Evaluation of Illinois Energy Now Public Sector Custom and Standard Incentives Programs: June 2015 through May 2016

Prepared for:

Illinois Department of Commerce & Economic Opportunity

Prepared By:

ADM Associates, Inc.

3239 Ramos Circle
Sacramento, CA 95827
916.363.8383

Draft Report: May 2017

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1. Executive Summary

This report presents the results of the impact evaluation performed by ADM Associates Inc. (ADM) for three programs administered by the Illinois Department of Commerce & Economic Opportunity (hereinafter referred to as the "Department of Commerce") for public sector entities: Public Sector Custom Incentive Program, Public Sector Standard Incentives Program (Custom and Standard Incentives Programs). This report presents results for electric program year eight and natural gas program year five (EPY8/GPY5), the period from June 2015 through May 2016. The main features of the approach used for the evaluation of the Custom and Standard Incentives Programs are as follows:

- Data for the study were collected through the following: review of program materials; on-site inspections; end-use metering; and interviews with Department of Commerce staff members, program partner staff members, and participating public sector entities' staff and contractors.
- A sample design was developed for on-site data collection. Separate samples were drawn for electric and natural gas savings that provided savings estimates for programs within ±10% precision at the 90% confidence level. Table 1-1 shows the precision of the sample estimates.
- Table 1-2 shows the sample sizes for different types of data collection employed for the Custom and Standard Incentives Programs.
- On-site visits were used to collect data for savings impact calculations, to verify measure installation, and to determine measure operating parameters. Facility staff were interviewed to determine operating hours of installed measures, and to explain any additional benefits or shortcomings with the installed measure. For the majority of sites, lighting equipment, HVAC equipment, or motors/VFDs were monitored to obtain accurate information on hours of operation. For electric savings, the 19 projects sampled for the Custom Incentives Program accounted for 72% of the expected kWh savings and the 34 projects sampled for the Standard Incentives Program accounted for 64% of the expected kWh savings. For natural gas savings, the 11 projects sampled for the Custom Incentives Program accounted for 50% of the expected therm savings and the 8 projects sampled for the Standard Incentives Program accounted for 98% of the expected therm savings.
- Surveys of participant decision makers provided information necessary for net-to-gross analysis and process evaluation. For the Custom and Standard Incentives Programs, a total of 7 participant decision makers were surveyed about the influence of the program on their project decision-making.

Table 1-1 Precision of Sample Estimates for Custom and Standard Electric and Natural Gas Savings

Program	*Electric*	*Natural Gas*
	Precision for 90% Confidence Level	Precision for 90% Confidence Level
Custom	± 8.67%	± 10.21%
Standard	± 8.00%	± 1.12%

Table 1-2 Sample Sizes for Custom and Standard Incentives Programs Data Collection Efforts

Type of Data Collected	*Sample Size*
Project On-Site Measurement and Verification	11
Site Desk Review	51
Participant Decision Maker Survey	7

The Illinois Statewide Technical Reference Manual (TRM) was used to estimate gross savings for measures implemented through the Standard Incentives Program. Measures implemented through the Custom Incentives Program and non-TRM savings measures implemented through the Standard Incentives Program were estimated using industry standard engineering calculations and verification of computer simulations.

For standard measures, savings were calculated using one of two different approaches. These approaches are as follows:

- TRM-Calculated: Savings calculated as per Illinois's Statewide TRM Version 4.0.
- ADM-Calculated: Savings calculated using a non-TRM methodology. ADM-Calculated savings were performed when the Standard Incentives Program measure was not in the TRM or when the methodology in the TRM was not applicable because the assumptions provided were not appropriate for that measure.

Incentive funds were unavailable in the 2015-2016 State of Illinois fiscal year budget. A limited number of public sector entities proceeded with program projects and implemented energy efficiency measures during the EPY8/GPY5. The incentives for these projects were paid when funds were appropriated for the 2016-2017 State of Illinois fiscal year and it is these projects that comprise the EPY8/GPY5 program activity.

The realized electric savings for the Custom and Standard Incentives Programs during the period June 2015 through May 2016 are summarized in Table 1-3 and Table 1-4.

During this period, gross ex post electric savings total 14,442,590 kWh for the Custom Incentives Program and 27,710,285 kWh for the Standard Incentives Program. The gross realization rates for electric savings from the Custom and Standard Incentives Program are 76% and 122%, respectively.

During EPY8/GPY5, net ex post electric savings total 13,992,488 kWh for the Custom Incentives Program and 20,321,303 kWh for the Standard Incentives Program. The net-to-gross ratio for the Custom Incentives Program is 97% and the net-to-gross ratio for the Standard Incentives Program is 73%.

Table 1-3 Summary of kWh Savings for Custom Incentives Program

Utility	*Ex Ante kWh Savings*	*Gross Ex Post kWh Savings*	*Gross Realization Rate*	*Net Ex Post kWh Savings*	*Net-to-Gross Ratio*
Ameren	7,137,552	8,425,929	118%	8,159,464	97%
ComEd	11,890,895	6,016,661	51%	5,833,024	97%
Total	19,028,447	14,442,590	76%	13,992,488	97%

Table 1-4 Summary of kWh Savings for Standard Incentives Program

Utility	*Ex Ante kWh Savings*	*TRM-Calculated*		*ADM-Calculated*			
		Gross Ex Post kWh Savings	*Net Ex Post kWh Savings*	*Gross Ex Post kWh Savings*	*Gross Realization Rate*	*Net Ex Post kWh Savings*	*Net-to-Gross Ratio*
Ameren	1,116,293	1,201,074	880,806	1,201,074	108%	880,806	73%
ComEd	21,583,789	26,509,211	19,440,497	26,509,210	123%	19,440,497	73%
Total	22,700,082	27,710,285	20,321,304	27,710,285	122%	20,321,303	73%

The gross ex post natural gas savings for the Custom and Standard Incentives during the period June 2015 through May 2016 are summarized in Table 1-5 and Table 1-6. For the period, gross ex post natural gas savings total 864,370 therms for the Custom Incentives Program and 96,646 therms for the Standard Incentives Program. The gross realization rates for the Custom and Standard Incentives Programs are 100% and 106%, respectively.

The total net ex post natural gas savings is 812,508 therms for the Custom Incentives Program and 90,847 therms for the Standard Incentives Program. The net-to-gross ratio for the Custom Incentives Program is 94%, while the net to gross ratio for the Standard Incentives Program is 94%.

Table 1-5 Summary of Therm Savings for Custom Incentives Program

Utility	*Ex Ante Therm Savings*	*Gross Ex Post Therm Savings*	*Gross Realization Rate*	*Net Ex Post Therm Savings*	*Net-to-Gross Ratio*
Ameren	564,641	504,331	89%	474,071	94%
Nicor	0	0	0%	0	0%
North Shore	0	0	0%	0	0%
Peoples	299,972	360,039	120%	338,437	94%
Total	864,613	864,370	100%	812,508	94%

Table 1-6 Summary of Therm Savings for Standard Incentives Program

Utility	*Ex Ante Therm Savings*	*TRM-Calculated*		*ADM-Calculated*			
		Gross Ex Post Therm Savings	*Net Ex Post Therm Savings*	*Gross Ex Post Therm Savings*	*Gross Realization Rate*	*Net Ex Post Therm Savings*	*Net-to-Gross Ratio*
Ameren	0	0	0	0	0%	0	0%
Nicor	14,428	14,428	13,562	14,428	100%	13,562	94%
North Shore	0	0	0	0	0%	0	0%
Peoples	76,410	82,218	77,285	82,218	108%	77,285	94%
Total	90,838	96,646	90,847	96,646	106%	90,847	94%

The gross ex post peak demand reductions for the Custom and Standard Incentives Programs during the period June 2015 through May 2016 are summarized in Table 1-7 and Table 1-8. For this period, gross peak demand reductions total 1,175.51 kW for the Custom Incentives Program and 4,084.90 kW for the Standard Incentives Program. The gross realization rate for the Standard Incentives Program is 72%.

The net peak demand reductions total 1,175.51 kW for the Custom Incentives Program and 2,934.75 kW for the Standard Incentives Program.

Table 1-7 Summary of Peak kW Reductions for Custom Incentives Program

Utility	*Ex Ante kW Savings*	*Gross Ex Post kW Savings*	*Gross Realization Rate*	*Net Ex Post kW Savings*	*Net-to-Gross Ratio*
Ameren	N/A	855.01	N/A.	831.0094	97%
ComEd	N/A	354.45	N/A.	344.50	97%
Total	N/A	1,209.46	N/A.	1,175.51	97%

Table 1-8 Summary of Peak kW Reductions for Standard Incentives Program

Utility	*Ex Ante kW Savings*	*TRM-Calculated*		*ADM-Calculated*			
		Gross Ex Post kW Savings	*Net Ex Post kW Savings*	*Gross Ex Post kW Savings*	*Gross Realization Rate*	*Net Ex Post kW Savings*	*Net-to-Gross Ratio*
Ameren	248.14	196.93	141.48	196.95	79%	141.49	72%
ComEd	4,049.16	3,887.41	2,792.85	3,887.96	96%	2,793.25	72%
Total	4,297.30	4,084.34	2,934.33	4,084.90	95%	2,934.75	72%

Realized energy savings were less than usual, compared to past program years. The decrease in savings was likely due to incentive funds not being available during the 2015-2016 State of Illinois fiscal year.

2. Introduction

This section presents a description of the three programs that the Illinois Department of Commerce & Economic Opportunity (hereinafter referred to as the "Department of Commerce") offers to public sector entities. These programs are the Public Sector Custom and Standard Incentives Programs (Custom and Standard Incentives Program). This section also includes an overview of the evaluation approach and report contents for the evaluation of electric program year eight and natural gas program year five (EPY8/GPY5), the period from June 2015 through May 2016.

2.1 Description of Programs

The Custom and Standard Incentives Programs offered by the Department of Commerce were designed to help the public sector identify and implement energy saving projects. The two programs evaluated in this report are described below.

2.1.1 Custom and Standard Incentives Programs

2.1.1.1 Incentive Structure

The following summarizes both the Custom and Standard Incentives Programs offered by the Department:

- The Custom Incentives Program generates electric and natural gas savings by helping public sector entities identify and implement energy savings projects and provide incentives on a per kilowatt hour (kWh) or per therm basis. During EPY8/GPY5, the program provided incentives of $0.12 per kWh saved and $3.00 per therm saved. A payback period of one to seven years is required for custom incentive projects.
- The Standard Incentives Program generates electric and natural gas savings by helping public sector entities identify and implement energy saving projects. The program offers incentives on a prescriptive basis for qualifying equipment purchased and installed by the participant.
- Higher incentives were offered for break-through equipment and devices that generate electric savings through both programs. For example, through the Custom Incentives Program some types of exterior LED and induction lighting projects were provided a higher custom incentive of $0.30 per kWh saved. Through the Standard Incentives Program additional incentives were provided for geothermal heat pumps.

Incentives provided by the program could not exceed 100% of the incremental measure cost or 75% of the total project cost.

If incentives were provided from other public sources, those incentives in combination with the program incentives, could not exceed 100% of the total project cost. Additionally, incentive awards could not exceed $300,000 unless multiple project locations were included

2.1.1.2 Project Summary

Expected electric savings are shown in Table 2-1 by utility for the Custom and Standard Incentives Programs. There were 51 Custom Incentives Program projects during the period from June 2015 through May 2016 that were expected to provide savings of 19,028,447 kWh. Additionally, there were 378 Standard Incentives Program projects during the period June 2015 through May 2016 that were expected to provide savings of 22,700,082 kWh.

Table 2-1 Ex Ante kWh Savings for Custom and Standard Incentives Programs

Utility	*Ex Ante kWh Savings*	
	Custom Incentives Program	*Standard Incentives Program*
Ameren	7,137,552	1,116,293
ComEd	11,890,895	21,583,789
Total	19,028,447	22,700,082

Expected natural gas savings are shown in Table 2-2 by utility for the Custom and Standard Incentives Programs. There were 33 Custom Incentives Program projects during the period June 2015 through May 2016, which were expected to provide a total savings of 864,613 therms. The 15 Standard Incentives Program projects during the same period were expected to provide a total savings of 90,838 therms.

Table 2-2 Ex Ante Therm Savings for Custom and Standard Incentives Programs

Utility	*Ex Ante Therm Savings*	
	Custom Incentives Program	*Standard Incentives Program*
Ameren	564,641	0
Nicor	0	14,428
North Shore	0	0
Peoples	299,972	76,410
Total	864,613	90,838

Figure 2-1 shows the Custom Incentives Program's realized kWh savings by the date of application submission.

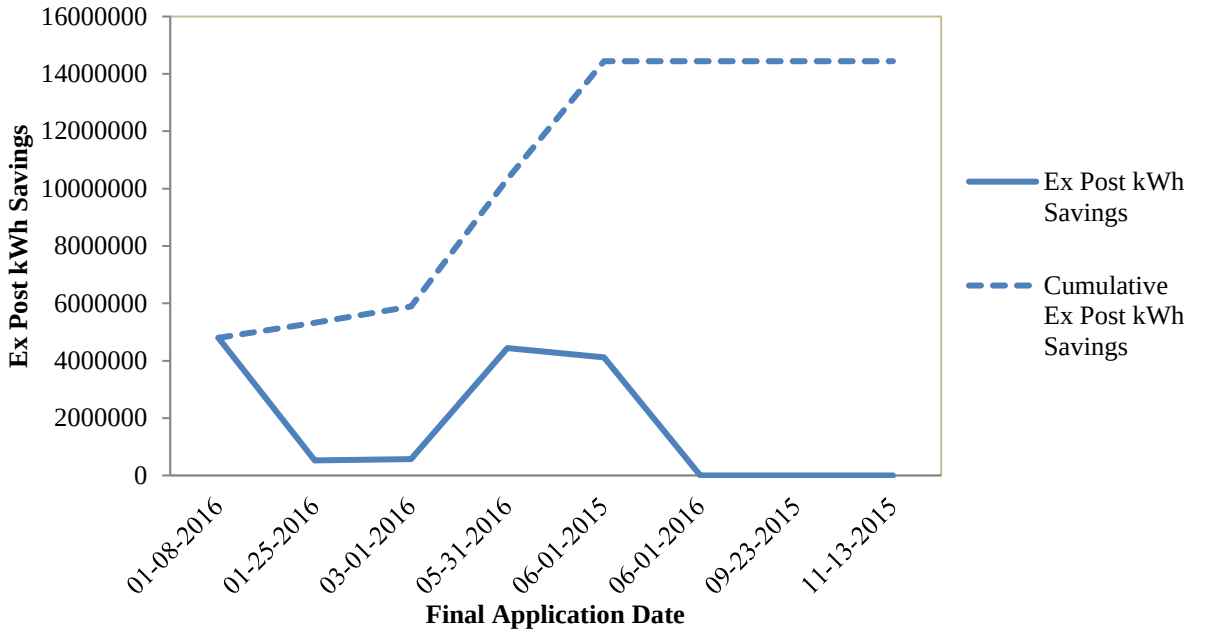

Figure 2-1 Custom Incentives Program Cumulative Ex Post kWh Savings by Date of Application Submission

Figure 2-2 shows the Standard Incentives Program's realized kWh savings by the date of application submission.

