had been installed:

- F17T8 to LED36W
- F32T8 to LED30W
- F17T8 to LED40W

Calculation Parameters

Savings calculations were performed using savings methodology described in section D.6.3 Commercial Lighting Efficiency of the New Orleans TRM 4.0. Deemed savings parameters applicable to this site are shown below:

Table A, Savings Parameters

Building Type	Heating Type	Annual Hours	IEF_E	IEF_D	CF
Education: K-12	Gas	2,333	1.09	1.20	0.47
Education: K-12	Gas	2,333	1.09	1.20	0.47

Savings Calculations

Table B, Lighting Retrofit kWh Savings Calculations

Measure	Quantity (Fixtures)		Wattage		Annual Operating Hours	Expected kWh Savings	Realized kWh Savings	IEF_E	Realization Rate
	Base	Post	Base	Post					
F17T8 to LED36W	220	110	33	36	2,333	6,402	8,392	1.09	131.1%
F32T8 to LED30W	54	27	31	30	2,333	3,137	2,197	1.09	70.0%
F17T8 to LED40W	28	14	33	40	2,333	1,627	926	1.09	56.9%
					Total	**11,166**	**11,515**		**103.1%**

Table C, Lighting Retrofit kW Reduction Calculations

Measure	Quantity (Fixtures)	Wattage	CF			IEF_D	

	Base	*Post*	*Base*	*Post*		*Expected kW Savings*	*Realized kW Savings*		*Realization Rate*
F17T8 to LED36W	220	110	33	36	0.47	1.10	1.86	1.20	169.1%
F32T8 to LED30W	54	27	31	30	0.47	0.54	0.49	1.20	90.7%
F17T8 to LED40W	28	14	33	40	0.47	0.28	0.21	1.20	75.0%
					Total	**1.32**	**2.56**		**133.3%**

Results

The kWh and kW realization rates for project LN8-083 are 100%.

Table D, Verified Gross Savings & Realization Rates

Measure	*Verified*			
	kWh Savings	*kW Savings*	*kWh Realization Rate*	*kW Realization Rate*
F17T8 to LED36W	8,392	1.86	131.1%	169.1%
F32T8 to LED30W	2,197	0.49	70.0%	90.7%
F17T8 to LED40W	926	0.21	56.9%	75.0%
Total	**11,515**	**2.56**	**103.1%**	**133.3%**

Project Number CIP 198

Program Publicly Funded Institution

Project Background

The participant is a university that received incentives from Entergy New Orleans for retrofitting energy efficient lighting indoors and outdoors. The Evaluators verified that the following had been installed:

- F32T8-28W to LED15W
- F32T8-28W to LED15W
- F32T8-28W to LED15W
- F32T8-28W to LED15W
- F32T8-28W to LED15W
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- F32T8-28W to LED15W
- F32T8 to LED45W
- F32T8 to LED30W
- F32T8 to LED60W
- F32T8 to LED45W
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- F32T8 to LED60W
- F32T8 to LED60W
- F32T8 to LED45W
- F32T8 to LED30W
- F32T8 to LED60W
- F32T8 to LED60W

Calculation Parameters

Savings calculations were performed using savings methodology described in section D.6.3 Commercial Lighting Efficiency of the New Orleans TRM 4.0. Deemed savings parameters applicable to this site are shown below:

Table A, Savings Parameters

Building Type	*Heating Type*	*Annual Hours*	*IEF_E*	*IEF_D*	*CF*
Education: College/University	HP	3,577	1.02	1.20	0.69
Education: College/University	HP	3,577	1.02	1.20	0.69
Education: College/University	HP	3,577	1.02	1.20	0.69

Savings Calculations

Table B, Lighting Retrofit kWh Savings Calculations

Measure	*Quantity (Fixtures)*		*Wattage*		*Annual Operating Hours*	*Expected kWh Savings*	*Realized kWh Savings*	*IEF_E*	*Realization Rate*
	Base	*Post*	*Base*	*Post*					
F32T8-28W to LED15W	139	139	27	15	3,577	8,076	6,086	1.02	75.4%
F32T8-28W to LED15W	132	132	27	15	3,577	7,669	5,779	1.02	75.4%

F32T8-28W to LED15W	274	274	27	15	3,577	15,919	11,996	1.02	75.4%
F32T8-28W to LED15W	259	259	27	15	3,577	15,048	11,340	1.02	75.4%
F32T8-28W to LED15W	50	50	27	15	3,577	2,905	2,189	1.02	75.4%
F32T8-28W to LED15W	401	401	27	15	3,577	23,298	17,557	1.02	75.4%
F32T8-28W to LED15W	48	48	27	15	3,577	2,789	2,102	1.02	75.4%
F32T8-28W to LED15W	272	272	27	15	3,577	15,803	11,909	1.02	75.4%
F32T8-28W to LED15W	40	40	27	15	3,577	2,324	1,751	1.02	75.3%
F32T8-28W to LED15W	484	484	27	15	3,577	28,120	21,191	1.02	75.4%
F32T8-28W to LED15W	416	416	27	15	3,577	24,170	18,214	1.02	75.4%
F32T8-28W to LED15W	196	196	27	15	3,577	11,388	8,581	1.02	75.4%
F32T8-28W to LED15W	38	38	27	15	3,577	2,208	1,664	1.02	75.4%
F32T8-28W to LED15W	427	427	27	15	3,577	24,809	18,695	1.02	75.4%
F32T8-28W to LED15W	488	488	27	15	3,577	28,353	21,366	1.02	75.4%
F32T8-28W to LED15W	332	332	27	15	3,577	19,289	14,536	1.02	75.4%
F32T8-28W to LED15W	38	38	27	15	3,577	2,208	1,664	1.02	75.4%
F32T8-28W to LED15W	369	369	27	15	3,577	21,439	16,156	1.02	75.4%
F32T8-28W to LED15W	408	408	27	15	3,577	23,705	17,863	1.02	75.4%
F32T8 to LED45W	35	35	93	45	3,577	15,011	6,130	1.02	40.8%
F32T8 to LED30W	23	23	60	30	3,577	6,165	2,517	1.02	40.8%
F32T8 to LED60W	14	14	118	60	3,577	7,255	2,963	1.02	40.8%
F32T8 to LED45W	63	63	93	45	3,577	2,702	11,033	1.02	408.3%
F32T8 to LED30W	9	9	60	30	3,577	2,413	985	1.02	40.8%
F32T8 to LED60W	5	5	118	60	3,577	2,591	1,058	1.02	40.8%
F32T8 to LED60W	39	39	118	60	3,577	20,211	8,253	1.02	40.8%
F32T8 to LED45W	40	40	93	45	3,577	17,156	7,005	1.02	40.8%

F32T8 to LED30W	5	5	60	30	3,577	1,340	547	1.02	40.8%
F32T8 to LED60W	32	32	118	60	3,577	16,584	6,772	1.02	40.8%
F32T8 to LED60W	7	7	118	60	3,577	3,628	1,481	1.02	40.8%
F32T8 to LED45W	40	40	93	45	3,577	17,156	7,005	1.02	40.8%
F32T8 to LED30W	5	5	60	30	3,577	1,340	547	1.02	40.8%
F32T8 to LED60W	31	31	118	60	3,577	16,066	6,560	1.02	40.8%
F32T8 to LED60W	3	3	118	60	3,577	1,555	635	1.02	40.8%
F32T8 to LED45W	40	40	93	45	3,577	17,156	7,005	1.02	40.8%
F32T8 to LED30W	5	5	60	30	3,577	1,340	547	1.02	40.8%
F32T8 to LED60W	23	23	118	60	3,577	11,920	4,867	1.02	40.8%
F32T8 to LED60W	9	9	118	60	3,577	4,664	1,905	1.02	40.8%
F32T8 to LED45W	34	34	93	45	3,577	14,582	5,954	1.02	40.8%
F32T8 to LED30W	15	15	60	30	3,577	4,021	1,642	1.02	40.8%
F32T8 to LED60W	27	27	118	60	3,577	13,993	5,714	1.02	40.8%
F32T8 to LED60W	7	7	118	60	3,577	3,628	1,481	1.02	40.8%
F32T8 to LED45W	38	38	93	45	3,577	16,298	6,655	1.02	40.8%
F32T8 to LED30W	6	6	60	30	3,577	1,608	657	1.02	40.9%
F32T8 to LED60W	35	35	118	60	3,577	18,139	7,407	1.02	40.8%
F32T8 to LED60W	5	5	118	60	3,577	2,591	1,058	1.02	40.8%
					Total	**520,633**	**319,022**		**61.3%**

Table C, Lighting Retrofit kW Reduction Calculations

Measure	***Quantity (Fixtures)***		***Wattage***		***CF***	***Expected kW Savings***	***Realized kW Savings***	***IEF$_D$***	***Realization Rate***
	Base	***Post***	***Base***	***Post***					

F32T8-28W to LED15W	139	139	27	15	0.69	1.39	1.38	1.20	99.3%
F32T8-28W to LED15W	132	132	27	15	0.69	1.32	1.31	1.20	99.2%
F32T8-28W to LED15W	274	274	27	15	0.69	2.74	2.72	1.20	99.3%
F32T8-28W to LED15W	259	259	27	15	0.69	2.59	2.57	1.20	99.2%
F32T8-28W to LED15W	50	50	27	15	0.69	0.50	0.50	1.20	100.0%
F32T8-28W to LED15W	401	401	27	15	0.69	4.01	3.98	1.20	99.3%
F32T8-28W to LED15W	48	48	27	15	0.69	0.48	0.48	1.20	100.0%
F32T8-28W to LED15W	272	272	27	15	0.69	2.72	2.70	1.20	99.3%
F32T8-28W to LED15W	40	40	27	15	0.69	0.40	0.40	1.20	100.0%
F32T8-28W to LED15W	484	484	27	15	0.69	4.84	4.81	1.20	99.4%
F32T8-28W to LED15W	416	416	27	15	0.69	4.16	4.13	1.20	99.3%
F32T8-28W to LED15W	196	196	27	15	0.69	1.96	1.95	1.20	99.5%
F32T8-28W to LED15W	38	38	27	15	0.69	0.38	0.38	1.20	100.0%
F32T8-28W to LED15W	427	427	27	15	0.69	4.27	4.24	1.20	99.3%
F32T8-28W to LED15W	488	488	27	15	0.69	4.88	4.85	1.20	99.4%

F32T8-28W to LED15W	332	332	27	15	0.69	3.32	3.30	1.20	99.4%
F32T8-28W to LED15W	38	38	27	15	0.69	0.38	0.38	1.20	100.0%
F32T8-28W to LED15W	369	369	27	15	0.69	3.69	3.67	1.20	99.5%
F32T8-28W to LED15W	408	408	27	15	0.69	4.08	4.05	1.20	99.3%
F32T8 to LED45W	35	35	93	45	0.69	2.02	1.39	1.20	68.8%
F32T8 to LED30W	23	23	60	30	0.69	0.83	0.57	1.20	68.7%
F32T8 to LED60W	14	14	118	60	0.69	0.97	0.67	1.20	69.1%
F32T8 to LED45W	63	63	93	45	0.69	3.63	2.50	1.20	68.9%
F32T8 to LED30W	9	9	60	30	0.69	0.32	0.22	1.20	68.8%
F32T8 to LED60W	5	5	118	60	0.69	0.35	0.24	1.20	68.6%
F32T8 to LED60W	39	39	118	60	0.69	2.71	1.87	1.20	69.0%
F32T8 to LED45W	40	40	93	45	0.69	2.30	1.59	1.20	69.1%
F32T8 to LED30W	5	5	60	30	0.69	0.18	0.12	1.20	66.7%
F32T8 to LED60W	32	32	118	60	0.69	2.23	1.54	1.20	69.1%
F32T8 to LED60W	7	7	118	60	0.69	0.49	0.34	1.20	69.4%
F32T8 to LED45W	40	40	93	45	0.69	2.30	1.59	1.20	69.1%
F32T8 to LED30W	5	5	60	30	0.69	0.18	0.12	1.20	66.7%
F32T8 to LED60W	31	31	118	60	0.69	2.16	1.49	1.20	69.0%
F32T8 to LED60W	3	3	118	60	0.69	0.21	0.14	1.20	66.7%
F32T8 to LED45W	40	40	93	45	0.69	2.30	1.59	1.20	69.1%
F32T8 to LED30W	5	5	60	30	0.69	0.18	0.12	1.20	66.7%
F32T8 to LED60W	23	23	118	60	0.69	1.60	1.10	1.20	68.8%
F32T8 to LED60W	9	9	118	60	0.69	0.63	0.43	1.20	68.3%

F32T8 to LED45W	34	34	93	45	0.69	1.96	1.35	1.20	68.9%
F32T8 to LED30W	15	15	60	30	0.69	0.54	0.37	1.20	68.5%
F32T8 to LED60W	27	27	118	60	0.69	1.88	1.30	1.20	69.1%
F32T8 to LED60W	7	7	118	60	0.69	0.49	0.34	1.20	69.4%
F32T8 to LED45W	38	38	93	45	0.69	2.19	1.51	1.20	68.9%
F32T8 to LED30W	6	6	60	30	0.69	0.22	0.15	1.20	68.2%
F32T8 to LED60W	35	35	118	60	0.69	2.44	1.68	1.20	68.9%
F32T8 to LED60W	5	5	118	60	0.69	0.35	0.24	1.20	68.6%
					Total	**83.77**	**72.37**		**86.4%**

Results

The kWh and kW realization rates for project CIP 198 are 61.3% and 86.4%.

Table D, Verified Gross Savings & Realization Rates

Measure	***Verified***			
	kWh Savings	***kW Savings***	***kWh Realization Rate***	***kW Realization Rate***
F32T8-28W to LED15W	6,086	1.38	75.4%	99.3%
F32T8-28W to LED15W	5,779	1.31	75.4%	99.2%
F32T8-28W to LED15W	11,996	2.72	75.4%	99.3%
F32T8-28W to LED15W	11,340	2.57	75.4%	99.2%
F32T8-28W to LED15W	2,189	0.50	75.4%	100.0%
F32T8-28W to LED15W	17,557	3.98	75.4%	99.3%
F32T8-28W to LED15W	2,102	0.48	75.4%	100.0%
F32T8-28W to LED15W	11,909	2.70	75.4%	99.3%

F32T8-28W to LED15W	1,751	0.40	75.3%	100.0%
F32T8-28W to LED15W	21,191	4.81	75.4%	99.4%
F32T8-28W to LED15W	18,214	4.13	75.4%	99.3%
F32T8-28W to LED15W	8,581	1.95	75.4%	99.5%
F32T8-28W to LED15W	1,664	0.38	75.4%	100.0%
F32T8-28W to LED15W	18,695	4.24	75.4%	99.3%
F32T8-28W to LED15W	21,366	4.85	75.4%	99.4%
F32T8-28W to LED15W	14,536	3.30	75.4%	99.4%
F32T8-28W to LED15W	1,664	0.38	75.4%	100.0%
F32T8-28W to LED15W	16,156	3.67	75.4%	99.5%
F32T8-28W to LED15W	17,863	4.05	75.4%	99.3%
F32T8 to LED45W	6,130	1.39	40.8%	68.8%
F32T8 to LED30W	2,517	0.57	40.8%	68.7%
F32T8 to LED60W	2,963	0.67	40.8%	69.1%
F32T8 to LED45W	11,033	2.50	408.3%	68.9%
F32T8 to LED30W	985	0.22	40.8%	68.8%
F32T8 to LED60W	1,058	0.24	40.8%	68.6%
F32T8 to LED60W	8,253	1.87	40.8%	69.0%
F32T8 to LED45W	7,005	1.59	40.8%	69.1%
F32T8 to LED30W	547	0.12	40.8%	66.7%
F32T8 to LED60W	6,772	1.54	40.8%	69.1%
F32T8 to LED60W	1,481	0.34	40.8%	69.4%
F32T8 to LED45W	7,005	1.59	40.8%	69.1%
F32T8 to LED30W	547	0.12	40.8%	66.7%
F32T8 to LED60W	6,560	1.49	40.8%	69.0%

F32T8 to LED60W	635	0.14	40.8%	66.7%
F32T8 to LED45W	7,005	1.59	40.8%	69.1%
F32T8 to LED30W	547	0.12	40.8%	66.7%
F32T8 to LED60W	4,867	1.10	40.8%	68.8%
F32T8 to LED60W	1,905	0.43	40.8%	68.3%
F32T8 to LED45W	5,954	1.35	40.8%	68.9%
F32T8 to LED30W	1,642	0.37	40.8%	68.5%
F32T8 to LED60W	5,714	1.30	40.8%	69.1%
F32T8 to LED60W	1,481	0.34	40.8%	69.4%
F32T8 to LED45W	6,655	1.51	40.8%	68.9%
F32T8 to LED30W	657	0.15	40.9%	68.2%
F32T8 to LED60W	7,407	1.68	40.8%	68.9%
F32T8 to LED60W	1,058	0.24	40.8%	68.6%
Total	**319,022**	**72.37**	**61.3%**	**86.4%**

Project Number CIP 199

Program Publicly Funded Institution

Project Background

The participant is a school that received incentives from Entergy New Orleans for retrofitting energy efficient lighting. The Evaluators verified that the following had been installed:

- H700/1 to LED096-FIXT
- H500 to LED30W
- F32T8 to LED12W
- FU31T8/6 to LED15W
- LED25W to LED3W

Calculation Parameters

The Evaluators confirmed installation of all fixtures listed in the project application. Savings for the measures were calculated using prescriptive savings values listed in Section 10.2.2, which are based on the New Orleans TRM 4.0. The specific values used in calculating savings for this site are presented in the table below.

Table A. Prescriptive Savings and kW Reductions

Prescriptive Measure	*Per-Unit kWh Savings*	*Per-Unit kW Reduction*
H700/1 to LED096-FIXT	1500.84	0.27
H500 to LED30W	1951.11	0.35
F32T8 to LED12W	58.10	0.01
FU31T8/6 to LED15W	79.00	0.02
LED25W to LED3W	164.00	0.02

Savings Calculations

Using values from the table above, the Evaluators calculated lighting savings as follows:

Table B. Lighting Retrofit kWh Savings Calculations

Prescriptive Measure	*Measure Quantity*	*Per-Unit kWh Savings*	*Expected kWh Savings*	*Realized kWh Savings*	*kWh Realization Rate*
H700/1 to LED096-FIXT	60	1500.84	117,066	124,199	106.1%
H500 to LED30W	18	1951.11	35,120	21,514	61.3%
F32T8 to LED12W	40	58.10	2,324	1,526	65.7%
FU31T8/6 to LED15W	4	79.00	316	173	54.7%
LED25W to LED3W	4	164.00	656	224	34.1%
		Total:	**155,482**	**147,636**	**95.0%**

Table C. Lighting Retrofit kW Reduction Calculations

Prescriptive Measure	*Measure Quantity*	*Per-Unit kW Reduction*	*Expected kW Reduction*	*Realized kW Reduction*	*kW Realization Rate*
H700/1 to LED096-FIXT	60	0.27	21.06	27.55	130.8%
H500 to LED30W	18	0.35	6.32	4.77	75.5%
F32T8 to LED12W	40	0.01	0.40	0.34	85.0%
FU31T8/6 to LED15W	4	0.02	0.06	0.04	66.7%
LED25W to LED3W	4	0.02	0.09	0.05	55.6%
		Total:	**27.93**	**32.75**	**117.4%**

Results

The kWh and kW realization rates for project CIP are 95.0% and 117.4%.

Table D. Verified Gross Savings & Realization Rates

Measure	*Verified*			
	kWh Savings	*kW Savings*	*kWh Realization Rate*	*kW Realization Rate*
H700/1 to LED096-FIXT	124,199	27.55	106.1%	130.8%
H500 to LED30W	21,514	4.77	61.3%	75.5%
F32T8 to LED12W	1,526	0.34	65.7%	85.0%
FU31T8/6 to LED15W	173	0.04	54.7%	66.7%
LED25W to LED3W	224	0.05	34.1%	55.6%
	147,636	**32.75**	**95.0%**	**117.4%**

Project Number CIP-205

Program Publicly Funded Institutions

Project Background

The participant is a school that received incentives from Entergy New Orleans for retrofitting energy efficient lighting. The Evaluators verified that the following had been installed:

- (66) 7–12-Watt LED Screw-IN, replacing (66) CFL/Incandescent Screw-In Lamps

Calculation Parameters

The Evaluators confirmed installation of all fixtures listed in the project application. Savings for the measures were calculated using prescriptive savings values listed in Section 10.2.2, which are based on the New Orleans TRM 4.0. The specific values used in calculating savings for this site are presented in the table below.

Table A. Prescriptive Savings and kW Reductions

Prescriptive Measure	*Per-Unit kWh Savings*	*Per-Unit kW Reduction*
Incandescent/CFL Screw-In Lamp with 7-12 Watt LED Screw-In	128.7	0.023

Savings Calculations

Using values from the table above, the Evaluators calculated lighting savings as follows:

Table B. Lighting Retrofit kWh Savings Calculations

Prescriptive Measure	*Measure Quantity*	*Per-Unit kWh Savings*	*Expected kWh Savings*	*Realized kWh Savings*	*kWh Realization Rate*
Incandescent/CFL Screw-In Lamp with 7-12 Watt LED Screw-In	66	128.7	8,494.2	5,203	61.3

Total:	**8,494.2**	**5,203**	**61.3%**

Table C. Lighting Retrofit kW Reduction Calculations

Prescriptive Measure	*Measure Quantity*	*Per-Unit kW Reduction*	*Expected kW Reduction*	*Realized kW Reduction*	*kW Realization Rate*
Incandescent/CFL Screw-In Lamp with 7-12 Watt LED Screw-In	66	0.023	1.5180	1.15	99.8%
Total:			**1.5180**	**1.15**	**99.8%**

Results

The kWh and kW realization rates for project CIP-205 are 99.8% and 61.3%.

Table D. Verified Gross Savings & Realization Rates

Measure	*Verified*			
	kWh Savings	*kW Savings*	*kWh Realization Rate*	*kW Realization Rate*
Incandescent/CFL Screw-In Lamp with 7-12 Watt LED Screw-In	5,203	1.15	61.3%	99.8%
Total:	**5,203**	**1.15**	**61.3%**	**99.8%**

Project Number CIP_221

Program Publicly Funded Institutions

Project Background

The participant is a community college that received incentives from Entergy New Orleans for implementing a schedule change to reduce the equipment's energy consumption during hours when it isn't needed. The Evaluators verified that the following schedule change had been implemented:

- Baseline schedule of 24/7 changed to 6am – 5:59pm Monday through Friday.