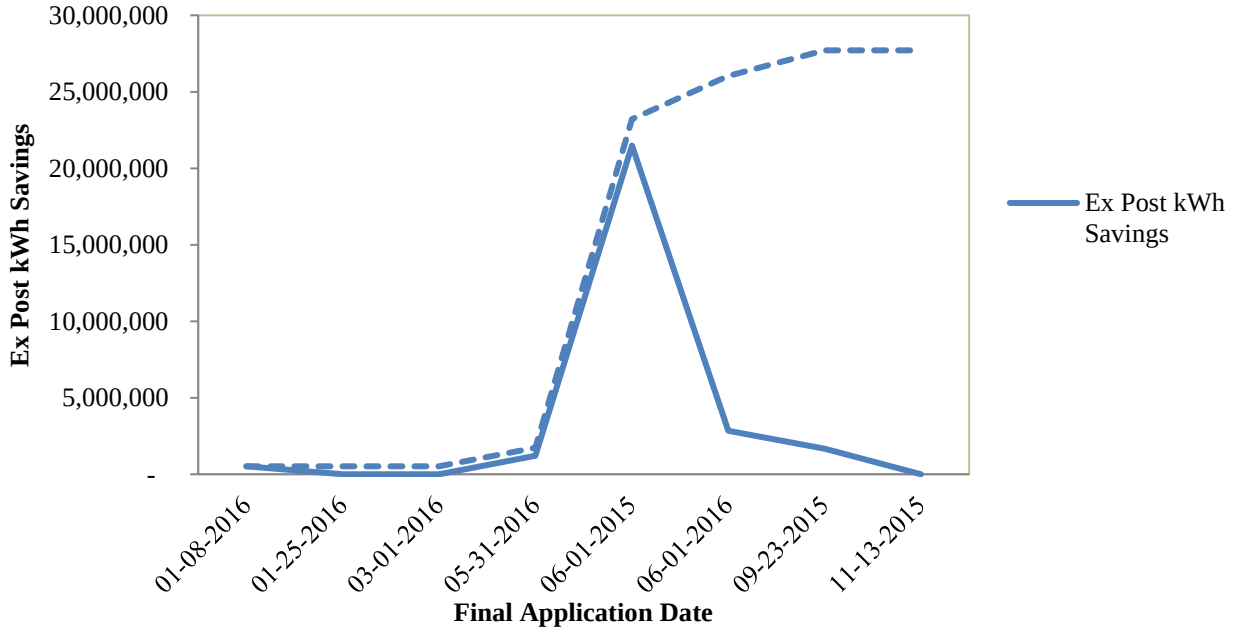

Figure 2-2 Standard Incentives Program Cumulative Ex Post kWh Savings by Date of Application Submission

Figure 2-3 shows the Custom Incentives Program's realized therm savings by the date of application submission.

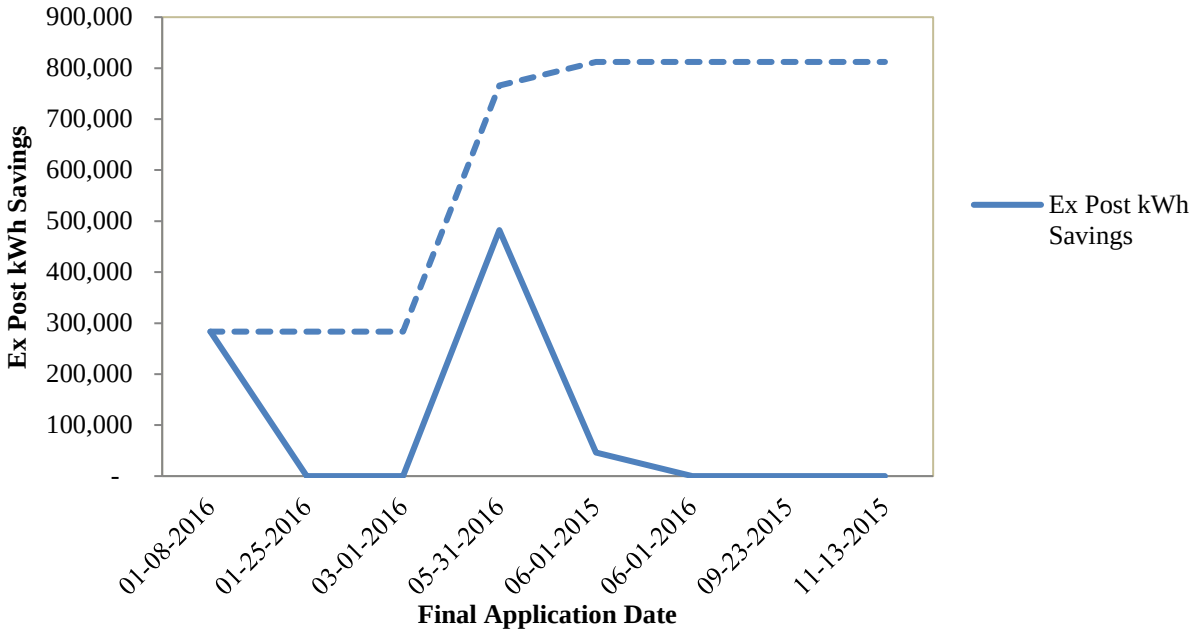

Figure 2-3 Custom Incentives Program Cumulative Ex Post Therm Savings by Date of Application Submission

Figure 2-4 shows the Standard Incentives Program's realized therm savings by the date of application submission.

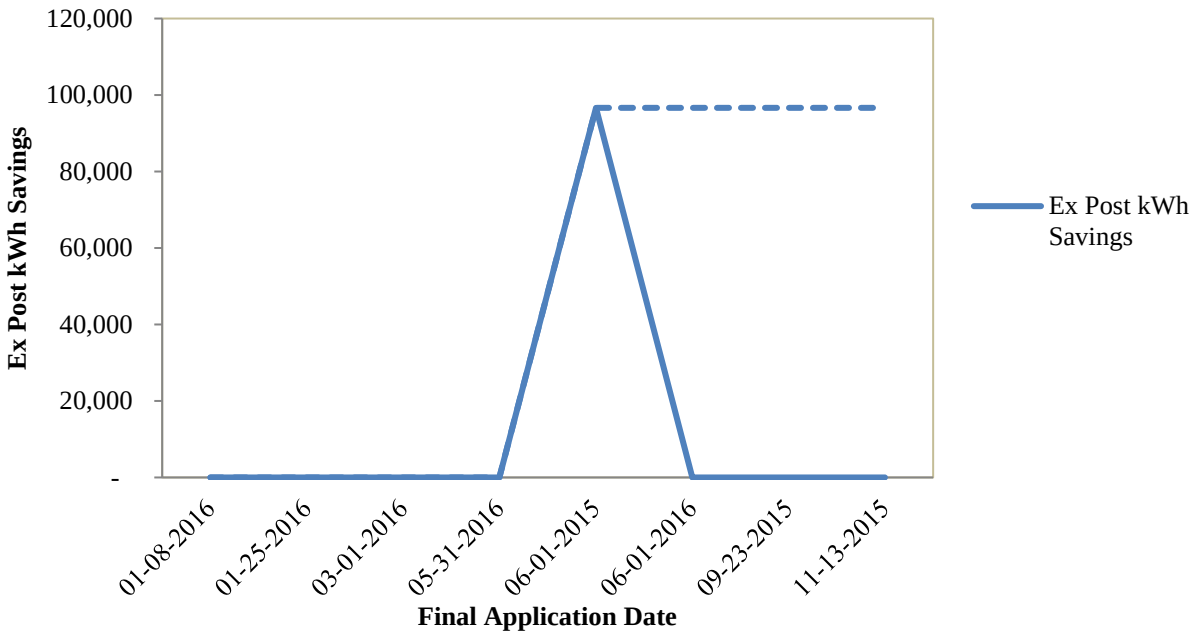

Figure 2-4 Standard Incentives Program Cumulative Ex Post Therm Savings by Date of Application Submission

2.2 Overview of Evaluation Approach

The objective of the impact evaluation performed for the Custom and Standard Incentives Programs was to determine the gross and net electric and natural gas savings and peak demand (kW) reductions resulting from projects completed during the June 2015 through May 2016 period.

The evaluation approach had the following main features:

- Available documentation (e.g., audit reports, savings calculation work papers, etc.) was reviewed for a sample of projects, with particular attention to the calculation procedures and documentation for savings estimates.
- On-site data collection was conducted for a sample of projects to provide the information needed for estimating savings and demand reductions. Monitoring was also conducted at some sites to obtain more accurate information on the hours of operation for lighting, HVAC equipment, and motors/VFDs.
- The Illinois Statewide Technical Reference Manual (TRM) Version 4.0 was used to estimate gross savings for measures implemented through the Standard Incentives Program. Measures implemented through the Custom Incentives Program, and non-TRM savings for measures implemented through the Standard Incentives Program were estimated using proven techniques, including industry standard engineering calculations and verification of computer simulations developed by program contractors to determine energy savings.

  - Analysis of lighting savings was conducted using ADM's custom-designed lighting evaluation model with system parameters (fixture wattage, operating characteristics, etc.) based on operating parameter information collected on-site and, if appropriate, industry standards.
  - For HVAC measures, the original analyses used to calculate the expected savings were reviewed and the operating and structural parameters of the analysis were verified. For custom measures or relatively more complex measures, simulations with the DOE-2 energy analysis model were used to develop estimates of energy use and savings from the installed measures.

- A participant survey was conducted from a sample of program participants to gather information on participant decision-making and factors that affected net-to-gross savings ratios for the program.

2.3 Organization of Report

This report on the impact and process evaluation of the Custom and Standard Incentives Programs for the period June 2015 through May 2016 is organized as follows:

- Chapter 3 presents the methods used for and the results obtained from estimating gross savings for measures installed under the Custom and Standard Incentives Programs.
- Chapter 4 presents the methods used for and results obtained from estimating net savings for the Custom and Standard Incentives Programs.
- Chapter **Error! Reference source not found.** presents and discusses the methods used for and results obtained from the process evaluation of the Custom and Standard Incentives Programs.
- Appendix A: Site-Level Reports presents the methods and results for the individual sample site analyses.
- Appendix B: Custom and Standard Incentives Participant Survey provides a copy of the questionnaire used for the survey of decision makers for participants in the Custom and Standard Incentives Programs.
- Appendix C: Free Ridership Analysis presents the results of the analysis of alternative scoring options allowed for under the Illinois Statewide Technical Reference Manual (TRM) Version 6.0, Vol. 4, Core Non-Residential Free Ridership Protocol (p.29).

3. Estimation of Gross Savings

This chapter addresses the estimation of gross kWh, gross therm savings, and peak kW reductions resulting from measures installed in facilities of participants who obtained incentives under the Custom and Standard Incentives Programs during the period June 2015 through May 2016. Section 3.1 describes the methodology used for estimating gross savings. Section 3.2 presents the electric and natural gas gross savings results for the three programs.

3.1 Methodology for Estimating Gross Savings

This section describes the methodology used for estimating gross savings for the Custom and Standard Incentives Programs.

3.1.1 Sampling Plan

Data used to estimate the gross savings achieved through the Custom and Standard Incentives Programs were collected for samples of projects completed during the June 2015 through May 2016 period. Samples were drawn for both electric and natural gas savings achieved through the programs.

3.1.1.1 Samples for Electric Projects

Data obtained from the Department of Commerce showed that during the period June 2015 through May 2016, there were 51 Custom Incentives Program projects that were expected to provide total electric savings of 19,028,447 kWh annually. During the same period there were 378 Standard Incentives Program projects, which were expected to provide total electric savings of 22,700,082 kWh annually.

Inspection of data on kWh savings for individual projects obtained from the Department of Commerce indicated that the distribution of electric savings was generally positively skewed, with a small number of projects accounting for a high percentage of the estimated energy savings for the Custom and Standard Incentives Programs. Estimation of electric savings for Custom and Standard Incentives Programs is based on a ratio estimation, which allows a smaller sample size to be used while still meeting requirements for precision. The actual precision of the Custom Incentives Program sample for electric savings is ±8.70% at 90% confidence. The actual precision of the Standard Incentives Program sample for electric savings is ±8.00% at 90% confidence. Table 3-1 shows the number of projects and expected kWh savings for the Custom Incentives Program sample by stratum.

Table 3-1 Population Statistics Used for Sample Design for Custom Incentives Program kWh Savings

	Stratum 1	*Stratum 2*	*Stratum 3*	*Stratum 4*	*Stratum 5*	*Totals*

Strata boundaries (kWh)	900,001 – 3,042,000	250,001 - 900,000	50,001 – 250,000	5,001 – 50,000	5,000 <	
Number of projects	9	5	9	18	10	51
Total kWh savings	15,130,923	2,424,114	1,102,460	341,535	29,414	19,028,447
Average kWh Savings	1,681,214	484,823	122,496	18,974	2,941	373,107
Standard deviation of kWh savings	742,778	182,645	65,107	11,360	1,437	175,052
Coefficient of variation	0.44	0.38	0.53	0.60	0.49	0.47
Final design sample	8	2	2	4	3	19

Table 3-2 shows the number of projects and expected kWh savings of the Standard Incentives Program sample by stratum.

Table 3-2 Population Statistics Used for Sample Design for Standard Incentives Program kWh Savings

	Stratum 1	*Stratum 2*	*Stratum 3*	*Stratum 4*	*Stratum 5*	*Totals*
Strata boundaries (kWh)	750,001 – 1,463,249	250,001 - 750,000	25,001 – 75,000	25,001 – 25,000	5,000 <	
Number of projects	15	25	89	108	141	378
Total kWh savings	13,875,015	3,509,261	3,728,724	1,286,950	300,132	22,700,082
Average kWh Savings	925,001	140,370	41,896	11,916	2,129	60,053
Standard deviation of kWh savings	628,455	46,810	13,992	5,451	1,285	79,203
Coefficient of variation	0.68	0.33	0.33	0.46	0.60	1.32
Final design sample	15	4	2	2	3	26

As shown in Table 3-3, the sample projects account for approximately 72% of the Custom Incentives Program's expected kWh savings, and, as shown in Table 3-4, the Standard Incentives Program's sample projects account for approximately 64% of expected kWh savings.

Table 3-3 Ex Ante kWh Savings for Custom Incentives Sampled Projects by Stratum

Stratum	*Sample Ex Ante kWh Savings*	*Total Ex Ante kWh Savings*	*Percent of Ex Ante kWh Savings in Sample*
1	12,677,401	15,130,923	84%
2	657,959	2,424,114	27%
3	220,695	1,102,460	20%
4	59,216	341,535	17%
5	11,872	29,414	40%
Total	13,627,143	19,028,447	72%

Table 3-4 Ex Ante kWh Savings for Standard Incentives Sampled Projects by Stratum

Stratum	*Sample Ex Ante kWh Savings*	*Total Ex Ante kWh Savings*	*Percent of Ex Ante kWh Savings in Sample*
1	13,875,015	13,875,015	100%
2	585,334	3,509,261	17%
3	85,714	3,728,724	2%
4	24,461	1,286,950	2%
5	8,569	300,132	3%
Total	14,579,093	22,700,082	64%

3.1.1.2 Samples for Natural Gas Projects

Data obtained from the Department of Commerce showed that during the period June 2015 through May 2016, there were 33 Custom Incentives Program projects that were expected to provide natural gas savings of 864,613 therms. During the same period, there were 15 Standard Incentives Program projects that were expected to provide natural gas savings of 90,838 therms.

Inspection of data on therm savings for individual projects obtained from the Department of Commerce indicated that the distribution of savings was generally positively skewed, with a relatively small number of projects accounting for a high percentage of the estimated savings. Estimation of natural gas savings for Custom and Standard Incentives Program is based on a ratio estimation procedure, which allows a smaller sample size to be used while still meeting requirements for precision. The actual precision of the Custom Incentives Program sample is ±10.21% at 90% confidence, while the actual precision of the Standard Incentives Program sample is ±1.12% at 90% confidence.

Table 3-5 shows the number of projects and expected therm savings of the Custom Incentives Program sample by stratum.

Table 3-5 Population Statistics Used for Sample Design for Custom Incentives Program Therm Savings

	Stratum 1	Stratum 2	Stratum 3	Stratum 4	Stratum 5	Totals
Strata boundaries (therm)	100,001 – 197,326	50,001 – 100,000	25,000 – 50,000	5,001 – 25,000	5,000 <	
Number of projects	1	5	3	12	12	33
Total therm savings	197,326	411,270	107,724	115,382	32,911	864,613
Average therm savings	197,326	82,254	35,908	9,615	2,743	26,200
Standard deviation of therm savings	N/A.	13,850	12,532	4,410	1,515	8,811
Coefficient of variation	N/A.	0.17	0.35	0.46	0.55	0.34
Final design sample	1	2	2	2	4	11

Table 3-6 shows the number of projects and expected therm savings of the Standard Incentives Program sample by stratum.

Table 3-6 Population Statistics Used for Sample Design for Standard Incentives Program Therm Savings

	Stratum 1	Stratum 2	Stratum 3	Totals
Strata boundaries (therm)	12,001 – 20,615	1,001 – 12,000	1,000 <	
Number of projects	3	3	9	15
Total therm savings	55,658	32,419	2,761	90,838
Average therm savings	18,553	10,806	307	6,056
Standard deviation of therm savings	3,572	973	111	1,156
Coefficient of variation	0.19	0.09	0.36	0.19
Final design sample	3	3	2	8

As shown in Table 3-7 the sample projects account for approximately 50% of the Custom Incentives Program's expected therm savings, and as shown in Table 3-8, the sample projects account for approximately 98% of the Standard Incentives Program's expected therm savings.

Table 3-7 Ex Ante Therm Savings for Custom Incentives Sampled Projects by Stratum

Stratum	*Sample Ex Ante Savings*	*Total Ex Ante Savings*	*Percent of Ex Ante Therm Savings in Sample*
1	197,326	197,326	100%
2	411,270	136,956	33%
3	107,724	74,955	70%
4	115,382	13,943	12%
5	32,911	6,600	20%
Total	864,613	429,780	50%

Table 3-8 Ex Ante Therm Savings for Standard Incentives Sampled Projects by Stratum

Stratum	*Sample Ex Ante Savings*	*Total Ex Ante Savings*	*Percent of Ex Ante Therm Savings in Sample*
1	55,658	55,658	100%
2	32,419	32,419	100%
3	502	2,761	18%
Total	88,579	90,838	98%

3.1.2 Review of Documentation

For each project selected in the sample, ADM reviewed the available documentation for each incented measure including audit reports, savings calculation work papers, program forms, databases, billing data, and weather data, with particular attention given to documentation supporting calculation procedures and savings estimates. Each application was reviewed to verify inclusion of the following information:

- Documentation of the equipment replaced, including (1) descriptions, (2) schematics, (3) performance data, and (4) other supporting information;
- Documentation of the newly-installed equipment, including (1) descriptions, (2) schematics, (3) performance data, and (4) other supporting information.
- Information about ex ante savings calculation methodology, and assumptions that were employed.

In the event of uncertainty regarding project characteristics, or apparently incomplete project documentation, ADM staff contacted the Department of Commerce to obtain further project information from program staff, participants, or contractors that facilitated the project implementation. This will facilitate the development of an appropriate project-specific M&V plan.

3.1.3 On-Site Data Collection Procedures

Data collected through on-site visits included information on the facilities participating in the program and data used in calculating savings impacts. Documentation ADM collected from the Department of Commerce about projects selected in the M&V sample included company names, project ID, site address, and contact information.

During an on-site visit, ADM field staff performed the following tasks:

- Verified the implementation of all measures for which the participants received incentives by confirming that energy efficiency measures were installed correctly and were functional.
- Collected physical data needed to analyze realized energy savings from installed measures.
- Interviewed personnel at the facility to obtain additional information about installed measures.
- At sites requiring higher accuracy of savings calculations, staff monitored operating hours of the installed measures. Monitoring was not conducted at sites where project documentation allowed for sufficiently detailed calculations.

3.1.4 Procedures for Estimating Savings from Measures Installed

This section presents procedures used to estimate savings for projects implemented through the Custom and Standard Incentives Programs.

3.1.4.1 Procedures for Estimating Savings from Custom Incentives Program Projects

The method ADM employed for measures implemented through the Custom Incentives Program was dependent on the measure type. Categories of measures may include the following:

- Lighting;
- HVAC;
- Motors;
- VFDs;
- Compressed-Air;
- Refrigeration; and
- Process Improvements.

ADM used specific methods to determine gross savings for projects, depending on the type of measure analyzed. These typical methods are summarized in Table 3-9.

Table 3-9 Typical Methods to Determine Savings for Measures

Type of Measure	*Method to Determine Savings*
Compressed Air Systems	Engineering analysis, with monitoring data on load factor and schedule of operation
Lighting	Analysis based on data regarding wattages before and after installation of measures and lighting hours-of-use data
HVAC (including packaged units, chillers, cooling towers, and controls/EMS)	eQUEST model using DOE-2 as its analytical engine for estimating HVAC loads and calibrated with site-level billing data to establish a benchmark
Motors and VFDs	Measurements of power and run-time obtained through monitoring
Refrigeration	Simulations with eQUEST engineering analysis model, with monitoring data
Process Improvements	Engineering analysis, with monitoring data on load factor and schedule of operation

The activities specified in Table 3-9 generated calculations of project ex post gross energy savings. This allowed for calculation of a realization rate (the ratio of verified gross savings to expected gross savings) for each sampled project. ADM developed estimates of program level gross savings by applying the realization rates of sampled projects to non-sampled projects.

Sampled sites with relatively high or low realization rates were further analyzed to determine the reasons for the discrepancy between expected and realized energy savings.

The following discussion describes the basic procedures used for estimating savings from various measure types.

Plan for Analyzing Savings from Lighting Measures: Lighting measures examined include retrofits of existing fixtures, lamps and/or ballasts with energy efficient fixtures, and lamps

and/or ballasts. These measures reduce demand, while not affecting operating hours. Any proposed lighting control strategies that might include the addition of efficient control technologies such as motion sensors or daylighting controls are examined. These measures typically involve a reduction in hours of operation and/or lower current passing through the fixtures.

Analyzing the savings from such lighting measures requires data for retrofitted fixtures on (1) wattages before and after retrofit, and (2) hours of operation before and after the retrofit. Fixture wattages are taken from a table of standard wattages, with corrections made for non-operating fixtures. Hours of operation are determined from metered data collected after measure installation for a sample of fixtures.

To determine baseline and post-retrofit demand values for the lighting efficiency measures, ADM uses in-house data on standard wattages of lighting fixtures and ballasts to determine demand values for lighting fixtures. These data provide information on wattages for common lamp and ballast combinations.

As noted, ADM collects data with which to determine average operating hours for retrofitted fixtures by using time-of-use data loggers to monitor a sample of "last points of control" for unique usage areas in the sites where lighting efficiency measures have been installed. Usage areas are defined to be those areas within a facility that are expected to have comparable average operating hours. Typical usage areas are designated in the forms used for data collection.

ADM uses per-fixture baseline demand, retrofit demand, and appropriate post-retrofit operating hours to calculate peak capacity savings and annual energy savings for sampled fixtures of each usage type.

Peak demand reductions (kW) are calculated for projects that are part of the sample for measurement and verification. To calculate total peak demand reductions, the total realized peak kW reductions for the sampled projects of a stratum were factored by the ratio of total expected kWh savings to sample expected kWh savings.

Peak demand reductions are calculated as the difference between peak period baseline demand and post-installation peak period demand of the affected lighting equipment, per the following formula:

$$\text{Peak Demand Reductions} = kW_{before} - kW_{after}$$

The baseline and post-installation average demands are calculated by dividing the total kWh usage during the peak period by the number of hours in the peak period.

ADM calculates annual energy savings for each sampled fixture per the following formula:

$$\text{Annual Energy Savings} = kWh_{before} - kWh_{after}$$

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

- Results from the monitored sample are used to calculate the average operating hours of the metered lights in each costing period for every unique building type/usage area.
- These average operating hours are then applied to the baseline and post-installation average demand for each usage area to calculate the respective energy usage and peak period demand for each usage area.
- The annual baseline energy usage is the sum of the baseline kWh for each costing period for all of the usage areas. The post-retrofit energy usage is calculated similarly. The energy savings are calculated as the difference between baseline and post-installation energy usage.
- Savings from lighting measures in conditioned spaces are factored by the region-specific, building type-specific heating/cooling interaction factors in order to calculate total savings attributable to lighting measures, inclusive of impacts on HVAC operation.

Plan for Analyzing Savings from HVAC Measures: Savings estimates for HVAC measures installed at a facility are derived by using the energy use estimates developed through DOE-2 simulations and engineering calculations. The HVAC simulations also allow calculation of the primary and secondary effects of lighting measures on energy use. Each simulation produces estimates of HVAC energy and demand usage to be expected under different assumptions about equipment and/or construction conditions. There may be cases in which DOE-2 simulation is inappropriate because data are not available to properly calibrate a simulation model, and engineering analysis provides more accurate M&V results.

For the analysis of HVAC measures, the data collected through on-site visits and monitoring are utilized. Using this data, ADM prepares estimates of the energy savings for the energy efficient equipment and measures installed in each of the participant facilities. Engineering staff develop independent estimates of the savings through engineering calculations or through simulations with energy analysis models. By using energy simulations for the analysis, the energy use associated with the end-use affected by the measure(s) being analyzed can be quantified. With these quantities in hand, it is a simple matter to determine what the energy use would have been without the measure(s).

Before making the analytical runs for each site with sampled project HVAC measures, engineering staff prepare a model calibration run. This is a base case simulation to ensure that the energy use estimates from the simulations have been reconciled against actual data on the building's energy use. This run is based on the information collected in an on-site visit pertaining to types of equipment, their efficiencies and capacities, and their operating profiles. Current operating schedules are used for this simulation, as are local (TMY) weather data covering the study period. The model calibration run is made using actual weather data for a time period corresponding to the available billing data for the site.

The goal of the model calibration effort is to have the results of the DOE-2 simulation come within approximately 10% of the patterns and magnitude of the energy use observed in the

billing data history. In some cases, it may not be possible to achieve this calibration goal because of idiosyncrasies of particular facilities (e.g., multiple buildings, discontinuous occupancy patterns, etc.).

Once the analysis model has been calibrated for a particular facility, ADM performs three steps in calculating estimates of energy savings for HVAC measures installed or to be installed at the facility.

- First, an analysis of energy use at a facility under the assumption that the energy efficiency measures are not installed is performed.
- Second, energy use at the facility with all conditions the same but with the energy efficiency measures now installed is analyzed.
- Third, the results of the analyses from the preceding steps are compared to determine the energy savings attributable to the energy efficiency measure.

Plan for Analyzing Savings from Motors: Estimates of the energy savings from use of high efficiency motors on HVAC and non-HVAC applications are derived through an "after-only" analysis. With this method, energy use is measured only for the high efficiency motor and only after it has been installed. The data thus collected are then used in estimating what energy use would have been for the motor application *if the high efficiency motor had not been installed*. In effect, the after-only analysis is a reversal of the usual design calculation used to estimate the savings that would result from installing a high efficiency motor. That is, at the design stage, the question addressed is how would energy use change for an application if a high efficiency motor is installed, whereas the after-only analysis addresses what the level of energy use would have been had the high efficiency motor not been installed.