		BASELINE							Post Retrofit						
1=ON 2=OFF		Pre-retrofit Runtime - Baseline Weekly Schedule							Post-retrofit Runtime - Post Weekly Schedule						
		Week Day					Week End		Week Day					Week End	
Hour	Range	MON	TUE	WED	THU	FRI	SAT	SUN	MON	TUE	WED	THU	FRI	SAT	SUN
1	Midnight - 1:00 AM	1	1	1	1	1	1	1	2	2	2	2	2	2	2
2	1:00 - 2:00 AM	1	1	1	1	1	1	1	2	2	2	2	2	2	2
3	2:00 - 3:00 AM	1	1	1	1	1	1	1	2	2	2	2	2	2	2
4	3:00 - 4:00 AM	1	1	1	1	1	1	1	2	2	2	2	2	2	2
5	4:00 - 5:00 AM	1	1	1	1	1	1	1	2	2	2	2	2	2	2
6	5:00 - 6:00 AM	1	1	1	1	1	1	1	2	2	2	2	2	2	2
7	6:00 - 7:00 AM	1	1	1	1	1	1	1	1	1	1	1	1	2	2
8	7:00 - 8:00 AM	1	1	1	1	1	1	1	1	1	1	1	1	2	2
9	8:00 - 9:00 AM	1	1	1	1	1	1	1	1	1	1	1	1	2	2
10	9:00 - 10:00 AM	1	1	1	1	1	1	1	1	1	1	1	1	2	2
11	10:00 - 11:00 AM	1	1	1	1	1	1	1	1	1	1	1	1	2	2
12	11:00 - Noon	1	1	1	1	1	1	1	1	1	1	1	1	2	2
13	Noon - 1:00 PM	1	1	1	1	1	1	1	1	1	1	1	1	2	2
14	1:00 - 2:00 PM	1	1	1	1	1	1	1	1	1	1	1	1	2	2
15	2:00 - 3:00 PM	1	1	1	1	1	1	1	1	1	1	1	1	2	2
16	3:00 - 4:00 PM	1	1	1	1	1	1	1	1	1	1	1	1	2	2
17	4:00 - 5:00 PM	1	1	1	1	1	1	1	1	1	1	1	1	2	2
18	5:00 - 6:00 PM	1	1	1	1	1	1	1	1	1	1	1	1	2	2
19	6:00 - 7:00 PM	1	1	1	1	1	1	1	2	2	2	2	2	2	2
20	7:00 - 8:00 PM	1	1	1	1	1	1	1	2	2	2	2	2	2	2
21	8:00 - 9:00 PM	1	1	1	1	1	1	1	2	2	2	2	2	2	2
22	9:00 - 10:00 PM	1	1	1	1	1	1	1	2	2	2	2	2	2	2
23	10:00 - 11:00 PM	1	1	1	1	1	1	1	2	2	2	2	2	2	2
24	11:00 - Midnight	1	1	1	1	1	1	1	2	2	2	2	2	2	2

Calculation Parameters

Savings calculations were performed by finding the reduction in heating and cooling hours from the original schedule. Each equipment was then evaluated based on the airflow and temperature for the difference the schedule change would make to the power consumption

Schedule change for this site are shown below:

Table A, Schedule Change

Unit Name	*Total Hours*	*Cooling hours*	*Heating Hours*
Baseline	8760	5590	3170

As-built	3354	2341	1013

Savings Calculations

Table B, kWh Usage Results

Equipment	*Baseline kWh*	*As-built kWh*	*Savings*	*Percentage Savings*
AHUCs	219,349.85	93,557.97	125,791.88	57%
AHUHs	101,244.81	32,635.71	68,609.10	67%
RTU 1	134,160	55,248	78,912	58%
RTU 2	134,160	56,184	77,976	58%
RTU3	91,296	30,297.60	60,998.40	66%

Heating and cooling systems are on at different times of the day. Savings from the schedule change depend on the temperature of the hours that were excluded from the schedule. Heating systems saw the most savings because the majority of hours cut were at night.

Table C, kWh Saving Calculations

Measure	*Pre kWh Usage*	*Post kWh Usage*	*Expected kWh Savings*	*Realized kWh Savings*	*Realization Rate*
BAS	680,210.66	267,923	360,299.80	359,987	99.1%

Results

The kWh realization rate for project CIP_221 is 99% with no peak demand savings since max usage is expected to be similar even after optimization.

Table D, Verified Gross Savings & Realization Rates

Measure	Verified			
	kWh Savings	kW Savings	kWh Realization Rate	kW Realization Rate
Central Plant Optimization	359,987	-	99.1%	-
Total	**359,987**	**-**	**99.1%**	**-**

Project Number CIP 222

Program Publicly Funded Institutions

Project Background

The participant is a school that received incentives from Entergy New Orleans for retrofitting energy efficient lighting. The Evaluators verified that the following had been installed:

- (108) T8/T12 2ft Linear Fluorescent with (108) 2' Linear LED
- (114) T8/T12 4ft Linear Fluorescent with (114) 4' Linear LED

Calculation Parameters

The Evaluators confirmed installation of all fixtures listed in the project application. Savings for the measures were calculated using prescriptive savings values listed in Section 10.2.2, which are based on the New Orleans TRM 4.0. The specific values used in calculating savings for this site are presented in the table below.

Table A. Prescriptive Savings and kW Reductions

Prescriptive Measure	*Per-Unit kWh Savings*	*Per-Unit kW Reduction*
T8/T12 2ft Linear Fluorescent with 2' Linear LED	29.1	0.005
T8/T12 4ft Linear Fluorescent with 4' Linear LED	58.1	0.01

Savings Calculations

Using values from the table above, the Evaluators calculated lighting savings as follows:

Table B. Lighting Retrofit kWh Savings Calculations

Prescriptive Measure	*Measure Quantity*	*Per-Unit kWh Savings*	*Expected kWh Savings*	*Realized kWh Savings*	*kWh Realization Rate*
T8/T12 2ft Linear Fluorescent with 2' Linear LED	108	29.1	3,143	(137)	-4.4%

T8/T12 4ft Linear Fluorescent with 4' Linear LED	114	58.1	6,623	2,319	35.0%
		Total:	**9,766**	**2,182**	**22.3%**

Table C. Lighting Retrofit kW Reduction Calculations

Prescriptive Measure	*Measure Quantity*	*Per-Unit kW Reduction*	*Expected kW Reduction*	*Realized kW Reduction*	*kW Realization Rate*
T8/T12 2ft Linear Fluorescent with 2' Linear LED	108	0.005	0.54	(0.03)	-5.6%
T8/T12 4ft Linear Fluorescent with 4' Linear LED	114	0.01	1.14	0.51	44.7%
		Total:	**1.68**	**0.48**	**28.6%**

Results

The kWh and kW realization rates for project CIP 222 are 22.3% and 28.6%.

Table D. Verified Gross Savings & Realization Rates

Measure	*Verified*			
	kWh Savings	*kW Savings*	*kWh Realization Rate*	*kW Realization Rate*
T8/T12 2ft Linear Fluorescent with 2' Linear LED	(137)	(0.03)	-4.4%	-5.6%
T8/T12 4ft Linear Fluorescent with 4' Linear LED	2,182	0.51	35.0%	44.7%

Project Number CIP_221

Program Publicly Funded Institutions

Project Background

The participant is a Municipal building that received incentives from Entergy New Orleans for implementing a schedule change for two of their buildings to reduce the equipment's energy consumption during hours when it isn't needed. The Evaluators verified that the following schedule change had been implemented:

- MTC Baseline schedule of 24/7 changed to 8am – 5:59pm every day of the week.
- NOPD Baseline schedule of 24/7 changed to 4am – 10:59pm every day.

MTC

Equipment Schedules					
Schedules	Equip On	Equip Off	Day On	Day Off	For which systems?
Schedule 1	0	24	1	7	all
Schedule 2	8	18	1	7	all

NOPD

Equipment Schedules					
Schedules	Equip On	Equip Off	Day On	Day Off	For which systems?
Schedule 1	0	24	1	7	all
Schedule 2	4	23	1	7	all

Calculation Parameters

Savings calculations were performed by finding the reduction in heating and cooling hours from the original schedule. Each equipment was then evaluated based on the airflow and temperature for the difference the schedule change would make to the power consumption

Schedule change for these sites are shown below:

Table A, Schedule Change

Unit Name	Total Hours	Cooling hours	Heating Hours
Baseline	8760	6639	2121
As-built MTC	4015	3217	798
AS-built NOPD	7300	5592	1708

Savings Calculations

Table B, kWh Usage Results

Equipment	Baseline kWh	As-built kWh	Savings	Percentage Savings
MTC AHUCs	148,298	74,103	74,195	31%
MTC AHUHs	43,907	16,395	27,512	62%
MTC Chiller	552,821	253,338	269,482	48%
MTC CWPs	60,456	31,356	29,099	48%
NOPD AHUC	339,965	288,310	51,654	15%
NOPD AHUH	100,656	80,836	19,819	19%
NOPD Chiller	522,821	440,370	82,451	15%
NOPD CWP	133,105	113,838	19,266	14%
NOPD CTFM	244,912	106,857	138,055	56%
NOPD CoWP	241,194	203,157	38,037	15%

Heating and cooling systems are on at different times of the day. Savings from the schedule change depend on the temperature of the hours that were excluded from the schedule. Heating systems saw the most savings because the majority of hours cut were at night.

Table C, kWh Saving Calculations

Measure	Pre kWh Usage	Post kWh Usage	Expected kWh Savings	Realized kWh Savings	Realization Rate
BAS	2,358,138	1,608,563	948,021	749,575	79%

Results

The kWh realization rate for project CIP_227 is 79% with no peak demand savings since max usage is expected to be similar even after optimization.

Table D, Verified Gross Savings & Realization Rates

Measure	Verified			
	kWh Savings	kW Savings	kWh Realization Rate	kW Realization Rate
Central Plant Optimization	749,575	2.7	79%	76%
Total	**749,575**	**2.7**	**79%**	**76%**

Project Number CIP_232

Program Large Commercial & Industrial Solutions

Project Background

The participant is a community college that received incentives from Entergy New Orleans for implementing a schedule change to reduce the equipment's energy consumption during hours when it isn't needed. The Evaluators verified that the following schedule change had been implemented:

- Baseline AHU schedule of 24 hours a day Sunday through Friday.
- Baseline Remaining RTUs schedule 6am – 11:59pm Sunday through Friday.
- Baseline RTU 3&4 Schedule 7am – 7:59pm Sunday through Friday.
- Baseline RTU 5 Schedule 10am – 8:59pm Sunday through Friday.
- Baseline RTU 8 Schedule 8am – 7:59pm Everyday
- As-built schedule 7am – 10:59pm Sunday through Thursday.

Calculation Parameters

Savings calculations were performed by finding the reduction in heating and cooling hours from the original schedule. Each equipment was then evaluated based on the airflow and temperature for the difference the schedule change would make to the power consumption.

Schedule change for this site are shown below:

Table A, Schedule Change

Unit Name	*Total Hours*	*Cooling hours*	*Heating Hours*
Baseline AHU	7512	5673	1839
Baseline RTU 3&4	4069	3284	785
Baseline RTU 5	3443	2845	598
Baseline RTU 8	4380	3576	804
Baseline Remaining RTUs	5634	4415	1219
As-built	4176	3305	871

Savings Calculations

Table B, kWh Usage Results

Equipment	*Baseline kWh*	*As-built kWh*	*Savings*	*Percentage Savings*
AHUCs	23,721	14,121	9,600	40%
AHUHs	7,393	3,463	3,929	53%
RTU 3&4	337,792	339,952	-2,160	-.6%
RTU 5	136,076	158,078	-22,001	-16%
RTU 8	49,134	45,410	3,723	7.5%
Remaining RTUs	232,891	174,338	58,552	25%
Total	787,009	735,365	51,644	6%

Heating and cooling systems are on at different times of the day. Savings from the schedule change depend on the temperature of the hours that were excluded from the schedule. Heating systems saw the most savings because the majority of hours cut were at night.

Table C, kWh Saving Calculations

Measure	*Pre kWh Usage*	*Post kWh Usage*	*Expected kWh Savings*	*Realized kWh Savings*	*Realization Rate*
BAS	787,009	735,365	282,659	66,626	24%

Results

The kWh realization rate for project PN8-013 is 24% with no peak demand savings since max usage is expected to be similar even after optimization.

Table D, Verified Gross Savings & Realization Rates

Measure	*Verified*			
	kWh Savings	*kW Savings*	*kWh Realization Rate*	*kW Realization Rate*
Central Plant Optimization	66,626	3.37	24%	42%
Total	**66,626**	**3.37**	**24%**	**42%**

Project Number PN9-012

Program Publicly Funded Institutions

Project Background

The participant is a Public Assembly Space that received incentives from Entergy New Orleans for a retro commissioning study.

Calculation Parameters

Savings calculations were performed using an energy simulation model and

billing data and the following algorithms:

$$kWh_{Savings} = kWh_{pre} - kWh_{post}$$

A billing regression simulation was used to calculate savings following a IPMVP Option C (Whole Facility) process.

Savings Calculations

Table A, kWh Usage Results

System	*Baseline kWh*	*Optimal kWh*	*Savings*	*Percentage Savings*
Whole Facility	882,560	341,384	541,176	61%

Billing data from the pre and post periods were collected, and regression was used to find the best fit lines for the pre and post periods. The Equations found through regression were then applied to the same set of test weather data appropriate for the region. The difference between the performance was taken as the savings.

Table C, kWh Saving Calculations

Measure	*Pre kWh Usage*	*Post kWh Usage*	*Model kWh Savings*	Model kW Savings	*Expected kWh Savings*	*Expected kW Savings*
Whole Facility	901,271	363,656	541,176.20	62.06	550,000	-

Results

The kWh realization rate for project PN9-012 is 98% no realization rate for peak demand savings. The modeled and realized kWh savings are greater than the provided energy model, because the model simulates the theoretical savings based on a best fit line. The difference in savings is due to the difference in the models used.