For the "after only" analysis, it is not possible to use a comparison of direct measurements to determine savings, since measured data are collected only for the high efficiency motor. However, savings attributable to installation of the high efficiency motor can be estimated using information on the efficiencies of the high efficiency motor and on the motor it replaced. In particular, demand and energy savings can be calculated as follows:

$$\text{Demand Savings} = kW_{peak} \times (1/Eff_{old} - 1/Eff_{new})$$

kWpeak = Volts x Ampspeak x Power Factor, and Ampspeak is the interval with the maximum recorded amps during the monitoring period.

$$\text{Energy Savings} = kW_{ave} \times (1/Eff_{old} - 1/Eff_{new}) \times \text{Hours of use}$$

kWave = Volts x Ampsave x Power Factor and Ampsave is the average measured amps for the duration of the monitored period.

$$\text{Annual Energy Savings} = kW_{ave} \times (1/Eff_{old} - 1/Eff_{new}) \times (\text{days of operation per year/days metered}) \times \text{Annual Adjustment Factor}$$

kW_{ave} = Volts x $Amps_{ave}$ x Power Factor is for the monitoring period, $Amps_{ave}$ is the average measured amps for the duration of the monitored period, and use factor is determined from interviews with site personnel. The Annual Adjustment Factor is 1 if the monitoring period is typical for the yearly operation, less than 1 if the monitoring period is expected to be higher use than typical for the rest of the year, and more than 1 if the monitoring period is expected to be lower than typical for the rest of the year.[1]

The information on motor efficiencies needed for the calculation of savings is obtained from different sources. The data on the efficiencies of high efficiency motors installed under the program should be available from program records. In some cases, the efficiencies of the replaced motors may also be noted in the Department of Commerce's program records. If the motor replacement is for normal replacement, the baseline efficiency is established as the efficiency of new, standard efficiency motor. However, in cases of early replacement, the efficiency of the old motor is used for the length of the remaining life. [2]

Because most motors monitored run only under full load conditions, some adjustments must be made from the "industry averages" of full load efficiencies. Motor efficiency curves of typical real motors that have the same full load efficiencies are used for determining part load efficiencies.

As is seen with motor efficiency, the power factor varies with motor loading. Motor power factor curves of typical real motors that have the same full load power factor are used for determining part load power factor.

Another factor to consider in demand and energy savings comparisons of motor change out programs is the rotor slip. Full load RPM ratings of motors vary. For centrifugal loads such as fans and pumps, the power supplied is dependent on the speed of the driven equipment. The power is theoretically proportional to the cube of the speed, but in practice more closely approximates the square of the speed. In general, high efficiency motors have slightly higher full load RPM ratings (lower slip) than standard motors. Where nameplate ratings of full load RPM are available for replaced motors, a derating factor can be applied.[3]

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[1] Current year weather data were compared with the *Typical Meteorological Year* from the National Oceanic and Atmospheric Administration (NOAA).

[2] Assumptions regarding measure expected useful life were taken from the most recent Database for Energy Efficiency Resources (DEER). See http://www.deeresources.com/.

[3] As an example, take the case where a new motor has a full load RPM rating of 1770 and the old motor had a full load RPM rating of 1760. The derating factor would be:

Derating factor = $(RPM_{old})^2 / (RPM_{new})^2 = 1760^2 / 1770^2 = 0.989$

The data needed to carry out these plans for determining savings are collected from several sources.

- The first source of data is the information from each project's documentation. This information is expected to include aggregate energy used at a site, disaggregated energy usage data for certain targeted processes (if available), before (actual) and after (projected) data on production, scrap, other key performance indicators, and final reports (which include process improvement recommendations, analyses, conclusions, performance targets, etc.).
- The second source of data is energy use obtained from utilities.
- The third source is information collected through on-site inspections of the facilities. ADM staff collect the data during on-site visits using a form that is comprehensive in addressing a facility's characteristics, its modes and schedules of operation, and its electrical and mechanical systems. The form also addresses various energy efficiency measures, including high efficiency lighting (both lamps and ballasts), lighting occupancy sensors, lighting dimmers and controls, air conditioning, and high efficiency motors, etc.
- As a fourth source of data, selected end-use equipment are monitored to develop information on operating schedules and power draws.

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

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

ADM's dual approach to determining savings from installation of VFDs involves making one-time measurements of voltage, current, and power factor of the VFD/motor, and conducting continuous measurements of amperage over a period of time in order to obtain the data needed to develop VFD load profiles and calculate demand and energy savings. VFDs are generally used in applications where motor loading changes when motor speed changes. Consequently, the true power drawn by a VFD is recorded to develop VFD load shapes. One-time measurements of power are made for different percent speed settings. Power and percent speed or frequency (depending on VFD display options) are recorded for as wide a range of speeds as the participant

allows the process to be controlled, so field staff attempt to obtain readings from 40 to 100% speed in 10 to 15% increments.

Plan for Analyzing Savings from Compressed Air Measures: Measures to improve the efficiency of a compressed air system include the reduction of air leaks, resizing of compressors, installing more efficient compressors, improved controls, or a complete system redesign. Savings from such measures are evaluated through engineering analysis of compressor performance curves, supported by data collected through short-term metering.

ADM field staff obtain nameplate information for the pre-retrofit equipment either from the project file or during the on-site survey. Performance curve data are obtained from manufacturers. Engineering staff then conduct an engineering analysis of the performance characteristics of the pre-retrofit equipment. During the on-site survey, field staff inspect the as-built system equipment, take pressure and load readings, and interview the system operator to identify seasonal variations in load. Potential interactions with other compressors are assessed and it is verified that the rebated compressor is being operated as intended.

When appropriate, short-term measurements are performed to reduce the uncertainty in defining the load on the as-built system. These measurements may be taken either with a multi-channel logger, which can record true power for several compressors; with current loggers, which can provide average amperage values; or with motor loggers to record operating hours. The appropriate metering equipment is selected by taking into account variability in load and the cost of conducting the monitoring.

ADM used AirMaster+ to calculate the savings attributed to the energy efficiency measures installed within each compressed air system. The as-built and baseline compressor types were inputted into the model using data points collected during on-site verification. The as-built model was then calibrated to a typical daily schedule, derived from at least two weeks of trending data. Project energy savings were calculated by subtracting the as-built from the baseline energy consumption.

Plan for Analyzing Savings from Refrigeration and Process Improvements: Analysis of savings from refrigeration and process improvements is inherently project-specific. Because of the specificity of processes, analyzing the processes through simulations is generally not feasible. Rather, reliance is made on engineering analysis of the process affected by the improvements. Major factors in ADM's engineering analysis of process savings are operating schedules and load factors. Information on these factors is developed through short-term monitoring of the affected equipment, be it pumps, heaters, compressors, or other. The monitoring is done after the process change, and the data gathered on operating hours and load factors are used in the engineering analysis to define "before" conditions for the analysis of savings.

3.1.4.2 Procedures for Estimating Savings for the Standard Incentives Program

The Illinois Statewide Technical Reference Manual (TRM) Version 4.0 was used to estimate gross savings for measures implemented through the Standard Incentives Program. Project specific parameters for the gross savings analysis were taken from project documentation and information collected during site visits. Non-TRM savings measures implemented through the Standard Incentives Program were estimated using proven techniques, including industry standard engineering calculations and verification of computer simulations developed by program contractors to determine energy savings as outlined in Section 3.1.4.1.

Depending on the measure type, savings were calculated using up to three different TRM approaches. These approaches were as follows:

- TRM-Calculated: Savings calculated as per Illinois's Statewide TRM Version 4.0.
- ADM-Calculated: Savings calculated using a non-TRM methodology. ADM-Calculated savings were performed when the measure was not in the TRM or when the methodology in the TRM was not applicable because the assumptions provided were not appropriate for that measure.

Appendix A contains project-level M&V reports providing information regarding the factors determining ex post energy savings and variances between ex post and ex ante energy savings.

Gross savings were developed for measures not covered by the Illinois TRM using the methods described in Section 3.1.4.1.

3.2 Results of Gross Savings Estimation

This section presents the results of the gross savings estimation analysis. To estimate gross electricity (kWh) savings, peak demand (kW) reductions, and gross natural gas (therm) savings for the Custom and Standard Incentives Programs, data were collected and analyzed for samples of 19 Custom Incentives Program projects and 26 Standard Incentives Program projects. The data were analyzed using the methods described in Section 2.1 to estimate project kWh savings and peak kW reductions, and to determine realization rates for the programs.

3.2.1 Realized Gross kWh and Therm Savings

The gross kWh savings for the Custom Incentives Programs during the period June 2015 through May 2016 are summarized by sampling stratum in Table 3-10. Overall, the gross ex post savings of 14,442,590 kWh were equal to 76% of the expected savings.

Table 3-10 Ex Ante and Gross Ex Post kWh Savings for the Custom Incentives Program by Sample Stratum

Stratum	*Ex Ante kWh Savings*	*Gross Ex Post kWh Savings*	*Gross Realization Rate*
1	15,130,923	9,754,101	64%
2	2,424,114	2,870,938	118%
3	1,102,460	1,538,342	140%
4	341,535	271,385	79%
5	29,414	7,824	27%
Total	19,028,447	14,442,590	76%

The gross ex post kWh savings for the Standard Incentives Program for the period June 2015 through May 2016 is summarized in Table 3-11. Overall, the gross ex post savings of 27,710,285 kWh were equal to 122% of the expected savings.

Table 3-11 Ex Ante and Gross Ex Post kWh Savings for the Standard Incentives Program by Sample Stratum

Stratum	*Ex Ante kWh Savings*	*TRM-Calculated*	*ADM Calculated*	*Gross Realization Rate*
		Gross Ex Post kWh Savings	*Gross Ex Post kWh Savings*	
1	13,875,015	17,623,767	17,623,767	127%
2	3,509,261	2,913,094	2,913,094	83%
3	3,728,724	4,892,040	4,892,040	131%
4	1,286,950	1,664,666	1,664,666	129%
5	300,132	616,716	616,716	205%
Total	22,700,082	27,710,285	27,710,285	122%

Table 3-12 shows the expected and gross ex post kWh energy savings by sampled project for the Custom Incentives Program.

Table 3-12 Ex Ante and Gross Ex Post kWh Savings for the Custom Incentives Program by Project

Project ID	*Ex Ante kWh Savings*	*Gross Ex Post kWh Savings*	*Gross Realization Rate*
1	3,042,000	3,984,843	131%
4	2,258,620	0	0%
11	1,497,234	1,801,427	120%

Project ID	*Ex Ante kWh Savings*	*Gross Ex Post kWh Savings*	*Gross Realization Rate*
12	1,144,356	923,396	81%
13	389,413	360,887	93%
14	268,546	418,350	156%
16	57,860	97,035	168%
17	11,396	0	0%
18	952,002	977,335	103%
19	28,306	25,244	89%
20	162,835	159,552	98%
21	1,258,892	0	0%
27	1,614,817	524,832	33%
31	4,609	4,117	89%
32	5,393	4,818	89%
35	14,121	12,614	89%
38	3,839	2,046	53%
40	3,424	1,661	49%
54	909,480	564,933	62%
All Non-Sample Projects	5,401,304	4,579,500	85%
Total	19,028,447	14,442,590	76%

Table 3-13 shows the expected and gross ex post kWh energy savings by sampled project for the Standard Incentives Program.

Table 3-13 Ex Ante and Gross Ex Post kWh Savings for Standard Incentives Program by Project

Project ID	*Ex Ante kWh Savings*	*TRM-calculated*	*ADM Calculated*	*Gross Realization Rate*
	Ex Ante kWh Savings	*Gross Ex Post kWh Savings*	*Gross Ex Post kWh Savings*	
2	656,550	532,115	532,115	81%
3	368,740	294,547	294,547	80%
15	628,498	646,753	646,753	103%
17	109,877	91,569	91,569	83%
20	563,658	429,447	429,447	76%
22	1,930,275	2,769,268	2,769,268	143%
23	2,082,029	2,504,738	2,504,738	120%
24	1,839,370	2,550,945	2,550,945	139%
25	1,240,052	2,014,439	2,014,439	162%
26	925,122	1,029,801	1,029,801	111%
30	57,620	65,859	65,859	114%

Project ID	*Ex Ante kWh Savings*	*TRM-calculated*	*ADM Calculated*	*Gross Realization Rate*
	Ex Ante kWh Savings	*Gross Ex Post kWh Savings*	*Gross Ex Post kWh Savings*	
31	4,266	9,100	9,100	213%
32	3,089	6,590	6,590	213%
33	78,502	78,502	78,502	100%
34	32,948	32,948	32,948	100%
35	5,295	11,297	11,297	213%
36	252,877	295,792	295,792	117%
37	1,160,107	1,160,107	1,160,107	100%
38	8,488	2,719	2,719	32%
39	19,166	20,344	20,344	106%
40	193,996	119,306	119,306	61%
41	136,850	127,940	127,940	93%
42	57,021	83,762	83,762	147%
43	306,591	322,831	322,831	105%
44	28,693	28,693	28,693	100%
45	1,215	1,918	1,918	158%
46	253,790	207,058	207,058	82%
55	85,676	212,357	212,357	248%
56	702,891	1,018,599	1,018,599	145%
57	9,478	14,027	14,027	148%
58	6,261	9,202	9,202	147%
59	80,229	122,677	122,677	153%
60	302,924	802,841	802,841	265%
61	446,950	653,275	653,275	146%
All non-sample projects	8,120,990	9,438,919	9,438,919	116%
Total	22,700,082	27,710,285	27,710,285	122%

Table 3-14 summarizes the gross ex post therm savings for the Custom Incentives Program for the period June 2015 through May 2016. Overall, the gross ex post savings of 864,370 therms were equal to 100% of the expected savings.

Table 3-14 Ex Ante and Gross Ex Post Therm Savings for the Custom Incentives Program by Sample Stratum

Stratum	*Ex Ante Therm Savings*	*Gross Ex Post Therm Savings*	*Gross Realization Rate*
1	197,326	158,631	80%
2	411,270	221,508	54%
3	107,724	271,932	252%
4	115,382	130,064	113%
5	32,911	82,235	250%
Total	864,613	864,370	100%

Table 3-15 summarizes the gross ex post therm savings for the Standard Incentives Program for the period June 2014 through May 2015. Overall, the gross ex post savings of 96,646 therms were equal to 106% of the expected savings.

Table 3-15 Ex Ante and Gross Ex Post Therm Savings for the Standard Incentives Program by Sample Stratum

Stratum	*Ex Ante Therm Savings*	*TRM-Calculated*	*ADM Calculated*	*Gross Realization Rate*
		Gross Ex Post Therm Savings	*Gross Ex Post Therm Savings*	
1	55,658	55,658	55,658	100%
2	32,419	38,227	38,227	118%
3	2,761	2,761	2,761	100%
Total	90,838	96,646	96,646	106%

Table 3-16 shows the expected and gross ex post therm savings by sampled project for the Custom Incentives Program.

Table 3-16 Ex Ante and Gross Ex Post Therm Savings for the Custom Incentives Program by Project

Project ID	*Ex Ante Therm Savings*	*Gross Ex Post Therm Savings*	*Gross Realization Rate*
6	197,326	158,631	80%
7	65,670	28,059	43%
8	71,286	69,162	97%
9	6,916	4,873	70%
10	49,711	64,185	129%
16	2,532	1,468	58%

Project ID	*Ex Ante Therm Savings*	*Gross Ex Post Therm Savings*	*Gross Realization Rate*
17	606	0	0%
18	25,244	73,727	292%
19	2,188	2,356	108%
20	7,027	9,675	138%
29	1,274	11,901	934%
All Non-Sample Projects	434,833	440,333	101%
Total	864,613	864,370	100%

Table 3-17 shows the expected and gross ex post therm savings by sampled project for the Standard Incentives Program.

Table 3-17 Ex Ante and Gross Ex Post Therm Savings for the Standard Incentives Program by Project

Project ID	*Ex Ante Therm Savings*	*TRM-Calculated*	*ADM Calculated*	*Gross Realization Rate*
		Gross Ex Post Therm Savings	*Gross Ex Post Therm Savings*	
28	14,428	14,428	14,428	100%
47	20,615	20,615	20,615	100%
48	11,892	11,892	11,892	100%
49	10,013	12,917	12,917	129%
50	20,615	20,615	20,615	100%
51	251	251	251	100%
52	10,515	13,419	13,419	128%
53	251	251	251	100%
All Non-Sample Projects	2,259	2,259	2,259	100%
Total	90,838	96,646	96,646	106%

3.2.2 Discussion of Gross Savings Analysis

The project realization rates were reviewed to assess whether there were factors that were causing systematic differences in the realization rates.

For the Custom Incentives Program projects, sample project realization rates and expected kWh savings are plotted in Figure 3-1. There is not a strong association between realization rates and expected kWh savings. Figure 3-2 plots the custom incentive project realized kWh savings against the expected kWh savings for each sample point.

Similarly, for the Standard Incentives Program projects, sample project realization rates and expected kWh savings are plotted in Figure 3-3. There is not a strong association between realization rates and expected kWh savings. Figure 3-4 plots the standard incentive project realized kWh savings against the expected kWh savings for each sample point.

Case-by-case examination showed that project-specific factors were more likely to cause realized kWh savings to differ from expected savings. Project-specific factors include type of measure implemented, building type, facility operating schedule, and other parameters that may affect energy efficiency measure savings.

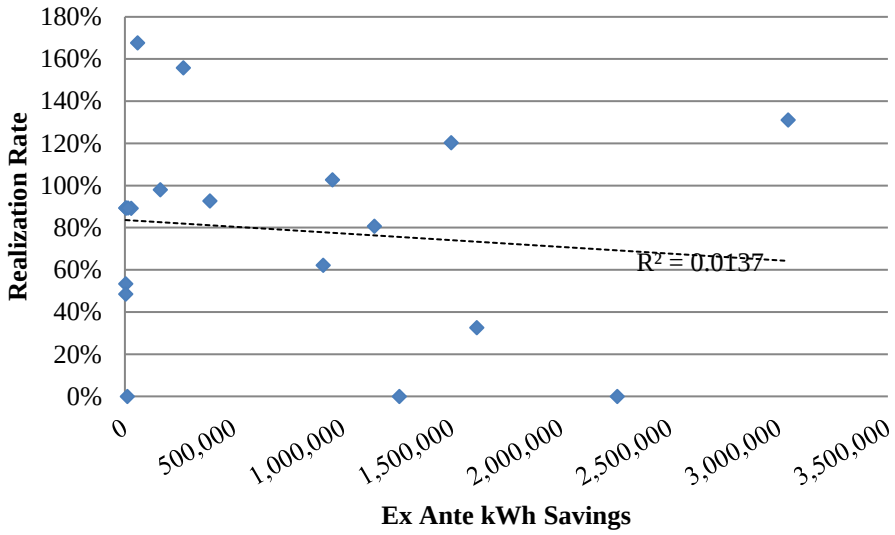


Figure 3-1 Custom Incentives Program Sample Project Realization Rate versus Ex Ante kWh Savings

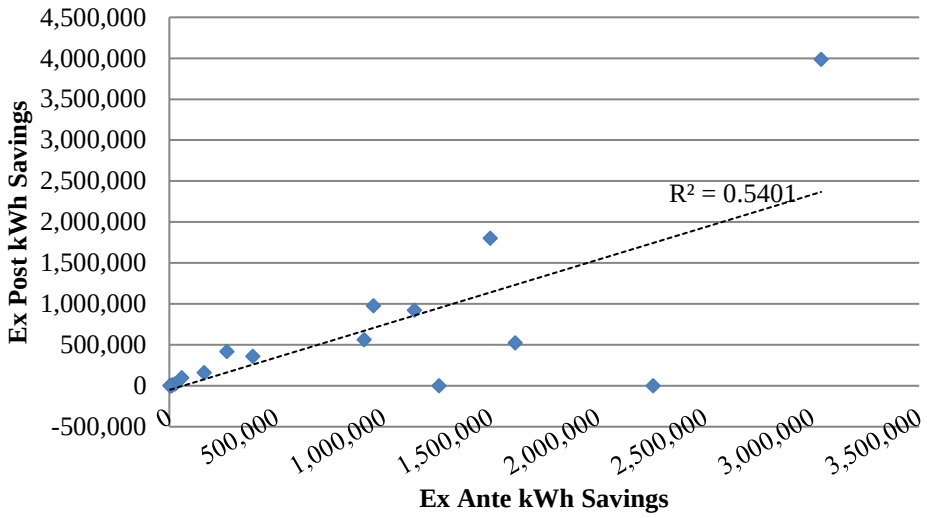


Figure 3-2 Custom Incentives Program Sample Project Ex Post kWh Savings versus Ex Ante kWh Savings

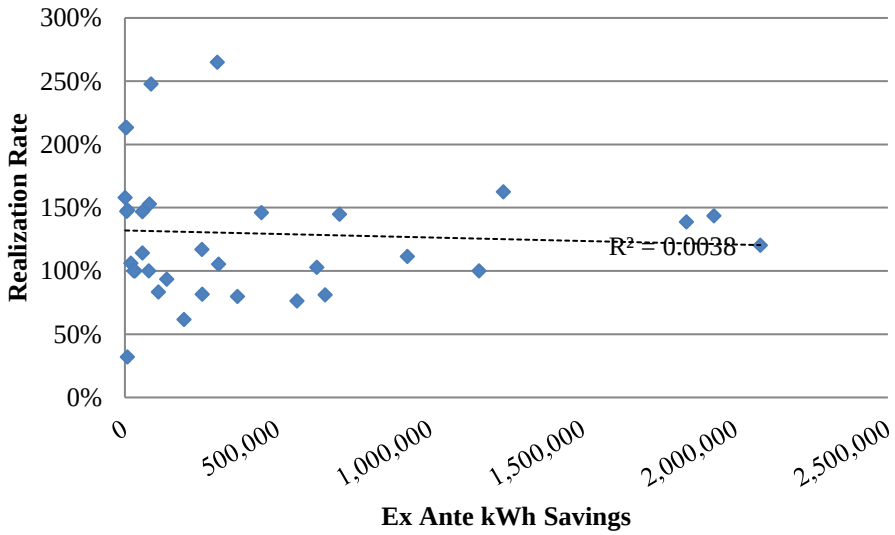


Figure 3-3 Standard Incentives Program Sample Project Realization Rate versus Ex Ante kWh Savings

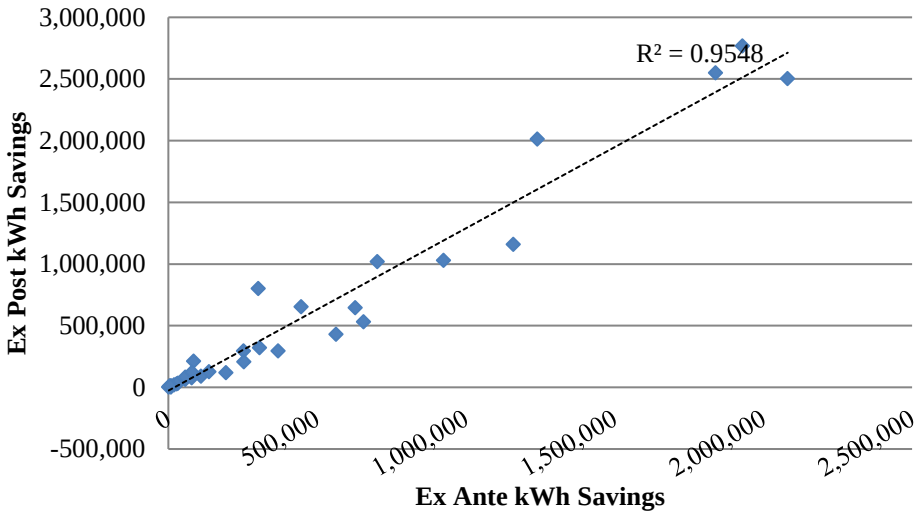


Figure 3-4 Standard Incentives Program Sample Project Ex Post kWh Savings (ADM Calculated) versus Ex Ante kWh Savings

Similarly, for the Custom Incentives Program, sample project realization rates and expected therm savings are plotted in Figure 3-5. There is not a strong association between realization rates and expected therm savings. Figure 3-6 plots the Custom Incentives Program's projects realized therm savings against the expected therm savings for each sample point. For the Standard Incentives Program, sample project realization rates and expected therm savings are plotted in Figure 3-7. There is not a strong association between realization rates and expected therm savings. Figure 3-8 plots the Standard Incentive Program's project realized therm savings against the expected therm savings for each sample point.

Case-by-case examination showed that project-specific factors were more likely to cause realized therm savings to differ from expected savings. Project-specific factors include type of measure implemented, building type, facility operating schedule, and other parameters that may affect energy efficiency measure savings.

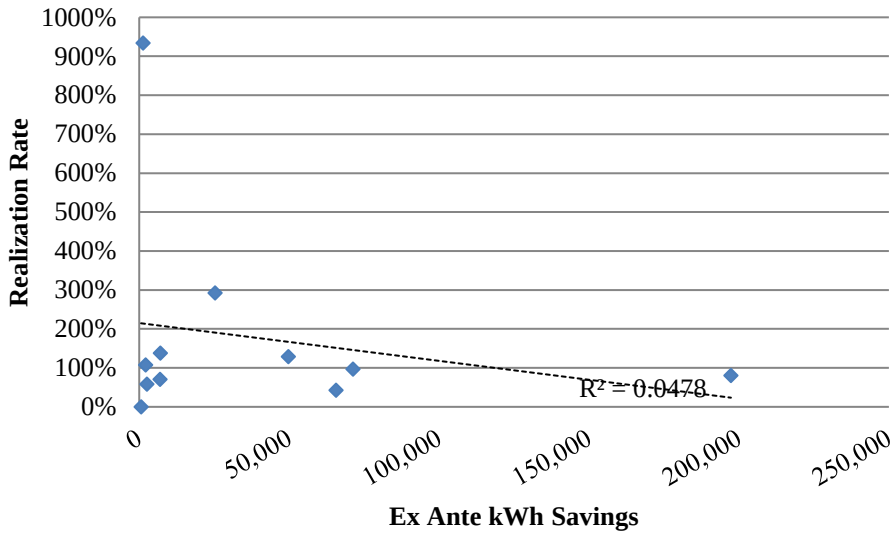


Figure 3-5 Custom Incentives Program Sample Project Realization Rate versus Ex Ante Therm Savings

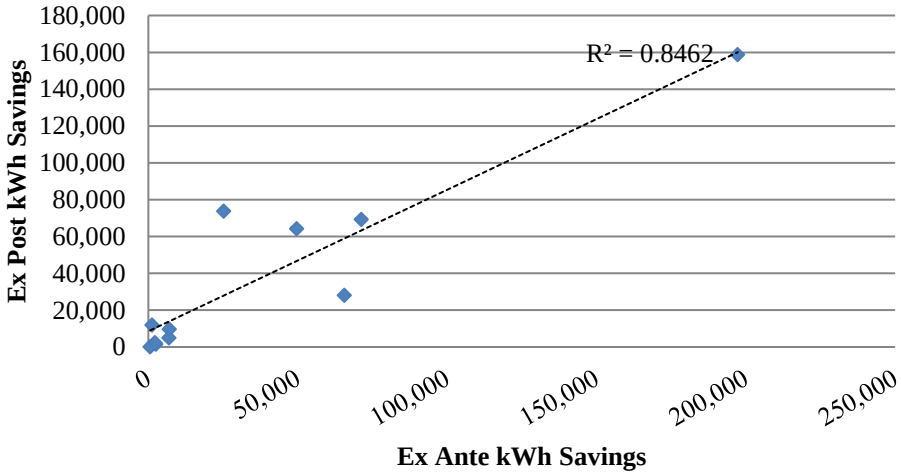


Figure 3-6 Custom Incentives Program Sample Project Ex Post Therm Savings versus Ex Ante Therm Savings

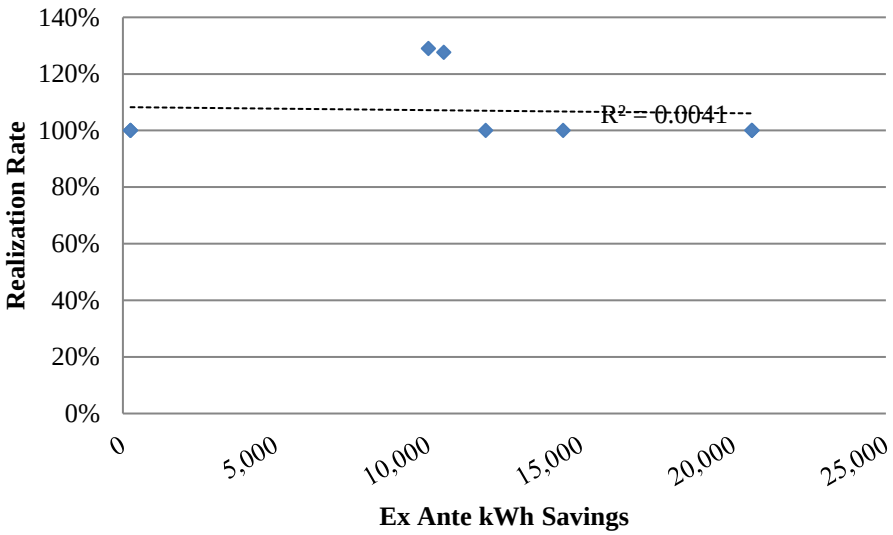


Figure 3-7 Standard Incentives Program Sample Project Realization Rate versus Ex Ante Therm Savings

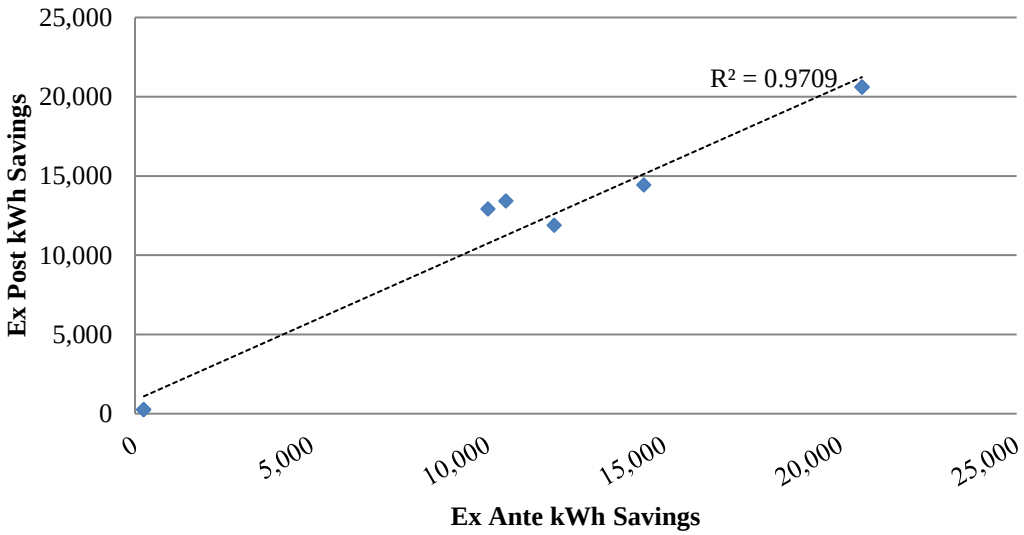


Figure 3-8 Standard Incentives Program Sample Project Ex Post Therm Savings (ADM Calculated) versus Ex Ante Therm Savings

4. Estimation of Net Savings

This chapter presents the net impacts of the Custom and Standard Incentives Programs during the period June 2015 through May 2016.