Table D, Verified Gross Savings & Realization Rates

Measure	*Verified*			
	kWh Savings	*kW Savings*	*kWh Realization Rate*	*kW Realization Rate*
Whole Facility	541,176	62.06	98.00%	-
Total	**541,176**	**-**	**98.00%**	**-**

Project Number CIP 075

Program Small C&I Solutions

Project Background

The participant is a university that received incentives from Entergy New Orleans for retrofitting energy efficient lighting indoors and outdoors. The Evaluators verified that the following had been installed:

- F32T8 to LED15W

Calculation Parameters

Savings calculations were performed using savings methodology described in section D.6.3 Commercial Lighting Efficiency of the New Orleans TRM 4.0. Deemed savings parameters applicable to this site are shown below:

Table A, Savings Parameters

Building Type	Heating Type	Annual Hours	IEF_E	IEF_D	CF
Retail: Enclosed Mall	Gas	8,760	1.09	1.20	0.93

Savings Calculations

Table B, Lighting Retrofit kWh Savings Calculations

Measure	Quantity (Fixtures)		Wattage		Annual Operating Hours	Expected kWh Savings	Realized kWh Savings	IEF_E	Realization Rate
	Base	Post	Base	Post					
F32T8 to LED15W	79	158	60	15	8,760	22,630	22,630	1.09	100.0%
					Total	**22,630**	**22,630**		**100.0%**

Table C, Lighting Retrofit kW Reduction Calculations

Measure	Quantity (Fixtures)		Wattage		CF	Expected kW Savings	Realized kW Savings	IEF_D	Realization Rate
	Base	Post	Base	Post					
F32T8 to LED15W	79	158	60	15	0.93	2.84	2.64	1.20	93.0%
					Total	**2.84**	**2.64**		**93.0%**

Results

The kWh and kW realization rates for project CIP 075 are 100% and 93.0%.

Table D, Verified Gross Savings & Realization Rates

Measure	*Verified*			
	kWh Savings	*kW Savings*	*kWh Realization Rate*	*kW Realization Rate*
F32T8 to LED15W	22,630	2.64	100.0%	93.0%
Total	**22,630**	**2.64**	**100.0%**	**93.0%**

Project Number CIP 143

Program Small C&I Solutions

Project Background

The participant is a university that received incentives from Entergy New Orleans for retrofitting energy efficient lighting indoors and outdoors. The Evaluators verified that the following had been installed:

- F32T8 to LED96W
- F32T8 to LED96W
- F32T8 to LED30W
- F32T8 to LED32W
- F32T8 to LED30W
- F32T8 to LED32W
- F32T8 to LED30W

Calculation Parameters

Savings calculations were performed using savings methodology described in section D.6.3 Commercial Lighting Efficiency of the New Orleans TRM 2.0. Deemed savings parameters applicable to this site are shown below:

Table A, Savings Parameters

Building Type	*Heating Type*	*Annual Hours*	*IEF_E*	*IEF_D*	*CF*
Retail: Strip Mall	ER	3,965	0.87	1.20	0.90
Retail: Strip Mall	ER	3,965	0.87	1.20	0.90

Savings Calculations

Table B, Lighting Retrofit kWh Savings Calculations

Measure	*Quantity (Fixtures)*		*Wattage*		*Annual Operating Hours*	*Expected kWh Savings*	*Realized kWh Savings*	*IEF_E*	*Realization Rate*
	Base	*Post*	*Base*	*Post*					
F32T8 to LED96W	37	37	151	96	3,965	7,020	7,020	0.87	100.0%

F32T8 to LED96W	24	24	182	96	3,965	7,120	7,120	0.87	100.0%
F32T8 to LED30W	3	3	85	30	3,965	569	569	0.87	100.0%
F32T8 to LED32W	8	8	59	32	3,965	745	745	0.87	100.0%
F32T8 to LED30W	4	4	85	30	3,965	759	759	0.87	100.0%
F32T8 to LED32W	2	2	59	32	3,965	186	186	0.87	100.0%
F32T8 to LED30W	6	6	85	30	3,965	1,138	1,138	0.87	100.0%
					Total	**17,537**	**17,537**		**100.0%**

Table C, Lighting Retrofit kW Reduction Calculations

Measure	*Quantity (Fixtures)*		*Wattage*		*CF*	*Expected kW Savings*	*Realized kW Savings*	*IEF$_D$*	*Realization Rate*
	Base	*Post*	*Base*	*Post*					
F32T8 to LED96W	37	37	151	96	0.90	2.20	2.20	1.20	100.0%
F32T8 to LED96W	24	24	182	96	0.90	2.23	2.23	1.20	100.0%
F32T8 to LED30W	3	3	85	30	0.90	0.18	0.18	1.20	100.0%
F32T8 to LED32W	8	8	59	32	0.90	0.23	0.23	1.20	100.0%
F32T8 to LED30W	4	4	85	30	0.90	0.24	0.24	1.20	100.0%
F32T8 to LED32W	2	2	59	32	0.90	0.06	0.06	1.20	100.0%
F32T8 to LED30W	6	6	85	30	0.90	0.36	0.36	1.20	100.0%
					Total	**5.50**	**5.50**		**100.0%**

Results

The kWh and kW realization rates for project LN8-083 are 100%.

Table D, Verified Gross Savings & Realization Rates

Measure	Verified			
	kWh Savings	kW Savings	kWh Realization Rate	kW Realization Rate
F32T8 to LED96W	7,020	2.20	100.0%	100.0%
F32T8 to LED96W	7,120	2.23	100.0%	100.0%
F32T8 to LED30W	569	0.18	100.0%	100.0%
F32T8 to LED32W	745	0.23	100.0%	100.0%
F32T8 to LED30W	759	0.24	100.0%	100.0%
F32T8 to LED32W	186	0.06	100.0%	100.0%
F32T8 to LED30W	1,138	0.36	100.0%	100.0%
Total	**17,537**	**5.50**	**100.0%**	**100.0%**

Project Number CIP 153

Program Small C&I

Project Background

The participant is a warehouse that received incentives from Entergy New Orleans for retrofitting energy efficient lighting indoors and outdoors. The Evaluators verified that the following had been installed:

- F96T8 to LED150W

Calculation Parameters

Savings calculations were performed using savings methodology described in section D.6.3 Commercial Lighting Efficiency of the New Orleans TRM 4.0. Deemed savings parameters applicable to this site are shown below:

Table A, Savings Parameters

Building Type	*Heating Type*	*Annual Hours*	*IEF_E*	*IEF_D*	*CF*
Warehouse: Non-Refrigerated	Gas	2,417	1.09	1.00	0.77

Savings Calculations

Table B, Lighting Retrofit kWh Savings Calculations

Measure	*Quantity (Fixtures)*		*Wattage*		*Annual Operating Hours*	*Expected kWh Savings*	*Realized kWh Savings*	*IEF_E*	*Realization Rate*
	Base	*Post*	*Base*	*Post*					
F96T8 to LED150W	202	30	69	150	2,417	25,492	24,865	1.09	97.5%
					Total	**25,492**	**24,865**		**97.5%**

Table C, Lighting Retrofit kW Reduction Calculations

Measure	Quantity (Fixtures)		Wattage		CF	Expected kW Savings	Realized kW Savings	IEF_D	Realization Rate
	Base	Post	Base	Post					
F96T8 to LED150W	202	30	69	150	0.77	4.64	7.27	1.00	156.7%
					Total	**4.64**	**7.27**		**156.7%**

Results

The kWh and kW realization rates for project CIP 153 are 97.5% and 156.7%.

Table D, Verified Gross Savings & Realization Rates

Measure	Verified			
	kWh Savings	kW Savings	kWh Realization Rate	kW Realization Rate
F96T8 to LED150W	24,865	7.27	97.5%	156.7%
Total	**24,865**	**7.27**	**97.5%**	**156.7%**

Project Number CIP 200

Program Small C&I

Project Background

The participant is a retail business that received incentives from Entergy New Orleans for retrofitting energy efficient lighting. The Evaluators verified that the following had been installed:

- I53 to LED17W

Calculation Parameters

The Evaluators confirmed installation of all fixtures listed in the project application. Savings for the measures were calculated using prescriptive savings values listed in Section 10.2.2, which are based on the New Orleans TRM 4.0. The specific values used in calculating savings for this site are presented in the table below.

Table A. Prescriptive Savings and kW Reductions

Prescriptive Measure	*Per-Unit kWh Savings*	*Per-Unit kW Reduction*
I53 to LED17W	149.50	0.03

Savings Calculations

Using values from the table above, the Evaluators calculated lighting savings as follows:

Table B. Lighting Retrofit kWh Savings Calculations

Prescriptive Measure	*Measure Quantity*	*Per-Unit kWh Savings*	*Expected kWh Savings*	*Realized kWh Savings*	*kWh Realization Rate*
I53 to LED17W	390	149.50	58,305	53,792	92.3%
		Total:	**58,305**	**53,792**	**92.3%**

Table C. Lighting Retrofit kW Reduction Calculations

Prescriptive Measure	*Measure Quantity*	*Per-Unit kW Reduction*	*Expected kW Reduction*	*Realized kW Reduction*	*kW Realization Rate*
I53 to LED17W	390	0.03	10.53	15.16	144%
		Total:	**10.53**	**15.16**	**144%**

Results

The kWh and kW realization rates for project CIP 200 are 92.3% and 144.0%.

Table D. Verified Gross Savings & Realization Rates

Measure	*Verified*			
	kWh Savings	*kW Savings*	*kWh Realization Rate*	*kW Realization Rate*
I53 to LED17W	53,792	10.53	92.3%	144%
Total:	**53,792**	**10.53**	**92.3%**	**144%**

Project Number CIP 214

Program Small C&I

Project Background

The participant is an exterior garage that received incentives from Entergy New Orleans for retrofitting energy efficient lighting. The Evaluators verified that the following had been installed:

- MH1000/1 with LED300-FIXT

Calculation Parameters

The Evaluators confirmed installation of all fixtures listed in the project application. Savings for the measures were calculated using prescriptive savings values listed in Section 10.2.2, which are based on the New Orleans TRM 4.0. The specific values used in calculating savings for this site are presented in the table below.

Table A. Prescriptive Savings and kW Reductions

Prescriptive Measure	*Per-Unit kWh Savings*	*Per-Unit kW Reduction*
MH1000/1 with LED300-FIXT	3,336.40	0.00

Savings Calculations

Using values from the table above, the Evaluators calculated lighting savings as follows:

Table B. Lighting Retrofit kWh Savings Calculations

Prescriptive Measure	*Measure Quantity*	*Per-Unit kWh Savings*	*Expected kWh Savings*	*Realized kWh Savings*	*kWh Realization Rate*
MH1000/1 with LED300-FIXT	10	3,336.40	33,364	33,602	100.7%
		Total:	**33,364**	**33,602**	**100.7%**

Results

The kWh realization rate for project CIP 214 is 100.7%.

Table C. Verified Gross Savings & Realization Rates

Measure	*Verified*	
	kWh Savings	*kWh Realization Rate*
MH1000/1 with LED300-FIXT	33,602	100.7%
Total:	**33,602**	**100.7%**

Project Number CIP 215

Program Small C&I

Project Background

The participant is a retail business that received incentives from Entergy New Orleans for retrofitting energy efficient lighting. The Evaluators verified that the following had been installed:

- F32T8 to LED17W
- F32T8 to LED17W
- F32T8 to LED17W

Calculation Parameters

The Evaluators confirmed installation of all fixtures listed in the project application. Savings for the measures were calculated using prescriptive savings values listed in Section 10.2.2, which are based on the New Orleans TRM 4.0. The specific values used in calculating savings for this site are presented in the table below.