4.1 Procedures Used to Estimate Net Savings

Net savings are defined as the portion of gross savings that can be attributed to the effects of the program. The savings attributed to the program are comprised of the program gross savings, less any free ridership, and spillover effects.

Free riders of a program are defined as those participants who would have implemented the same energy efficiency measures and achieved the observed energy changes, even in the absence of the program. That is, because the energy savings realized by free riders are not induced by the program, these savings should not be included in the estimates of the program's actual (net) impacts. Without an adjustment for free ridership, some savings that would have occurred naturally would be incorrectly attributed to the program.

Spillover effects occur when energy savings accrue that are not included in program gross energy savings but are attributable to the program. That is, spillover savings result from program induced measures implemented outside of the program.

ADM performed a net savings analysis to estimate the impacts of the energy efficiency measures attributable to the Custom and Standard Incentives Programs that were net of free ridership and inclusive of participant spillover using a self-report methodology. Information on the program's impact on the participants' decision making was collected from a sample of program participants through a decision-maker survey. Appendix B provides a copy of the survey instrument used for Custom and Standard Incentives Program participants. The following sections describe the procedures used to estimate net savings.

4.1.1 Free Ridership

The following subsections describe the procedures used to develop participant free ridership scores.

Free ridership was calculated using the procedures outlined in the Core Non-Residential Free Ridership Protocol presented in the Illinois Statewide Technical Reference Manual (TRM) Version 6.0, Vol. 4 (p.29). The attachment provides for the calculation of multiple free ridership scores. Analysis and discussion of the alternative approaches and the results are presented in Appendix C.

4.1.1.1 Free Ridership Scores

Three component scores to estimate the likelihood that a participant would have implemented the project in the absence of the program were calculated to estimate free ridership.

The No-Program Score is based on the participant's assessment of the likelihood of completing the project in the absence of the program. Survey respondents are asked the following question:

> Using a scale where 0 is "Not at all likely" and 10 is "Extremely likely, if the program had not been available," what is the likelihood that you would have completed the project?"

The No-Program Score is equal to:

> [*Likelihood in Absence of Program*]/10

The Program Components Score is based on ratings of the impact of various factors on the decision to implement the project. Participants rate the impact of the program and non-program factors. The Program Components Score is equal to:

> 1 – ([*Highest Rated Program Factor*]/10)

The program factors Custom Incentive and Standard Incentive Program respondents rated include the following:

- The availability of the program incentive;
- The impact of technical assistance you received from program staff;
- The impact of a recommendation from Department of Commerce Program staff;
- The impact of information from Department of Commerce marketing materials; or
- The impact of an endorsement or recommendation by the Energy Resources Center, Smart Energy Design Assistance Center, or Midwest Energy Efficiency Alliance.

Additionally, program respondents are asked if any other factor influenced the project. These responses were coded as program or non-program factors and incorporated in the analysis.

The Program Influence Score is based on the relative importance of program and non-program factors in the decision to implement the measure. After rating the program and non-program factors, survey respondents were asked to allocate 100 points to program and non-program factors that reflected the importance of the program and other considerations to their decision to implement the project. Specifically, respondents were asked the following:

> "If you were given a TOTAL of 100 points that reflect the importance in your decision to implement the [MEASURE], and you had to divide those 100 points between: 1) the program, and 2) other factors, how many points would you give to the importance of the PROGRAM?"

The Program Influence Score is equal to:

1 – ([*Program Points*]/100)

The preliminary free ridership score is calculated as the average of the No-Program, Program Components, and Program Influence Score.

To account for the effect the program may have had on project timing, a timing adjustment factor was developed and applied to the overall free ridership score for Custom and Standard Incentive Program projects. This adjustment factor is based on responses to questions on when the project would have occurred in the absence of the program. The adjustment factor was based on the number of months the respondent reported the program expedited the project. Respondents who reported that in the absence of the program they would have completed the project at the same time were scored as zero months expedited. For those that reported that without the program they never would have completed the project, the months expedited was scored as 48. For all other responses, the number of months expedited were scored as shown in Table 4-1.

Table 4-1 Number of Months Expedited Scoring

Survey Response	*Number of Months Expedited*
0 to 6 months	3
7 months to 1 year	9
more than 1 year up to 2 years	18
more than 2 years up to 3 years	30
more than 3 years up to 4 years	42
Over 4 years	48

Respondents also estimated the likelihood of completing the project in the next 12 months. The response to this question was incorporated into the calculation of the timing adjustment factor. Specifically, the timing adjustment factor is equal to:

1 - ((*Number of Months Expedited* - 6)/42)*((10 - *Likelihood of Implementing within One Year*)/10)

4.1.1.2 Consistency Checks

Additional questions were administered to respondents who provided responses that appeared inconsistent with other responses. Specifically, respondents were asked to provide explanations or provide a new response if:

- The Program Influence Score was inconsistent with the ratings of the importance of the program components;
- The No-Program Score was inconsistent with the ratings of the importance of the program components; or

- The respondent indicated that they learned of the program after deciding to complete the project, but the Program Influence Score was greater than 70, the likelihood of completing the project was rated as less than three, or any of the ratings of the importance of the program factors were rated greater than seven.

4.1.1.3 Energy Efficiency Plans Score

ADM developed an Energy Efficiency Plans Score and incorporated it into the algorithm for calculation of participant free ridership. Program participants were asked a series of questions regarding plans they may have had prior to deciding to participate in the program. Respondents who provided a response that indicated the presence of plans were asked to rate how certain they were of the indication that they had plans using a 0-10 scale, where zero indicated that they were "Not at all certain" and 10 indicated that they were "Extremely certain."

The Energy Efficiency Plans Score is equal to zero for participants if either of the following was true:

- The respondent stated that they did not have plans before deciding to participate and provided a certainty rating greater than seven;
- The respondent stated that their plans did not specify the specific measure they implemented; or
- The respondent stated that they did not have funds to implement the measure before deciding to participant and provided a certainty rating greater than seven.

4.1.1.4 Calculation of Project Free Ridership

Overall, Custom and Standard Incentives project free ridership is equal to:

> ([*No Program Score*] + [*Program Influence Score*] + [*Program Components Score*]) * *Timing Adjustment Factor* Energy Efficiency Plans Score*

4.1.1.5 Application of Free Ridership Scores to Additional Projects

The questions used to calculate free ridership were asked in regards to a single project. Respondents who completed additional project(s) were asked the following question:

Participants who implemented the same measure as the focal measure at other locations were asked the following question:

> Our records show that [ORGANIZATION] also completed projects through [PROGRAM ADMINISTRATOR]'s [PROGRAM] at [NSAME] other [FACILITY/IES]. Was it a single decision to complete the additional [PROJECT/PROJECTS] through the program or did each project go through its own decision process?

Free ridership scores calculated for the focal project were applied to additional projects at other locations if the respondent indicated that it was a single decision.

Participants who implemented other measures at the same facility where the focal measure was implemented were asked the following question:

> Our records show that [ORGANIZATION] also received an incentive from [PROGRAM ADMINISTRATOR>'s [PROGRAM] for a [FDESC] project at [ADDRESS]. Was the decision-making process for that project the same as for the [ENDUSE] project we have been talking about?

Free ridership scores calculated for the focal project were applied to additional projects at other locations if the respondent indicated that it was the same decision making process.

4.1.1.6 Participant Spillover

To assess whether or not spillover savings were associated with program participants, survey respondents were asked about energy saving projects implemented outside of the program.

Respondents who reported installing additional measures were asked to provide information on the project. To determine whether or not the savings associated with measures are attributable to the program respondents were asked the following two questions:

1) "How important was your experience in 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?"
2) "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?"

Based on responses to these two questions, a program attribution score is calculated as follows:

> (Rating of Program Importance + (10 – Likelihood of Implementing without Participation)) / 2

Savings are considered attributable to the program if the score is greater than five.

4.1.2 Survey Administration

The EPY8/GPY5 program participants were interviewed by telephone. The sample was developed from data reported in the program-tracking database. Data were reviewed for missing or incomplete information.

Program projects were defined based on unique identifiers in program tracking data. In total, there were 16 unique decision-makers who completed projects through the Custom and Standard Incentives Programs.

Program participants were contacted up to five times to complete the survey. In total 7 decision-makers who completed projects through the Custom and Standard Incentive Programs were interviewed.

4.2 Results of Nets Savings Estimation

The procedures described in the preceding section were used to estimate free ridership, spillover, and net-to-gross ratios for the Custom Incentives and Standard Incentives Programs for the period June 2015 through May 2016.

4.2.1 Free Ridership Sample Characteristics

Table 4-2 and Table 4-3 summarize the free ridership sample characteristics for the electricity and natural gas saving projects of the Custom Incentives, Standard Incentives Programs, respectively.

Table 4-2 Summary of Sample Characteristics for Custom Incentive kWh and Therm Savings

Program	*Number of Respondents*	*Ex Post kWh Savings*	*Percent of Savings in Sample*
Custom	3	8,550,164	59%
Standard	3	4,125,649	15%

Table 4-3 Summary of Sample Characteristics for Standard Incentive kWh and Therm Savings

Program	*Number of Respondents*	*Ex Post Therm Savings*	*Percent of Savings in Sample*
Custom	1	444,838	51%
Standard	0	0	0%

4.2.2 Participant Spillover

None of the survey respondents reported implementing any additional measures attributable to the program.

4.2.3 Net Savings by Utility

The net ex post electric savings of the Custom and Standard Incentives Programs during the period June 2015 through May 2016 are summarized by utility in Table 4-4 and Table 4-5. For the period, net ex post kWh savings for the Custom Incentives Program total 13,992,488 and net ex post kWh savings for the Standard Incentives Program total 20,321,303. The net-to-gross ratio for the Custom Incentives Program is 97%, while the net-to-gross ratio for the Standard Incentives Program is 73%.

Table 4-4 Summary of kWh Savings for the Custom Incentives Program

Utility	*Ex Ante kWh Savings*	*Gross Ex Post kWh Savings*	*Net Ex Post kWh Savings*	*Net-to-Gross Ratio*
Ameren	7,137,552	8,425,929	8,159,464	97%
ComEd	11,890,895	6,016,661	5,833,024	97%
Total	19,028,447	14,442,590	13,992,488	97%

Table 4-5 Summary of kWh Savings for the Standard Incentives Program

Utility	*Ex Ante kWh Savings*	*Gross Ex Post kWh Savings*	*Net Ex Post kWh Savings*	*Net-to-Gross Ratio*
Ameren	1,116,293	1,201,074	880,806	73%
ComEd	21,583,789	26,509,210	19,440,497	73%
Total	22,700,082	27,710,285	20,321,303	73%

The net ex post natural gas savings of the Custom and Standard Incentives Programs during the period June 2015 through May 2016 are summarized by utility in Table 4-6 and Table 4-7. For the period, net ex post natural gas savings for the Custom Incentives Program total 812,508 therms, and net ex post natural gas savings for the Standard Incentives Program total 90,847 therms. The net-to-gross ratio for the Custom Incentives Program is 94%, and the net-to-gross ratio for the Standard Incentives Program is 94%.

Table 4-6 Summary of Therm Savings for the Custom Incentives Program

Utility	*Ex Ante Therm Savings*	*Gross Ex Post Therm Savings*	*Net Ex Post Therm Savings*	*Net-to-Gross Ratio*
Ameren	564,641	504,331	474,071	94%
Nicor	0	0	0	0%
North Shore	0	0	0	0%
Peoples	299,972	360,039	338,437	94%
Total	864,613	864,370	812,508	94%

Table 4-7 Summary of Therm Savings for the Standard Incentives Program

Utility	*Ex Ante Therm Savings*	*Gross Ex Post Therm Savings*	*Net Ex Post Therm Savings*	*Net-to-Gross Ratio*
Ameren	0	0	0	0%
Nicor	14,428	14,428	13,562	94%
North Shore	0	0	0	0%
Peoples	76,410	82,218	77,285	94%
Total	90,838	96,646	90,847	94%

4.2.4 Net Ex Post Peak Demand Reductions

The net ex post peak demand reductions for the Custom and Standard Incentives Programs during the period June 2015 through May 2016 are summarized by utility in Table 4-8 and Table 4-9.

The net ex post peak demand savings for the Custom Incentives Program total 1,175.51 kW and the net ex post peak demand savings for the Standard Incentives Program total 2,934.75 kW.

Table 4-8 Summary of Net Peak kW Reductions for the Custom Incentives Program

Utility	*Ex Ante kWh Savings*	*Gross Ex Post kWh Savings*	*Net Ex Post kWh Savings*	*Net-to-Gross Ratio*
Ameren	N/A.	855.01	831.01	97%
ComEd	N/A.	354.45	344.50	97%
Total	N/A.	1,209.46	1,175.51	97%

Table 4-9 *Summary of Net Peak kW Reductions for the Standard Incentives Program*

Utility	*Ex Ante kWh Savings*	*Gross Ex Post kWh Savings*	*Net Ex Post kWh Savings*	*Net-to-Gross Ratio*
Ameren	248.14	196.95	141.49	72%
ComEd	4,049.16	3,887.96	2,793.25	72%
Total	4,297.30	4,084.90	2,934.75	72%

5. Appendix A: Site-Level Reports

Site ID: 1

Executive Summary

The program participant received custom incentives for the installation of fine bubble membrane diffusers replacing dome diffusers at a wastewater treatment plant. The gross realization rate for these measures is 131%.

Project Description

The participant installed fine bubble membrane diffusers replacing dome diffusers at a wastewater treatment plant. The existing aeration diffusers were replaced with fine bubble diffusers which allow for a high rate of oxygen transfer to the waste, thus reducing aeration needs and subsequent blower energy consumption.

Methodology for Estimating Gross Savings

During the M&V visit, field staff verified equipment installation/operation, and obtained historical influent/effluent data from the facility's SCADA system.

In order to calculate the annual savings as a result of the project, ADM performed a multivariable linear regression using influent flow as a variable. The form of the regression model with an R^2 of 0.99 is as follows:

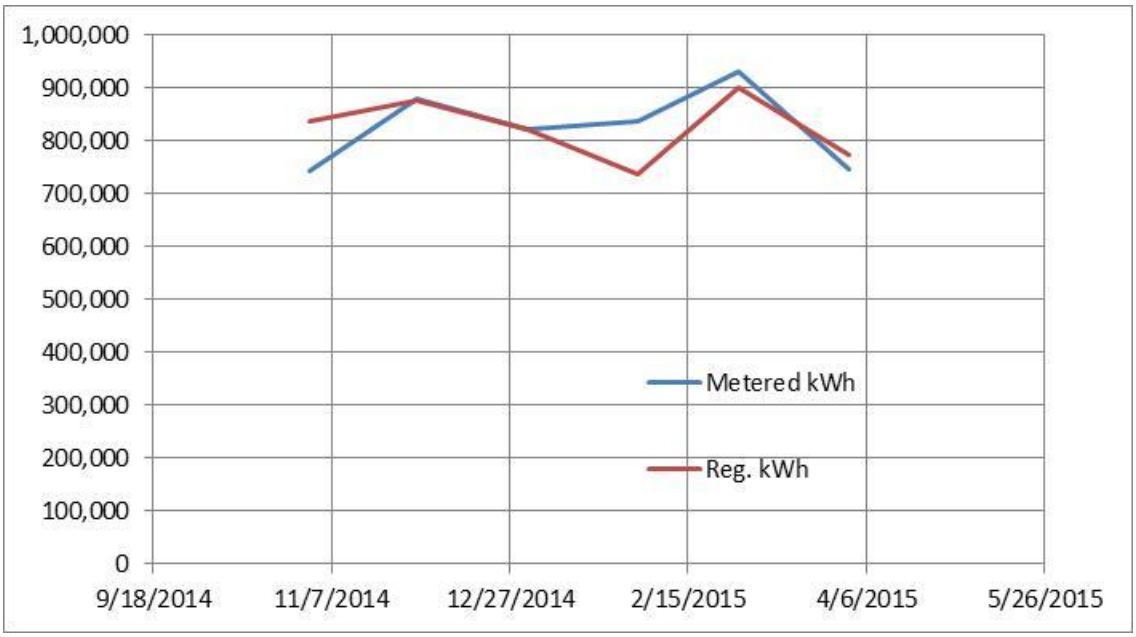
$$kWh_{monthly} = 30{,}436 \times MGD - 332{,}070 \times Post$$

Where,

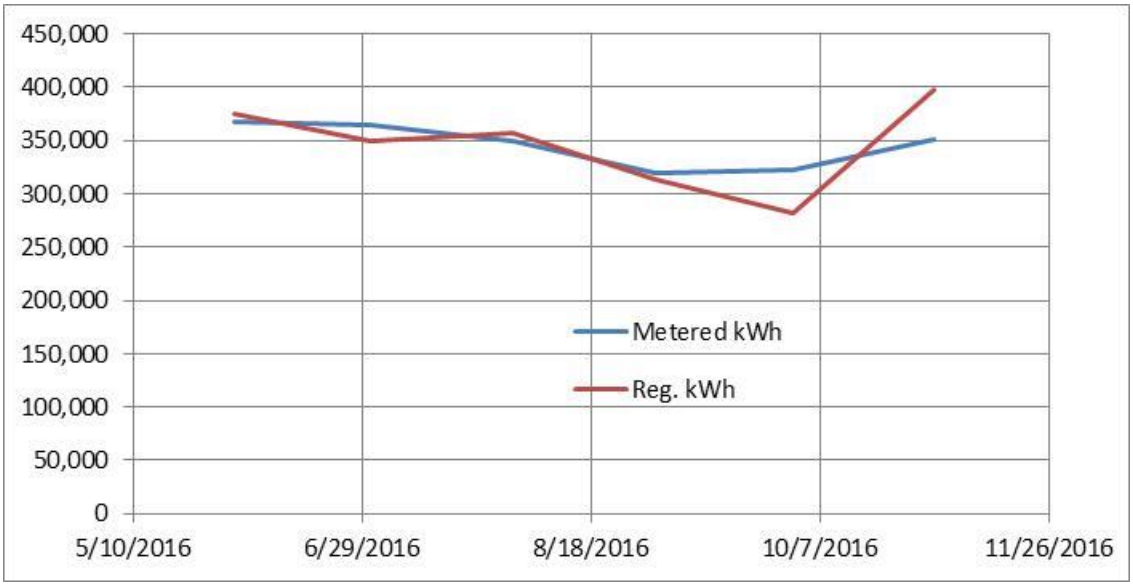
$kWh_{monthly}$	= Monthly kWh consumption of the facility
MGD	= Average effluent flow of a given month in Million Gallons per Day
Post	= Binary flag denoting a post project billing month, 1 = Post

The following graphs illustrate the monthly kWh calculated by the above equations, compared to the actual billed kWh for both the pre- and post-retrofit billing periods:

Pre-Retrofit Billed kWh vs. Regressed kWh



Post-Retrofit Billed kWh vs. Regressed kWh



Measure-level Gross Savings Results

The derived regression equations results in a typically monthly savings of 332,070 kWh which results in an annual energy savings of 3,984,843 kWh for the project.

The table shown below presents the verified gross savings for measures that received custom incentives.

Annual kWh Savings for WWTP Upgrades

Measure	*Annual Gross kWh Savings*	
	Ex Ante	*ADM Calculated Ex Post*
WWTP Upgrades	3,042,000	3,984,843
Total	**3,042,000**	**3,984,843**

Project-level Gross Savings Results

The tables shown below present the verified gross savings for this project.

Verified Electric Savings/Realization Rates

Incentive Type	*Measure Category*	*Annual Gross Savings*				*Lifetime Gross Savings*
		Ex Ante kWh	*Ex Post kWh*	*Realization Rate*	*Ex Post Peak kW Reduction*	*Ex Post kWh*
Custom	WWTP Upgrades	3,042,000	3,984,843	131%	455	59,772,649
Total		**3,042,000**	**3,984,843**	**131%**	**455**	**59,772,649**

The realization rate for this project is 131%. The realization is 131% due the ex ante savings being based on assumed post conditions. The ex ante analysis assumed the post: air flow, pressure, VFD speed, and horsepower. The ex ante analysis appears to have made conservative assumptions for the post conditions.

The ex post analysis uses actual pre and post billing data to derive savings. This methodology accounts for the actual pre and post conditions.

Site ID: 2

Executive Summary

The program participant received Standard program incentives for retrofitting lighting and installing occupancy controls. The gross realization rate for these measures is 81%.

Project Description

The participant implemented the following measure(s):

- (84) Permanent 4' T8 lamp removals
- (2,239) Permanent 4' T8 lamp removals with installed reflectors
- (3,828) 32W T8 lamps replaced with 28W T8 lamps
- (26) 185W MH fixtures replaced with 42W LED wall packs
- (233) Fixture-mounted occupancy sensors installed (12,815 controlled watts)
- (45) Exterior 265W MH fixtures replaced with 118W LED fixtures
- (11) Exterior 262W MH fixtures replaced with 118W LED fixtures
- (21) Exterior 129W MH fixtures replaced with 28W LED fixtures

Methodology for Estimating Gross Savings

ADM staff inspected project documentation pertaining to the lighting retrofit.

Energy savings for the lighting retrofit were calculated according to the Illinois TRM 4.0, measures 4.5.2, 4.5.3, 4.5.4, and 4.5.10. Algorithms pertaining to savings calculations are presented below.

Electric Energy Savings

$$\Delta kWh\ (reduced\ wattage) = \left(\frac{Watts_{base} - Watts_{EE}}{1000}\right) * \ Hours * WHF_e * ISR$$

Where:

$Watts_{base}$	= input wattage of the baseline system
$Watts_{EE}$	= new input wattage of EE fixture
WHF_e	= waste heat factor to account for cooling energy savings
ISR	= in service rate (% of units rebated that get installed) = 1

$$\Delta kWh\ (occupancy\ sensor) = kW_{controlled} * \ Hours * ESF * WHF_e$$

Where:

$kW_{controlled}$	= total lighting load connected to the control in kilowatts
ESF	= energy savings factor (% reduction to the operating hours from the non-controlled baseline lighting system)

Summer Coincident Peak Demand Savings

$$\Delta kW\ (reduced\ wattage) = \left(\frac{Watts_{base} - Watts_{EE}}{1000}\right) * WHF_d * CF * ISR$$

Where:

WHF_d = waste heat factor to account for cooling demand savings

CF = summer peak coincidence factor

$$\Delta kW\ (occupancy\ sensor) = kW_{controlled} * WHF_d * (CF_{baseline} - CF_{OS})$$

Where:

CF_{OS} = 0.15

Measure-Level Gross Realized Savings

The table below presents the realized gross energy savings of the lighting retrofit, along with the numeric values of inputs to the savings calculation equation.

Annual kWh Savings for Lighting Retrofit

Measure	*Calculation Inputs*						*Annual Gross kWh Savings*			
	Quantity	***Baseline Wattage***	***Efficient Wattage***	***Hours***	***WHF_e***	***ESF***	***Ex Ante***	***TRM Ex Post***	***ADM Ex Post***	***Realization Rate***
Fluorescent Delamping	84	TRM = 19.4 Actual = 32	TRM = 0 Actual = 0	4,311	1.25	N/A	13,942	8,782	8,782	63%
	2,239	TRM = 19.4 Actual = 32	TRM = 0 Actual = 0	4,311	1.25	N/A	375,432	234,069	234,069	62%
HP and RW T8 Fixtures and Lamps	1,505	TRM = 59 Actual = 45.5	TRM = 43 Actual = 47	4,311	1.25	N/A	145,642	129,761	129,761	119%
	818	TRM = 32 Actual = 37	TRM = 22 Actual = 30	4,311	1.25	N/A		44,080	44,080	
LED Bulbs and Fixtures	26	TRM = 182.9 Actual = 185	TRM = 52.5 Actual = 42	4,903	1.00	N/A	18,270	17,962	17,962	98%
Occupancy Sensor Lighting Controls	233	12,815	N/A	4,311	1.25	0.3	20,717	20,717	20,717	100%
LED Bulbs and Fixtures	45	TRM = 361.4 Actual = 265	TRM = 116.8 Actual = 118	4,903	1.00	N/A	70,152	53,703	53,703	77%
LED Bulbs and Fixtures	11	TRM = 361.4 Actual = 262	TRM = 116.8 Actual = 118	4,903	1.00	N/A	4,981	13,127	13,127	264%
LED Bulbs and Fixtures	21	TRM = 124.3 Actual = 129	TRM = 18.6 Actual = 28	4,903	1.00	N/A	7,413	9,915	9,915	134%
Total							**656,550**	**532,115**	**532,115**	

The ADM calculated ex post savings estimate will be equal to the TRM savings estimate, except in cases in which the TRM is not applied. The TRM is not be applied in cases in which it does not properly characterize the newly installed lighting system.

Summary of Project-Level Gross Realized Savings

The table shown below presents the realized gross energy savings of the lighting retrofit.

Verified Electric Savings/Realization Rates

Incentive Type	***Annual Gross Savings***			
	Ex Ante (kWh)	***Ex Post (kWh)***	***Realization Rate***	***Ex Post Peak kW Reduction***
Standard	656,550	532,115	81%	25.79
Total	**656,550**	**532,115**	**81%**	**25.79**

A CF value of 0.22 and a WHF_d value of 1.44 was used to determine kW reduction. These values were taken from the TRM 4.0 based on applicable facility type. No kW reduction for the LED measures was calculated due to only exterior lighting being implemented.

Measures regarding fluorescent delamping, measure 4.5.2, references tables found in the TRM for baseline wattage. Measures regarding installed T8 lighting, measure 4.5.3, references tables found in the TRM for baseline and efficient wattage. Measures regarding installed LED lighting, measure 4.5.4, references tables found in the TRM for baseline wattage, and actual installed LEDs for efficient wattage.

Discussion with project personnel revealed that the actual lighting count differs from what is referenced in the application for two reasons. The first being that less lighting was necessary to achieve desired lumen levels. The second being that original fixture counts and wattages found in the application were incorrect.

Site ID: 3

Executive Summary

The program participant received Standard program incentives for retrofitting lighting and installing occupancy controls. The gross realization rate for these measures is 80%.

Project Description

The participant implemented the following measure(s):

- (1,482) Permanent 4' T8 lamp removals with installed reflectors
- (2,382) 32W T8 lamps replaced with 28W T8 lamps
- (27) 185W MH fixtures replaced with 42W LED wall packs
- (135) Fixture-mounted occupancy sensors installed (7,425 controlled watts)

Methodology for Estimating Gross Savings.

ADM staff inspected project documentation pertaining to the lighting retrofit.

Energy savings for the lighting retrofit were calculated according to the Illinois TRM 4.0, measures 4.5.2, 4.5.3, 4.5.4, and 4.5.10. Algorithms pertaining to savings calculations are presented below.