Table A. Prescriptive Savings and kW Reductions

Prescriptive Measure	*Per-Unit kWh Savings*	*Per-Unit kW Reduction*
F32T8 to LED17W	54.38	0.01
F32T8 to LED17W	54.38	0.02
F32T8 to LED17W	54.39	0.01

Savings Calculations

Using values from the table above, the Evaluators calculated lighting savings as follows:

Table B. Lighting Retrofit kWh Savings Calculations

Prescriptive Measure	*Measure Quantity*	*Per-Unit kWh Savings*	*Expected kWh Savings*	*Realized kWh Savings*	*kWh Realization Rate*

F32T8 to LED17W	780	54.38	42,423	47,195	111.2%
F32T8 to LED17W	8	54.38	435	484	111.2%
F32T8 to LED17W	160	54.39	8,702	9,681	111.2%
		Total:	**51,560**	**57,360**	**111.2%**

Table C. Lighting Retrofit kW Reduction Calculations

Prescriptive Measure	*Measure Quantity*	*Per-Unit kW Reduction*	*Expected kW Reduction*	*Realized kW Reduction*	*kW Realization Rate*
F32T8 to LED17W	780	0.01	11.27	47,195	104.6%
F32T8 to LED17W	8	0.02	0.12	0.12	103.7%
F32T8 to LED17W	160	0.01	2.31	2.42	104.6%
		Total:	**13.701**	**14.33**	**104.6%**

Results

The kWh and kW realization rates for project CIP 215 are 111.2% and 104.6%.

Table D. Verified Gross Savings & Realization Rates

Measure	*Verified*			
	kWh Savings	*kW Savings*	*kWh Realization Rate*	*kW Realization Rate*
F32T8 to LED17W	42,423	47,195	111.2%	104.6%

F32T8 to LED17W	435	0.12	111.2%	103.7%
F32T8 to LED17W	8,702	2.42	111.2%	104.6%
Total:	**51,560**	**14.33**	**111.2%**	**104.6%**

Project Number CIP 256

Program Small C&I

Project Background

The participant is an outdoor area that received incentives from Entergy New Orleans for retrofitting energy efficient lighting. The Evaluators verified that the following had been installed:

- MH1500 to LED300W
- MH1500 to LED300W
- MH1500 to LED300W

Calculation Parameters

The Evaluators confirmed installation of all fixtures listed in the project application. Savings for the measures were calculated using prescriptive savings values listed in Section 10.2.2, which are based on the New Orleans TRM 4.0. The specific values used in calculating savings for this site are presented in the table below.

Table A. Prescriptive Savings and kW Reductions

Prescriptive Measure	*Per-Unit kWh Savings*	*Per-Unit kW Reduction*
MH1500 to LED300W	656.43	0.00
MH1500 to LED300W	656.50	0.00
MH1500 to LED300W	656.50	0.00

Savings Calculations

Using values from the table above, the Evaluators calculated lighting savings as follows:

Table B. Lighting Retrofit kWh Savings Calculations

Prescriptive Measure	*Measure Quantity*	*Per-Unit kWh Savings*	*Expected kWh Savings*	*Realized kWh Savings*	*kWh Realization Rate*
MH1500 to LED300W	30	656.43	19,693	19,692	100.0%

MH1500 to LED300W	4	656.50	2,626	2,626	100.0%
MH1500 to LED300W	2	656.50	1,313	1,313	100.0%
		Total:	**23,632**	**23,631**	**100.0%**

Results

The kWh realization rate for project CIP 256 is 100.0%.

Table C. Verified Gross Savings & Realization Rates

Measure	*Verified*	
	kWh Savings	*kWh Realization Rate*
MH1500 to LED300W	19,692	100.0%
MH1500 to LED300W	2,626	100.0%
MH1500 to LED300W	1,313	100.0%
Total:	**23,631**	**100.0%**

Project Number CIP 371

Program Small C&I Solutions

Project Background

The participant is an outdoor area that received incentives from Entergy New Orleans for retrofitting energy efficient lighting indoors and outdoors. The Evaluators verified that the following had been installed:

- MH1000 to LED500W

Calculation Parameters

Savings calculations were performed using savings methodology described in section D.6.3 Commercial Lighting Efficiency of the New Orleans TRM 4.0. Deemed savings parameters applicable to this site are shown below:

Table A, Savings Parameters

Building Type	*Heating Type*	*Annual Hours*	*IEF_E*	*IEF_D*	*CF*
Tennis Court	(none)	1,092	1.00	1.00	0.00

Savings Calculations

Table B, Lighting Retrofit kWh Savings Calculations

Measure	*Quantity (Fixtures)*		*Wattage*		*Annual Operating Hours*	*Expected kWh Savings*	*Realized kWh Savings*	*IEF_E*	*Realization Rate*
	Base	*Post*	*Base*	*Post*					
MH1000 to LED500W	60	60	1,067	500	1,092	37,150	37,150	1.00	100.0%
					Total	**37,150**	**37,150**		**100.0%**

Results

The kWh realization rate for project CIP 371 is 100%.

Table C, Verified Gross Savings & Realization Rates

Measure	*Verified*			
	kWh Savings	*kW Savings*	*kWh Realization Rate*	*kW Realization Rate*
MH1000 to LED500W	37,150	0.00	100.0%	N/A
Total	**37,150**	**0.00**	**100.0%**	**N/A**

21 APPENDIX B: COST-EFFECTIVENESS METHODS

21.1 Cost Effectiveness Summary

The Evaluators estimated the cost-effectiveness for the overall energy efficiency and demand response portfolio of programs, based on PY11 costs and savings estimates provided by ENO and their third-party implementers. This appendix provides the cost-effectiveness results, as well as a brief overview of the approach taken by the Evaluators. The portfolio and energy efficiency programs pass all the cost-effectiveness tests except the RIM test. The table below presents the cost-effectiveness results for the PY11 portfolio.

TABLE 21-1 PY11 COST-EFFECTIVENESS RESULTS

Program	TRC	UCT	RIM	PCT	SCT
HPwES	2.02	1.79	0.39	6.73	2.79
RLA	4.03	3.26	0.42	10.21	5.55
Multifamily Solutions	1.39	1.38	0.40	5.16	1.94
IQW	1.64	1.66	0.64	2.93	2.41
A/C Solutions	0.90	0.94	0.34	3.60	1.16
SK&E	0.65	0.52	0.24	9.15	0.82
AR&R Pilot	0.09	0.08	0.07	2.39	0.12
Behavioral	0.47	0.47	0.19	0.00	0.47
Rewards	0.00	0.00	0.00	1.00	0.00
EasyCool - DLC	0.00	0.00	0.00	0.00	0.00
EasyCool - BYOT	0.00	0.00	0.00	0.00	0.00
Small C&I Solutions	0.57	0.55	0.26	3.28	0.72
Large C&I Solutions	1.99	2.03	0.39	6.97	2.56
PFI	1.03	1.06	0.28	6.05	1.26
C&I NC	0.00	0.00	0.00	0.00	0.00
Large C&I DR	0.00	0.00	0.00	0.00	0.00
EasyCool for Business	0.00	0.00	0.00	0.00	0.00
Total	**1.64**	**1.57**	**0.39**	**6.33**	**2.19**

21.2 Cost Effectiveness Methods

The California Standard Practice Model was used as a guideline for the calculations, along with guidance from the ENO TRM V4.0, the IL TRM V7.0, and the AR TRM v8.2. The cost-effectiveness analysis methods that were used in this analysis are among the set of standard methods used in this industry and include the Utility Cost Test (UCT)[131], Total Resource Cost Test (TRC), Ratepayer Impact Measure Test (RIM), and Participant Cost Test (PCT). All tests weigh monetized benefits against costs. These monetized amounts are presented as Net Present Value (NPV) evaluated over the lifespan of the measure. The benefits and

[131] The UCT is also referred to as the Program Administrator Cost Test (PACT).

costs differ for each test based on the perspective of the test. The definitions below are taken from the California Standard Practice Manual.

The TRC measures the net costs of a demand-side management program as a resource option based on the total costs of the program, including both the participants' and the utility's costs.

The UCT measures the net costs of a demand-side management program as a resource option based on the costs incurred by the program administrator (including incentive costs) and excluding any net costs incurred by the participant. The benefits are similar to the TRC benefits. Costs are defined more narrowly.

The PCT is the measure of the quantifiable benefits and costs to the customer due to participation in a program. Since many customers do not base their decision to participate in a program entirely on quantifiable variables, this test cannot be a complete measure of the benefits and costs of a program to a customer.

The RIM test measures what happens to customer bills or rates due to changes in utility revenues and operating costs caused by the program. Rates will go down if the change in revenues from the program is greater than the change in utility costs. Conversely, rates or bills would go up if revenues collected after program implementation is less than the total costs incurred by the utility in implementing the program. This test indicates the direction and magnitude of the expected change in customer bills or rate levels.

A common misperception is that there is a single best perspective for evaluation of cost-effectiveness. Each test is useful and accurate, but the results of each test are intended to answer a different set of questions. The questions to be addressed by each cost test are shown in the table below.[132]

[132] https://www.epa.gov/energy/understanding-cost-effectiveness-energy-efficiency-programs

TABLE 21-2 QUESTIONS ADDRESSED BY THE VARIOUS COST TESTS

Cost Test	Questions Addressed
Participant Cost Test (PCT)	▪ Is it worth it to the customer to install energy efficiency?
	▪ Is it likely that the customer wants to participate in a utility program that promotes energy efficiency?
Ratepayer Impact Measure (RIM)	▪ 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 (UCT)	▪ 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 (TRC)	▪ 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?

Overall, the results of all four cost-effectiveness tests provide a more comprehensive picture than the use of any one test alone. The TRC cost test addresses whether energy efficiency is cost-effective overall. The PCT, UCT, and RIM address whether the selection of measures and design of the program are balanced from the perspective of the participants, utilities, and non-participants. The scope of the benefit and cost components included in each test are summarized in the table below.[133]

[133] *Ibid*.

TABLE 21-3 BENEFITS AND COSTS INCLUDED IN EACH COST-EFFECTIVENESS TEST

Test	Benefits	Costs
PCT (Benefits and costs from the perspective of the customer installing the measure)	▪ Incentive payments	▪ Incremental equipment costs
	▪ Bill Savings	▪ Incremental installation costs
	▪ Applicable tax credits or incentives	
UCT (Perspective of utility, government agency, or third party implementing the program	▪ Energy-related costs avoided by the utility	▪ Program overhead costs
	▪ Capacity-related costs avoided by the utility, including generation, transmission, and distribution	▪ Utility/program administrator incentive costs
TRC (Benefits and costs from the perspective of all utility customers in the utility service territory)	▪ Energy-related costs avoided by the utility	▪ Program overhead costs
	▪ Capacity-related costs avoided by the utility, including generation, transmission, and distribution	▪ Program installation costs
	▪ Additional resource savings	▪ Incremental measure costs
	▪ Monetized non-energy benefits as outlined by the TRM.	
RIM (Impact of efficiency measure on non-participating ratepayers overall)	▪ Energy-related costs avoided by the utility	▪ Program overhead costs
	▪ Capacity-related costs avoided by the utility, including generation, transmission, and distribution	▪ Lost revenue due to reduced energy bills
		▪ Utility/program administrator installation costs

21.2.1 NON-ENERGY BENEFITS

See Appendix C: Non-Energy Benefits for additional details on the inclusion of Non-Energy Benefits.

21.2.2 LINE LOSSES

The Evaluators used the line losses provided by ENO for the PY11 evaluation.

21.2.3 ECONOMIC INPUTS

The Evaluators used the economic inputs provided by ENO for the cost benefit analysis, this included avoided costs that were estimated using the Real Economic Carrying Charge (RECC) approach. The rates utilized for avoided water from Protocol L in the AR TRM V8.2.

The Evaluators used the discount rates provided by ENO to perform the cost benefit analysis, and these values align with the rates used in the PY10 to PY12 Plan. The evaluated net energy savings (kWh) and demand reductions (kW) values utilized in the cost benefit analysis include a line loss factor, those values are in the table below. Additionally, the table below outlines the discount rates, escalation rate and avoided costs used in the PY11 cost-effectiveness analysis.

TABLE 21-4 ECONOMIC INPUTS FOR COST EFFECTIVENESS ANALYSIS

Discount Rates	
Utility (TRC)	8.57%
Utility (UCT)	8.57%
Utility (RIM)	8.57%
Societal (SCT)	3.00%
Participant (PCT)	10.00%
Line Losses	
Line Losses (demand)	7.29%
Line Losses (energy)	7.29%
Escalation rate	2.10%
Avoided Costs	
Avoided Energy ($/kWh)	$0.027
Avoided Demand ($/kW)	$0.004
Avoided Water ($/gallon)	$0.008

21.3 Cost Effectiveness Findings

The tables below outline the results for each test, for both the programs and the portfolio as a whole.

TABLE 21-5 PY11 COST-EFFECTIVENESS RESULTS BY PROGRAM

Program	TRC	UCT	RIM	PCT	SCT
HPwES	2.02	1.79	0.39	6.73	2.79
RLA	4.03	3.26	0.42	10.21	5.55
Multifamily Solutions	1.39	1.38	0.40	5.16	1.94
IQW	1.64	1.66	0.64	2.93	2.41
A/C Solutions	0.90	0.94	0.34	3.60	1.16
SK&E	0.65	0.52	0.24	9.15	0.82
AR&R Pilot	0.09	0.08	0.07	2.39	0.12
Behavioral	0.47	0.47	0.19	0.00	0.47
Rewards Pilot	0.00	0.00	0.00	1.00	0.00
EasyCool - DLC	0.00	0.00	0.00	0.00	0.00
EasyCool - BYOT	0.00	0.00	0.00	0.00	0.00
Small C&I Solutions	0.57	0.55	0.26	3.28	0.72
Large C&I Solutions	1.99	2.03	0.39	6.97	2.56
PFI	1.03	1.06	0.28	6.05	1.26
C&I NC	0.00	0.00	0.00	0.00	0.00
Large C&I DR	0.00	0.00	0.00	0.00	0.00
EasyCool for Business	0.00	0.00	0.00	0.00	0.00
Total	**1.64**	**1.57**	**0.39**	**6.33**	**2.19**

TABLE 21-6 PY11 COST-EFFECTIVENESS BENEFITS BY PROGRAM

Program	TRC Benefits	UCT Benefits	RIM Benefits	PCT Benefits	SCT Benefits
HPwES	$1,791,817	$1,679,834	$1,679,834	$3,512,613	$2,481,003
RLA	$5,714,860	$5,455,461	$5,455,461	$11,119,275	$7,866,111
Multifamily Solutions	$697,744	$687,129	$687,129	$1,287,407	$977,332
IQW	$3,421,823	$3,360,647	$3,360,647	$4,076,529	$5,027,143
A/C Solutions	$399,188	$399,188	$399,188	$840,542	$514,439
SK&E	$331,939	$272,678	$272,678	$669,406	$416,086
AR&R Pilot	$18,976	$18,976	$18,976	$116,832	$26,213
Behavioral	$132,750	$132,750	$132,750	$415,537	$132,750
Rewards Pilot	$0	$0	$0	$235	$0
EasyCool - DLC	$3	$3	$3	$54,965	$3
EasyCool - BYOT	$5	$5	$5	$126,985	$5
Small C&I Solutions	$761,004	$663,110	$663,110	$1,626,947	$961,746
Large C&I Solutions	$12,565,138	$11,282,820	$11,282,820	$24,098,748	$16,154,103
PFI	$1,014,876	$947,341	$947,341	$2,592,381	$1,237,775
C&I NC	$0	$0	$0	$0	$0
Large C&I DR	$119	$119	$119	$25,544	$119
EasyCool for Business	$0	$0	$0	$4,140	$0
Total	**$26,850,243**	**$24,900,062**	**$24,900,062**	**$50,568,087**	**$35,794,829**

TABLE 21-7 PY11 COST-EFFECTIVENESS COSTS BY PROGRAM

Program	TRC Costs	UCT Costs	RIM Costs	PCT Costs	SCT Costs
HPwES	$888,488	$940,622	$4,336,632	$521,849	$888,488
RLA	$1,416,857	$1,674,090	$13,132,514	$1,088,810	$1,416,857
Multifamily Solutions	$502,626	$497,216	$1,728,465	$249,510	$502,626
IQW	$2,089,905	$2,028,174	$5,237,578	$1,390,271	$2,089,905
A/C Solutions	$443,384	$425,592	$1,167,238	$233,643	$443,384
SK&E	$509,116	$528,983	$1,138,630	$73,198	$509,116
AR&R Pilot	$212,559	$246,163	$287,015	$48,896	$212,559
Behavioral	$279,614	$279,614	$695,151	$0	$279,614
Rewards Pilot	$235	$235	$235	$235	$235
EasyCool - DLC	$262,097	$317,062	$317,062	$0	$262,097
EasyCool - BYOT	$163,346	$290,331	$290,331	$0	$163,346
Small C&I Solutions	$1,333,972	$1,201,858	$2,551,102	$496,417	$1,333,972
Large C&I Solutions	$6,318,153	$5,566,214	$28,969,590	$3,459,086	$6,318,153
PFI	$984,521	$895,366	$3,348,698	$428,637	$984,521
C&I NC	$346,748	$346,748	$346,748	$0	$346,748
Large C&I DR	$510,427	$535,605	$535,971	$0	$510,427
EasyCool for Business	$72,734	$76,874	$76,874	$0	$72,734
Total	**$16,334,783**	**$15,850,748**	**$64,159,835**	**$7,990,553**	**$16,334,783**

TABLE 21-8 PY11 COST-EFFECTIVENESS NET BENEFITS BY PROGRAM

Program	TRC Net Benefits	UCT Net Benefits	RIM Net Benefits	PCT Net Benefits	SCT Net Benefits
HPwES	$903,329	$739,212	-$2,656,798	$2,990,764	$1,959,154
RLA	$4,298,003	$3,781,371	-$7,677,053	$10,030,465	$6,777,301
Multifamily Solutions	$195,118	$189,913	-$1,041,336	$1,037,898	$727,823
IQW	$1,331,918	$1,332,473	-$1,876,931	$2,686,258	$3,636,871
A/C Solutions	-$44,195	-$26,404	-$768,050	$606,899	$280,796
SK&E	-$177,177	-$256,305	-$865,952	$596,208	$342,887
AR&R Pilot	-$193,583	-$227,187	-$268,039	$67,936	-$22,683
Behavioral	-$146,864	-$146,864	-$562,401	$415,537	$132,750
Rewards Pilot	-$235	-$235	-$235	$0	-$235
EasyCool - DLC	-$262,094	-$317,059	-$317,059	$54,965	$3
EasyCool - BYOT	-$163,341	-$290,326	-$290,326	$126,985	$5
Small C&I Solutions	-$572,967	-$538,748	-$1,887,992	$1,130,531	$465,329
Large C&I Solutions	$6,246,985	$5,716,606	-$17,686,770	$20,639,662	$12,695,017
PFI	$30,355	$51,975	-$2,401,357	$2,163,743	$809,138
C&I NC	-$346,748	-$346,748	-$346,748	$0	$0
Large C&I DR	-$510,308	-$535,487	-$535,853	$25,544	$119
EasyCool for Business	-$72,734	-$76,874	-$76,874	$4,140	$0
Total	**$10,515,460**	**$9,049,314**	**-$39,259,774**	**$42,577,534**	**$27,804,276**

Sums may differ due to rounding.

22 APPENDIX C: BEHAVIORAL PROGRAM EVALUATION

This section summarizes the post-program regression model output for each of the cohorts evaluated through the Behavioral Program.

22.1 Validity Testing

The tables below detail the average daily energy consumption differences and statistical significance between each cohort's treatment and control groups for each of the 12 months in the pre-period, relative to each cohort's intervention date prior to propensity score matching activities.

TABLE 22-1 INITIAL GROUP VALIDITY TESTING RESULTS

Pre-Period Month	Treatment Group Average Daily Usage (kWh/day)	Control Group Average Daily Usage (kWh/day)	Average Daily Usage Difference (kWh/day)	P-value	Statistically Significant Difference
May 2017	56.56	56.97	-0.42	0.3303	-
Jun 2017	69.44	69.84	-0.40	0.4237	-
Jul 2017	76.94	77.39	-0.46	0.3887	-
Aug 2017	77.19	77.52	-0.33	0.5334	-
Sep 2017	67.66	68.05	-0.39	0.4312	-
Oct 2017	55.54	56.06	-0.52	0.2474	-
Nov 2017	42.93	43.54	-0.62	0.1127	-
Dec 2017	61.64	62.73	-1.09	0.1143	-
Jan 2018	69.00	70.07	-1.06	0.1873	-
Feb 2018	44.37	44.93	-0.56	0.1783	-
Mar 2018	39.81	40.39	-0.58	0.0970	-
Apr 2018	38.61	38.88	-0.27	0.5483	-

TABLE 22-2 SUPPLEMENTAL GROUP VALIDITY TESTING RESULTS

Pre-Period Month	Treatment Group Average Daily Usage (kWh/day)	Control Group Average Daily Usage (kWh/day)	Average Daily Usage Difference (kWh/day)	P-value	Statistically Significant Difference
Jul 2017	40.17	40.19	-0.02	0.9524	-
Aug 2017	39.27	39.35	-0.08	0.7848	-
Sep 2017	34.02	34.04	-0.02	0.9336	-
Oct 2017	27.20	27.18	0.02	0.9441	-
Nov 2017	19.89	20.12	-0.23	0.2138	-

Dec 2017	28.43	28.99	-0.56	0.1188	-
Jan 2018	33.89	34.53	-0.63	0.1556	-
Feb 2018	21.19	21.38	-0.20	0.3460	-
Mar 2018	18.76	18.79	-0.04	0.8328	-
Apr 2018	19.30	19.46	-0.15	0.3813	-
May 2018	33.84	34.02	-0.18	0.5170	-
Jun 2018	41.18	40.94	0.24	0.4785	-

The Third group did not undergo validity testing because it was not designed to have a control group. Therefore, the Evaluators conducted propensity score matching for this cohort. The results of propensity score matching are summarized in the next section of Appendix D.

TABLE 22-3 NEIGHBOR COMPARE - ADM VALIDITY TESTING RESULTS

Pre-Period Month	Treatment Group Average Daily Usage (kWh/day)	Control Group Average Daily Usage (kWh/day)	Average Daily Usage Difference (kWh/day)	P-value	Statistically Significant Difference
Feb 2020	26.56	25.99	0.57	1.3846	-
Mar 2020	26.60	26.49	0.11	1.5848	-
Apr 2020	23.24	22.97	0.27	1.9665	-
May 2020	28.32	28.00	0.32	1.5136	-
Jun 2020	37.24	36.98	0.26	1.5691	-
Jul 2020	40.59	40.19	0.40	1.4807	-
Aug 2020	41.41	41.02	0.39	1.4537	-
Sep 2020	35.33	35.10	0.23	1.2711	-
Oct 2020	25.82	25.69	0.14	1.5141	-
Nov 2020	21.80	21.65	0.15	1.3939	-
Dec 2020	30.45	30.38	0.06	1.8176	-
Jan 2020	33.11	32.89	0.22	2.1946	-

TABLE 22-4 NEIGHBOR COMPARE - NEW VALIDITY TESTING RESULTS

Pre-Period Month	Treatment Group Average Daily Usage (kWh/day)	Control Group Average Daily Usage (kWh/day)	Average Daily Usage Difference (kWh/day)	P-value	Statistically Significant Difference
Oct 2019	39.96	38.93	1.03	0.5037	-
Nov 2019	40.11	41.44	-1.33	0.2847	-
Dec 2019	43.29	46.09	-2.80	0.0462	*
Jan 2020	43.10	45.07	-1.97	0.1591	-

Feb 2020	39.27	41.15	-1.88	0.1382	-
Mar 2020	41.43	42.48	-1.05	0.3116	-
Apr 2020	37.93	36.38	1.55	0.0618	-
May 2020	47.60	46.81	0.78	0.4374	-
Jun 2020	59.81	59.19	0.62	0.5938	-
Jul 2020	64.44	63.34	1.10	0.3637	-
Aug 2020	65.77	63.94	1.83	0.1289	-
Sep 2020	52.58	50.66	1.92	0.0791	-

TABLE 22-5 NEIGHBOR COMPARE - ORIGINAL VALIDITY TESTING RESULTS

Pre-Period Month	Treatment Group Average Daily Usage (kWh/day)	Control Group Average Daily Usage (kWh/day)	Average Daily Usage Difference (kWh/day)	P-value	Statistically Significant Difference
Jul 2019	53.22	54.60	-1.38	0.5454	-
Aug 2019	51.92	50.28	1.64	0.3873	-
Sep 2019	52.88	52.58	0.30	0.8870	-
Oct 2019	36.65	38.79	-2.15	0.2066	-
Nov 2019	33.73	34.42	-0.68	0.6868	-
Dec 2019	35.79	34.23	1.56	0.3604	-
Jan 2020	35.98	34.57	1.41	0.4181	-
Feb 2020	34.23	32.63	1.59	0.3474	-
Mar 2020	32.82	31.42	1.40	0.2985	-
Apr 2020	30.77	29.52	1.25	0.3051	-
May 2020	36.98	35.02	1.97	0.1889	-
Jun 2020	44.19	42.66	1.53	0.4059	-

TABLE 22-6 NEIGHBOR COMPARE - PRINT VALIDITY TESTING RESULTS

Pre-Period Month	Treatment Group Average Daily Usage (kWh/day)	Control Group Average Daily Usage (kWh/day)	Average Daily Usage Difference (kWh/day)	P-value	Statistically Significant Difference
Oct 2019	30.80	30.32	0.49	0.6225	-
Nov 2019	31.88	32.09	-0.21	0.8004	-
Dec 2019	36.09	34.77	1.31	0.1639	-
Jan 2020	33.76	33.61	0.14	0.8723	-
Feb 2020	30.46	30.91	-0.45	0.5944	-
Mar 2020	31.13	31.29	-0.16	0.8249	-
Apr 2020	27.78	27.80	-0.01	0.9828	-

May 2020	36.43	36.55	-0.12	0.8776	-
Jun 2020	47.21	47.25	-0.04	0.9677	-
Jul 2020	50.31	49.79	0.52	0.5874	-
Aug 2020	51.86	51.84	0.02	0.9856	-
Sep 2020	39.53	39.04	0.50	0.5699	-

TABLE 22-7 SELF COMPARE - NEW VALIDITY TESTING RESULTS

Pre-Period Month	Treatment Group Average Daily Usage (kWh/day)	Control Group Average Daily Usage (kWh/day)	Average Daily Usage Difference (kWh/day)	P-value	Statistically Significant Difference
Oct 2019	30.48	34.01	-3.53	0.0057	*
Nov 2019	31.49	34.23	-2.74	0.0134	*
Dec 2019	34.63	37.22	-2.59	0.0363	*
Jan 2020	32.84	36.54	-3.71	0.0019	*
Feb 2020	30.55	32.56	-2.00	0.0621	-
Mar 2020	32.29	34.34	-2.05	0.0328	*
Apr 2020	27.98	30.35	-2.37	0.0049	*
May 2020	35.87	39.65	-3.78	0.0003	*
Jun 2020	45.87	49.64	-3.77	0.0023	*
Jul 2020	47.82	52.71	-4.89	0.0000	*
Aug 2020	49.79	54.45	-4.66	0.0002	*
Sep 2020	39.10	42.88	-3.78	0.0007	*

TABLE 22-8 SELF COMPARE - ORIGINAL VALIDITY TESTING RESULTS

Pre-Period Month	Treatment Group Average Daily Usage (kWh/day)	Control Group Average Daily Usage (kWh/day)	Average Daily Usage Difference (kWh/day)	P-value	Statistically Significant Difference
Jul 2019	41.46	37.98	3.49	0.0046	*
Aug 2019	41.24	38.10	3.14	0.0029	*
Sep 2019	41.96	38.24	3.72	0.0006	*
Oct 2019	29.35	27.46	1.89	0.0178	*
Nov 2019	27.65	25.01	2.63	0.0029	*
Dec 2019	29.68	27.16	2.52	0.0118	*
Jan 2020	29.04	26.58	2.46	0.0095	*
Feb 2020	27.86	25.51	2.35	0.0185	*
Mar 2020	27.39	25.30	2.09	0.0144	*
Apr 2020	23.84	20.94	2.90	0.0000	*

May 2020	29.30	25.36	3.94	0.0000	*
Jun 2020	35.17	29.87	5.30	0.0000	*

The Self Compare – New and Self Compare – Original groups did not pass validity testing. Therefore, the Evaluators conducted propensity score matching for these cohorts. The results of propensity score matching are summarized in the next section of Appendix D.

22.2 Model Output

The tables in this section summarize each cohort's model results, including model terms, coefficients, confidence intervals, t-statistics, and p-values. In addition, adjusted R-squared values are demonstrated for each cohort.

TABLE 22-9 INITIAL GROUP PPR MODEL ESTIMATES

Variable	Coefficient	90% CI Lower	90% CI Upper	t-statistic	P-value
(Intercept)	11.4428	10.9175	11.9680	35.8332	<0.0001
trmt	-0.3754	-0.5581	-0.1928	-3.3809	0.0007
month2	5.0164	4.2008	5.8320	10.1166	<0.0001
month3	0.7744	0.0018	1.5471	1.6486	0.0992
month4	0.5434	-0.2522	1.3389	1.1235	0.2612
month5	-1.4381	-2.2846	-0.5916	-2.7943	0.0052
month6	4.2766	3.3946	5.1585	7.9759	<0.0001
month7	3.8991	3.0092	4.7890	7.2070	<0.0001
month8	0.6388	-0.2570	1.5346	1.1729	0.2408
month9	-1.0166	-1.8860	-0.1473	-1.9235	0.0544
month10	0.8558	0.0341	1.6774	1.7132	0.0867
month11	-1.2215	-2.0144	-0.4286	-2.5339	0.0113
month12	-0.7878	-1.5216	-0.0541	-1.7662	0.0774
daily_usage_pre	0.6302	0.6240	0.6365	165.7057	<0.0001
month2:daily_usage_pre	0.3447	0.3303	0.3592	39.3101	<0.0001
month3:daily_usage_pre	0.1231	0.1084	0.1377	13.8058	<0.0001
month4:daily_usage_pre	0.0575	0.0431	0.0720	6.5455	<0.0001
month5:daily_usage_pre	0.1344	0.1217	0.1471	17.3640	<0.0001
month6:daily_usage_pre	0.1355	0.1239	0.1471	19.2374	<0.0001
month7:daily_usage_pre	0.1015	0.0906	0.1124	15.2758	<0.0001
month8:daily_usage_pre	0.0952	0.0842	0.1061	14.2730	<0.0001
month9:daily_usage_pre	-0.0046	-0.0161	0.0070	-0.6471	0.5176
month10:daily_usage_pre	0.0273	0.0149	0.0397	3.6175	0.0003
month11:daily_usage_pre	0.0055	-0.0088	0.0198	0.6276	0.5303
month12:daily_usage_pre	0.0718	0.0621	0.0816	12.1020	<0.0001
Adjusted R-Squared	**0.5432**				

TABLE 22-10 SUPPLEMENTAL GROUP PPR MODEL ESTIMATES

Variable	Coefficient	90% CI Lower	90% CI Upper	t-statistic	P-value
(Intercept)	7.1199	6.8304	7.4094	40.4501	<0.0001
trmt	0.0899	-0.0169	0.1966	1.3843	0.1663
month2	-0.0360	-0.4952	0.4233	-0.1288	0.8975
month3	0.0810	-0.3576	0.5195	0.3036	0.7614
month4	-0.0227	-0.4654	0.4200	-0.0842	0.9329
month5	-0.4164	-0.8878	0.0551	-1.4526	0.1463
month6	2.4443	1.9408	2.9478	7.9846	<0.0001
month7	3.3595	2.8441	3.8748	10.7221	<0.0001
month8	1.9157	1.4235	2.4079	6.4017	<0.0001
month9	0.4619	-0.0260	0.9497	1.5573	0.1194
month10	1.3954	0.9250	1.8658	4.8793	<0.0001
month11	-1.4822	-1.9362	-1.0283	-5.3707	<0.0001
month12	-0.7533	-1.1583	-0.3483	-3.0592	0.0022
daily_usage_pre	0.6054	0.5989	0.6119	153.1959	<0.0001
month2:daily_usage_pre	0.4798	0.4635	0.4960	48.5699	<0.0001
month3:daily_usage_pre	0.1395	0.1225	0.1564	13.5236	<0.0001
month4:daily_usage_pre	0.0995	0.0827	0.1163	9.7363	<0.0001
month5:daily_usage_pre	0.0007	-0.0112	0.0125	0.0947	0.9246
month6:daily_usage_pre	0.0689	0.0576	0.0801	10.0524	<0.0001
month7:daily_usage_pre	0.1346	0.1228	0.1464	18.7462	<0.0001
month8:daily_usage_pre	0.1234	0.1121	0.1348	17.8640	<0.0001
month9:daily_usage_pre	-0.0069	-0.0194	0.0056	-0.9081	0.3638
month10:daily_usage_pre	0.0334	0.0194	0.0475	3.9224	<0.0001
month11:daily_usage_pre	0.0644	0.0474	0.0814	6.2355	<0.0001
month12:daily_usage_pre	0.1052	0.0947	0.1157	16.4582	<0.0001
Adjusted R-Squared	**0.5024**				

TABLE 22-11 THIRD GROUP PPR MODEL ESTIMATES

Variable	Coefficient	90% CI Lower	90% CI Upper	t-statistic	P-value
(Intercept)	6.8887	6.6575	7.1199	49.0126	<0.0001
trmt	-0.1607	-0.2512	-0.0702	-2.9194	0.0035
month2	2.1240	1.7818	2.4663	10.2079	<0.0001
month3	-0.6897	-1.0201	-0.3592	-3.4331	0.0006
month4	-1.1241	-1.4550	-0.7932	-5.5871	<0.0001
month5	-2.0839	-2.4304	-1.7374	-9.8929	<0.0001
month6	0.1782	-0.1872	0.5437	0.8021	0.4225

month7	0.0383	-0.3107	0.3872	0.1803	0.8569
month8	0.3957	0.0417	0.7497	1.8387	0.0660
month9	-1.7459	-2.1001	-1.3918	-8.1083	<0.0001
month10	-0.6437	-0.9886	-0.2987	-3.0690	0.0021
month11	-0.8529	-1.1845	-0.5213	-4.2310	<0.0001
month12	-1.5596	-1.9274	-1.1917	-6.9732	<0.0001
daily_usage_pre	0.6269	0.6225	0.6313	233.8439	<0.0001
month2:daily_usage_pre	0.4305	0.4207	0.4403	72.0249	<0.0001
month3:daily_usage_pre	0.1808	0.1703	0.1913	28.2883	<0.0001
month4:daily_usage_pre	0.1325	0.1219	0.1430	20.6819	<0.0001
month5:daily_usage_pre	0.0463	0.0385	0.0541	9.7593	<0.0001
month6:daily_usage_pre	0.1215	0.1142	0.1289	27.0471	<0.0001
month7:daily_usage_pre	0.1166	0.1098	0.1234	28.1194	<0.0001
month8:daily_usage_pre	0.1467	0.1394	0.1539	33.2412	<0.0001
month9:daily_usage_pre	-0.0218	-0.0292	-0.0143	-4.8228	<0.0001
month10:daily_usage_pre	0.0985	0.0896	0.1074	18.2335	<0.0001
month11:daily_usage_pre	-0.0958	-0.1041	-0.0875	-18.9965	<0.0001
month12:daily_usage_pre	0.1526	0.1439	0.1612	29.0878	<0.0001
Adjusted R-Squared			**0.6036**		

TABLE 22-12 NEIGHBOR COMPARE - ADM PPR MODEL ESTIMATES

Variable	Coefficient	90% CI Lower	90% CI Upper	t-statistic	P-value
(Intercept)	5.2605	5.0799	5.4412	47.8905	<0.0001
trmt	0.0705	-0.0220	0.1631	1.2532	0.2102
month5	-0.3397	-0.5798	-0.0996	-2.3272	0.0200
month6	0.2690	0.0182	0.5198	1.7641	0.0777
month7	-0.2299	-0.4751	0.0154	-1.5417	0.1231
month8	-0.4000	-0.6494	-0.1506	-2.6382	0.0083
month9	0.0000	-0.2448	0.2449	0.0002	0.9998
month10	-0.6052	-0.8467	-0.3636	-4.1212	<0.0001
month11	-1.8707	-2.1112	-1.6303	-12.7969	<0.0001
daily_usage_pre	0.7222	0.7167	0.7276	218.1854	<0.0001
month5:daily_usage_pre	0.0767	0.0695	0.0839	17.4917	<0.0001
month6:daily_usage_pre	0.1316	0.1248	0.1383	31.9124	<0.0001
month7:daily_usage_pre	0.0963	0.0898	0.1028	24.3032	<0.0001
month8:daily_usage_pre	0.0989	0.0924	0.1055	24.8058	<0.0001
month9:daily_usage_pre	-0.0887	-0.0955	-0.0819	-21.4379	<0.0001
month10:daily_usage_pre	0.1625	0.1549	0.1702	35.0808	<0.0001
month11:daily_usage_pre	0.1132	0.1050	0.1215	22.5863	<0.0001
Adjusted R-Squared			**0.7402**		

TABLE 22-13 NEIGHBOR COMPARE - NEW PPR MODEL ESTIMATES

Variable	Coefficient	90% CI Lower	90% CI Upper	t-statistic	P-value
(Intercept)	11.3232	10.7044	11.9421	30.0954	<0.0001
trmt	0.7403	0.4225	1.0580	3.8321	0.0001
month2	-1.5281	-2.3490	-0.7072	-3.0619	0.0022
month3	-0.9578	-1.7585	-0.1570	-1.9675	0.0491
month4	-6.4899	-7.3189	-5.6608	-12.8758	<0.0001
month5	-7.1302	-7.9953	-6.2650	-13.5559	<0.0001
month6	-5.3370	-6.2515	-4.4225	-9.5994	<0.0001
month7	-5.9828	-6.8915	-5.0741	-10.8298	<0.0001
month8	-6.3957	-7.3168	-5.4745	-11.4208	<0.0001
month9	-3.2656	-4.1355	-2.3958	-6.1751	<0.0001
month10	-0.1879	-1.0849	0.7091	-0.3446	0.7304
month11	0.5614	-0.2187	1.3415	1.1837	0.2366
month12	0.0674	-0.7021	0.8369	0.1440	0.8855
daily_usage_pre	0.7385	0.7284	0.7487	119.9604	<0.0001
month2:daily_usage_pre	0.2005	0.1843	0.2166	20.4165	<0.0001
month3:daily_usage_pre	-0.1907	-0.2063	-0.1752	-20.1663	<0.0001
month4:daily_usage_pre	-0.0122	-0.0295	0.0052	-1.1512	0.2497
month5:daily_usage_pre	0.0742	0.0583	0.0901	7.6633	<0.0001
month6:daily_usage_pre	0.1032	0.0883	0.1181	11.3968	<0.0001
month7:daily_usage_pre	0.0870	0.0727	0.1013	10.0077	<0.0001
month8:daily_usage_pre	0.0398	0.0255	0.0541	4.5644	<0.0001
month9:daily_usage_pre	-0.0794	-0.0946	-0.0642	-8.6033	<0.0001
month10:daily_usage_pre	-0.0360	-0.0538	-0.0181	-3.3131	0.0009
month11:daily_usage_pre	-0.3063	-0.3213	-0.2913	-33.5535	<0.0001
month12:daily_usage_pre	-0.0352	-0.0494	-0.0211	-4.0975	<0.0001
Adjusted R-Squared	**0.6699**				

TABLE 22-14 NEIGHBOR COMPARE - ORIGINAL PPR MODEL ESTIMATES

Variable	Coefficient	90% CI Lower	90% CI Upper	t-statistic	P-value
(Intercept)	9.6577	8.7655	10.5498	17.8058	<0.0001
trmt	-0.7194	-1.1859	-0.2529	-2.5367	0.0112
month2	-0.5115	-1.6985	0.6755	-0.7088	0.4785
month3	-0.3375	-1.4847	0.8096	-0.4840	0.6284
month4	-3.7165	-4.8857	-2.5472	-5.2283	<0.0001
month5	-4.0695	-5.2725	-2.8666	-5.5646	<0.0001
month6	-3.6639	-5.0331	-2.2948	-4.4019	<0.0001

month7	6.4324	5.2041	7.6606	8.6143	<0.0001
month8	3.5778	2.3411	4.8145	4.7587	<0.0001
month9	1.1322	-0.0901	2.3545	1.5236	0.1276
month10	2.6863	1.5147	3.8579	3.7715	0.0002
month11	1.2214	0.0803	2.3625	1.7606	0.0783
month12	-0.3589	-1.4771	0.7592	-0.5280	0.5975
daily_usage_pre	0.8301	0.8126	0.8475	78.2969	<0.0001
month2:daily_usage_pre	0.1793	0.1521	0.2066	10.8169	<0.0001
month3:daily_usage_pre	-0.2157	-0.2430	-0.1884	-12.9903	<0.0001
month4:daily_usage_pre	-0.1092	-0.1387	-0.0797	-6.0918	<0.0001
month5:daily_usage_pre	-0.0434	-0.0707	-0.0162	-2.6255	0.0087
month6:daily_usage_pre	0.0316	0.0035	0.0598	1.8492	0.0644
month7:daily_usage_pre	-0.2629	-0.2860	-0.2398	-18.7282	<0.0001
month8:daily_usage_pre	-0.2113	-0.2349	-0.1877	-14.7135	<0.0001
month9:daily_usage_pre	-0.3804	-0.4036	-0.3573	-27.0306	<0.0001
month10:daily_usage_pre	-0.2665	-0.2927	-0.2404	-16.7585	<0.0001
month11:daily_usage_pre	-0.3779	-0.4041	-0.3517	-23.7248	<0.0001
month12:daily_usage_pre	-0.0504	-0.0753	-0.0256	-3.3415	0.0008
Adjusted R-Squared			**0.6107**		

TABLE 22-15 NEIGHBOR COMPARE – PRINT PPR MODEL ESTIMATES

Variable	Coefficient	90% CI Lower	90% CI Upper	t-statistic	P-value
(Intercept)	6.8044	6.3479	7.2610	24.5155	0.0000
trmt	-0.4598	-0.6611	-0.2584	-3.7559	0.0002
month2	-1.0490	-1.6989	-0.3991	-2.6552	0.0079
month3	-0.3107	-0.9226	0.3011	-0.8353	0.4035
month4	-3.1644	-3.7831	-2.5457	-8.4127	0.0000
month5	-4.1854	-4.8331	-3.5378	-10.6306	0.0000
month6	-2.9177	-3.5997	-2.2356	-7.0366	0.0000
month7	-2.9937	-3.6584	-2.3290	-7.4080	0.0000
month8	-3.9044	-4.5854	-3.2234	-9.4309	0.0000
month9	0.4890	-0.1541	1.1321	1.2508	0.2110
month10	0.6624	0.0042	1.3206	1.6553	0.0979
month11	1.0016	0.3874	1.6158	2.6823	0.0073
month12	1.7573	1.1590	2.3555	4.8314	0.0000
daily_usage_pre	0.8485	0.8389	0.8581	145.0872	0.0000
month2:daily_usage_pre	0.1742	0.1587	0.1898	18.3838	0.0000
month3:daily_usage_pre	-0.2015	-0.2162	-0.1867	-22.4976	0.0000
month4:daily_usage_pre	-0.0720	-0.0881	-0.0560	-7.3866	0.0000
month5:daily_usage_pre	-0.0006	-0.0152	0.0139	-0.0699	0.9442
month6:daily_usage_pre	0.0283	0.0148	0.0418	3.4508	0.0006

month7:daily_usage_pre	0.0092	-0.0037	0.0221	1.1733	0.2407
month8:daily_usage_pre	-0.0582	-0.0712	-0.0452	-7.3767	0.0000
month9:daily_usage_pre	-0.1418	-0.1556	-0.1279	-16.8284	0.0000
month10:daily_usage_pre	-0.0961	-0.1123	-0.0800	-9.8156	0.0000
month11:daily_usage_pre	-0.3287	-0.3430	-0.3144	-37.8367	0.0000
month12:daily_usage_pre	-0.1179	-0.1309	-0.1049	-14.9482	0.0000
Adjusted R-Squared	**0.7386**				

TABLE 22-16 SELF COMPARE – NEW PPR MODEL ESTIMATES

Variable	Coefficient	90% CI Lower	90% CI Upper	t-statistic	P-value
(Intercept)	6.4953	18.1575	0.0000	5.9069	7.0837
trmt	0.6769	3.9781	0.0001	0.3970	0.9568
month2	-1.2171	-2.4171	0.0156	-2.0454	-0.3888
month3	0.7546	1.6162	0.1060	-0.0134	1.5227
month4	-2.7431	-5.8596	0.0000	-3.5131	-1.9730
month5	-3.9525	-8.0783	0.0000	-4.7573	-3.1477
month6	-2.7207	-5.2715	0.0000	-3.5697	-1.8718
month7	-3.2711	-6.5651	0.0000	-4.0907	-2.4516
month8	-2.6059	-5.1194	0.0000	-3.4432	-1.7686
month9	-0.3160	-0.6442	0.5194	-1.1229	0.4909
month10	2.2482	4.5413	0.0000	1.4339	3.0625
month11	2.0121	4.2828	0.0000	1.2393	2.7849
month12	1.3864	3.0102	0.0026	0.6288	2.1439
daily_usage_pre	0.8257	109.6017	0.0000	0.8133	0.8380
month2:daily_usage_pre	0.2013	16.3505	0.0000	0.1810	0.2215
month3:daily_usage_pre	-0.2285	-20.5932	0.0000	-0.2467	-0.2102
month4:daily_usage_pre	-0.0599	-4.9682	0.0000	-0.0797	-0.0401
month5:daily_usage_pre	0.0250	2.2522	0.0243	0.0067	0.0432
month6:daily_usage_pre	0.0455	4.3554	0.0000	0.0283	0.0627
month7:daily_usage_pre	0.0385	3.8648	0.0001	0.0221	0.0549
month8:daily_usage_pre	-0.0702	-7.0260	0.0000	-0.0867	-0.0538
month9:daily_usage_pre	-0.0964	-8.9620	0.0000	-0.1141	-0.0787
month10:daily_usage_pre	-0.1404	-11.6010	0.0000	-0.1603	-0.1205
month11:daily_usage_pre	-0.3489	-31.6436	0.0000	-0.3670	-0.3308
month12:daily_usage_pre	-0.0961	-9.3509	0.0000	-0.1130	-0.0792
Adjusted R-Squared	**0.7033**				

TABLE 22-17 SELF COMPARE – PRINT PPR MODEL ESTIMATES

Variable	Coefficient	90% CI Lower	90% CI Upper	t-statistic	P-value
(Intercept)	5.7906	5.1223	6.4589	14.2529	0.0000
trmt	-0.0732	-0.3746	0.2282	-0.3994	0.6896
month2	0.8409	-0.1113	1.7930	1.4526	0.1463
month3	1.9972	1.1115	2.8829	3.7090	0.0002
month4	-0.5245	-1.4136	0.3646	-0.9703	0.3319
month5	-0.4369	-1.3545	0.4806	-0.7833	0.4335
month6	0.2324	-0.8559	1.3207	0.3512	0.7254
month7	6.2874	5.3431	7.2318	10.9516	0.0000
month8	4.0366	3.0965	4.9768	7.0625	0.0000
month9	4.0931	3.1689	5.0172	7.2852	0.0000
month10	4.0820	3.1714	4.9927	7.3734	0.0000
month11	2.1091	1.2051	3.0131	3.8377	0.0001
month12	1.6195	0.7422	2.4968	3.0363	0.0024
daily_usage_pre	0.9230	0.9067	0.9393	92.8861	0.0000
month2:daily_usage_pre	0.1070	0.0813	0.1327	6.8566	0.0000
month3:daily_usage_pre	-0.2923	-0.3164	-0.2681	-19.9086	0.0000
month4:daily_usage_pre	-0.1875	-0.2141	-0.1608	-11.5705	0.0000
month5:daily_usage_pre	-0.1373	-0.1618	-0.1127	-9.1962	0.0000
month6:daily_usage_pre	-0.0876	-0.1142	-0.0609	-5.3984	0.0000
month7:daily_usage_pre	-0.3175	-0.3389	-0.2961	-24.3852	0.0000
month8:daily_usage_pre	-0.3056	-0.3272	-0.2840	-23.2926	0.0000
month9:daily_usage_pre	-0.4578	-0.4789	-0.4366	-35.6496	0.0000
month10:daily_usage_pre	-0.3397	-0.3640	-0.3153	-22.9628	0.0000
month11:daily_usage_pre	-0.3975	-0.4220	-0.3731	-26.7202	0.0000
month12:daily_usage_pre	-0.1295	-0.1522	-0.1069	-9.4019	0.0000
Adjusted R-Squared	**0.5954**				