Electric Energy Savings

$$\Delta kWh\ (reduced\ wattage) = \left(\frac{Watts_{base} - Watts_{EE}}{1000}\right) * Hours * WHF_e * ISR$$

Where:

$Watts_{base}$	= input wattage of the baseline system
$Watts_{EE}$	= new input wattage of EE fixture
WHF_e	= waste heat factor to account for cooling energy savings
ISR	= in service rate (% of units rebated that get installed) = 1

$$\Delta kWh\ (occupancy\ sensor) = kW_{controlled} * Hours * ESF * WHF_e$$

Where:

$kW_{controlled}$	= total lighting load connected to the control in kilowatts
ESF	= energy savings factor (% reduction to the operating hours from the non-controlled baseline lighting system)

Summer Coincident Peak Demand Savings

$$\Delta kW\ (reduced\ wattage) = \left(\frac{Watts_{base} - Watts_{EE}}{1000}\right) * WHF_d * CF * ISR$$

Where:

WHF_d = waste heat factor to account for cooling demand savings

CF = summer peak coincidence factor

$$\Delta kW\ (occupancy\ sensor) = kW_{controlled} * WHF_d * (CF_{baseline} - CF_{OS})$$

Where:

CF_{OS} = 0.15

Measure-Level Gross Realized Savings

The table below presents the realized gross energy savings of the lighting retrofit, along with the numeric values of inputs to the savings calculation equation.

Annual kWh Savings for Lighting Retrofit

Measure	***Calculation Inputs***						***Annual Gross kWh Savings***			
	Quantity	***Baseline Wattage***	***Efficient Wattage***	***Hours***	***WHF_e***	***ESF***	***Ex Ante***	***TRM Ex Post***	***ADM Ex Post***	***Realization Rate***
Fluorescent Delamping	1,482	TRM = 19.4 Actual = 32	TRM = 0 Actual = 0	4,311	1.25	N/A	246,969	154,931	154,931	63%
HP and RW T8 Fixtures and Lamps	900	TRM = 59 Actual = 49	TRM = 43 Actual = 45	4,311	1.25	N/A	90,795	77,598	77,598	120%
	582	TRM = 32 Actual = 29	TRM = 22 Actual = 29	4,311	1.25	N/A		31,363	31,363	
LED Bulbs and Fixtures	27	TRM = 182.9 Actual = 185	TRM = 52.5 Actual = 42	4,903	1.00	N/A	18,973	18,652	18,652	98%
Occupancy Sensor Lighting Controls	135	7,425	N/A	4,311	1.25	0.3	12,003	12,003	12,003	100%
Total							**368,740**	**294,547**	**294,547**	

The ADM calculated ex post savings estimate will be equal to the TRM savings estimate, except in cases in which the TRM is not applied. The TRM is not be applied in cases in which it does not properly characterize the newly installed lighting system.

Summary of Project-Level Gross Realized Savings

The table shown below presents the realized gross energy savings of the lighting retrofit.

Verified Electric Savings/Realization Rates

Incentive Type	***Annual Gross Savings***			
	Ex Ante (kWh)	***Ex Post (kWh)***	***Realization Rate***	***Ex Post Peak kW Reduction***
Standard	368,740	294,547	80%	16.26
Total	**368,740**	**294,547**	**80%**	**16.26**

A CF value of 0.22 and a WHF_d value of 1.44 was used to determine kW reduction. These values were taken from the TRM 4.0 based on applicable facility type. No kW reduction was calculated for measure 4.5.4 due to only exterior lighting being implemented.

Site ID: 4

Executive Summary

The program participant received Custom Program incentives from the Illinois Department of Commerce for retrofitting existing laboratory fume hoods with high efficiency fume hoods. The electric realization rate for this project is 0%.

Project Description

The customer installed the following high efficiency fume hoods:

- (2) 4-foot Fume Hoods with a gross area opening of 2.70 ft^2 and minimum face velocity of 80 feet per minute,
- (160) 6-foot Fume Hoods with a gross area opening of 4.45 ft^2 and minimum face velocity of 80 feet per minute, and
- (6) 8-foot Fume Hoods with a gross area opening of 6.20 ft^2 and minimum face velocity of 80 feet per minute.

The installation of the new fume hoods resulted in savings through reduced face velocity as compared to the existing fume hoods. The reduction in face velocity results in a decrease in exhaust fan energy consumption and HVAC cooling load. HVAC cooling load is reduced as a result of a decrease in the volume of air being exhausted from the building; thus, the amount of "Make Up" air needing to be brought back into the building to maintain pressurization is reduced.

Methodology for Estimating Gross Savings

ADM staff reviewed project documentation and verified the installation of the high efficiency laboratory fume hoods during an onsite inspection.

Custom Incentives

Annual electrical savings for the new high efficiency fume hood was calculated through the use of Lawrence Berkeley National Laboratory Fume Hood Calculator[4]. The fume hood calculator compares the annual energy consumption of two user defined fume hoods while calculating the potential annual energy savings. The fume hood calculator requires users to input known details of each hood which includes the following: location, hours of operation, vertical hood opening, horizontal hood opening, face velocity, and cooling plant efficiency.

[4] http://fumehoodcalculator.lbl.gov/index.php

Annual energy savings for each individual hood type was calculated and multiplied by the corresponding quantity to determine the total annual energy savings for the project.

Measure-level Gross Savings Results

Custom Incentives

The table shown below presents the annual kWh savings associated with the fume hoods:

Annual kWh Savings for High Efficiency Fume Hoods

Measure	***Measure Metrics***						
	Qty	***Horizontal "in"***	***Vertical "in"***	***Opening Area "ft²"***	***Min Face FPM***		***kWh Savings per Hood***
					As-Built	***Baseline[5]***	
4' Fume Hood	14	18.5	21	2.7	80	150	4,625
6' Fume Hood	59	30.5	21	4.4	80	150	8,715
8' Fume Hood	2	42.5	21	6.2	80	150	10,626

The table shown below presents the verified gross savings:

Measure	***Annual Gross kWh Savings***	
	Ex Ante	***ADM Calculated Ex Post***
Fume Hoods	2,258,620	0
Total	**2,258,620**	**0**

Project-level Gross Savings Results

The tables shown below present the verified gross savings for this project.

[5] Energy-Efficient Fume Hoods (Low-Flow Fume Hoods), Lawrence Berkeley National Laboratory

Verified Electric Savings/Realization Rates

Incentive Type	***Measure Category***	***Annual Gross Savings***				***Lifetime Gross Savings***	
		Ex Ante kWh	***Ex Post kWh***	***Realization Rate***	***Ex Post Peak kW Reduction***	***Ex Post kWh***	***Ex Post Peak kW Reduction***
Custom	Fume Hoods	2,258,620	0	0%	0	0	0
Total		**2,258,620**	**0**	**0%**	**0**	**0**	**0**

The electric measure has a verified realization rate of 0%. ADM evaluated all savings for this project in EPY7/GPY4. The ex post analysis used Lawrence Berkeley National Laboratory Fume Hood Calculator. The calculator includes interactive cooling savings. This EPY8/GPY5 part of the project is only for cooling interactive savings.

It was unclear in the application for EPY7/GPY4, Elec. Grant 15-420009, that the claimed electric savings were only for the equipment and excluded interactive cooling effects. For ADM's EPY7/GPY4 evaluation of project 8550-12823, the ex post analysis accounted for all electric energy savings associated with the projects. ADM was not aware that there was a separate EPY8/GPY5 electric grant for the cooling interactive effects. Therefore, there are zero realized electric savings associated with the EPY8/GPY5 project.

Site ID: 6

Executive Summary

The program participant received Custom incentives for retro-commissioning. The gross realization rate for these measures is 80%.

Project Description

The customer performed retro-commissioning (RCx) at one of their buildings, which included the following measures:

- Fixed occupancy sensors and reprogrammed VAV operation in unoccupied mode,
- Calibrated all sensors and transducers,
- Calibrated VAV boxes and thermostats,
- Relocated sensors to more ideal locations,
- Modified existing scheduling to better match building usage, and
- Relocated all airflow monitoring devices and fixed corroded boards on 3 AHUs.

Methodology for Estimating Gross Savings

During the M&V visit, ADM staff verified the effectiveness of the RCx measures by reviewing the operation of the building and varying changes in the Energy Management System (EMS).

ADM calculated the annual energy savings for the installed measures through the use of a monthly pre/post trending data regression. The regression compared the monthly trending data to the local weather in an effort to determine the effects that weather has on the cooling system/heating system for both the pre and post conditions. The monthly data consisted of natural gas sub meters and steam meters. The steam metered energy was converted to Therms based on the efficiency of the campus's central plant. The derived regression has an R^2 of 0.95 and an adjusted R^2 of 0.94.

From the regression the following equation was derived and used to calculate the monthly energy consumption for the pre and post configurations:

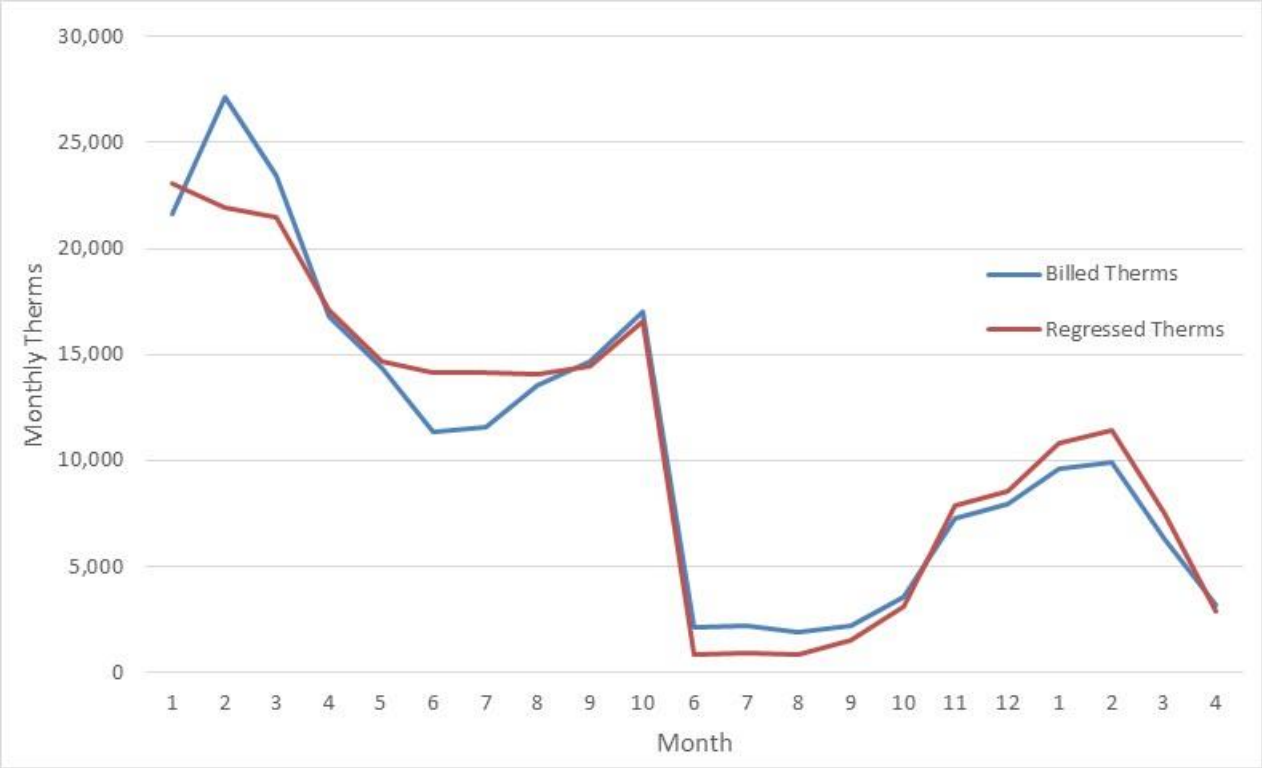
$$Therms_{Monthly} = 9 \times HDD - 13{,}219 \times Post + 14{,}030$$

Where:

$Therms_{Monthly}$	= Monthly Therm consumption
HDD	= Number of Heating Degree Days for the month
Post	= Binary value for pre/post monthly period (0=Pre, 1=Post)

The following graphs compare the monthly billed Therms to the Therms calculated through the use of the derived equation:

Billed Vs. Regressed Monthly Therms



Measure-level Gross Savings Results

The derived regression equations results in a typically monthly savings of 13,219 Therms which results in an annual energy savings of 158,631 Therms for the project.

The table shown below presents the verified gross savings for measures that received custom incentives:

Annual Therm Savings for Retro Commissioning

Measure	***Annual Gross Therms Savings***	
	Ex Ante	***ADM Calculated Ex Post***
RCx	197,326	158,631
Total	**197,326**	**158,631**

Project-level Gross Savings Results

The tables shown below present the verified gross savings for this project.

Verified Natural Gas Savings/Realization Rates

Incentive Type	*Measure Category*	*Annual Gross Savings*			*Lifetime Gross Savings*
		Ex Ante Therms	*Ex Post Therms*	*Realization Rate*	*Ex Post Therms*
Custom	RCx	197,326	158,631	80%	2,379,469
Total		**197,326**	**158,631**	**80%**	**2,379,469**

The natural gas realization rate is 80%. The difference in savings can be attributed to the ex ante analysis applying a constant 25% savings factor for natural gas RCx projects. The savings factor was based on average historical RCx project savings for numerous other buildings on their campus. While this method may be appropriate for estimating the overall RCx savings at the campus, at an individual building level, it isn't accurate for individual RCx measures that are performed at each building. The individual measures will vary and will result in difference savings magnitudes. Therefore, ADM relied on a billing analysis to calculate the annual savings for this particular RCx project.

Site ID: 7

Executive Summary

The program participant received Custom incentives for the retro-commissioning at a university building. The gross realization rate for these measures is 43%.

Project Description

The customer performed retro-commissioning (RCx) on one of their buildings, which included the following measures:

- Rebuilt AHU control panels for improved operations,
- Sealed off roof vents and unused exhaust systems,
- Enabled outside air economizers in AHUs,
- Installed VFDs on AHU-4 fans and both heating loops,
- Insulated steam and condensate lines,
- Installed occupancy sensors in labs to reduce exhaust rates during unoccupied times, and
- Retro-commissioned all AHUS and VAV boxes.

Methodology for Estimating Gross Savings

During the M&V visit, ADM staff verified the effectiveness of the RCx measures by reviewing the operation of the building and varying changes in the Energy Management System (EMS).

ADM calculated the annual energy savings for the installed measures through the use of a monthly pre/post trending data regression. The regression compared the monthly trending data to the local weather in an effort to determine the effects that weather has on the cooling system/heating system for both the pre and post conditions. The monthly data consisted of natural gas sub meters and steam meters. The steam metered energy was converted to Therms based on the efficiency of the campus's central plant. The derived regression has an R^2 of 0.97 and an adjusted R^2 of 0.96.

From the regression the following equation was derived and used to calculate the monthly energy consumption for the pre and post configurations:

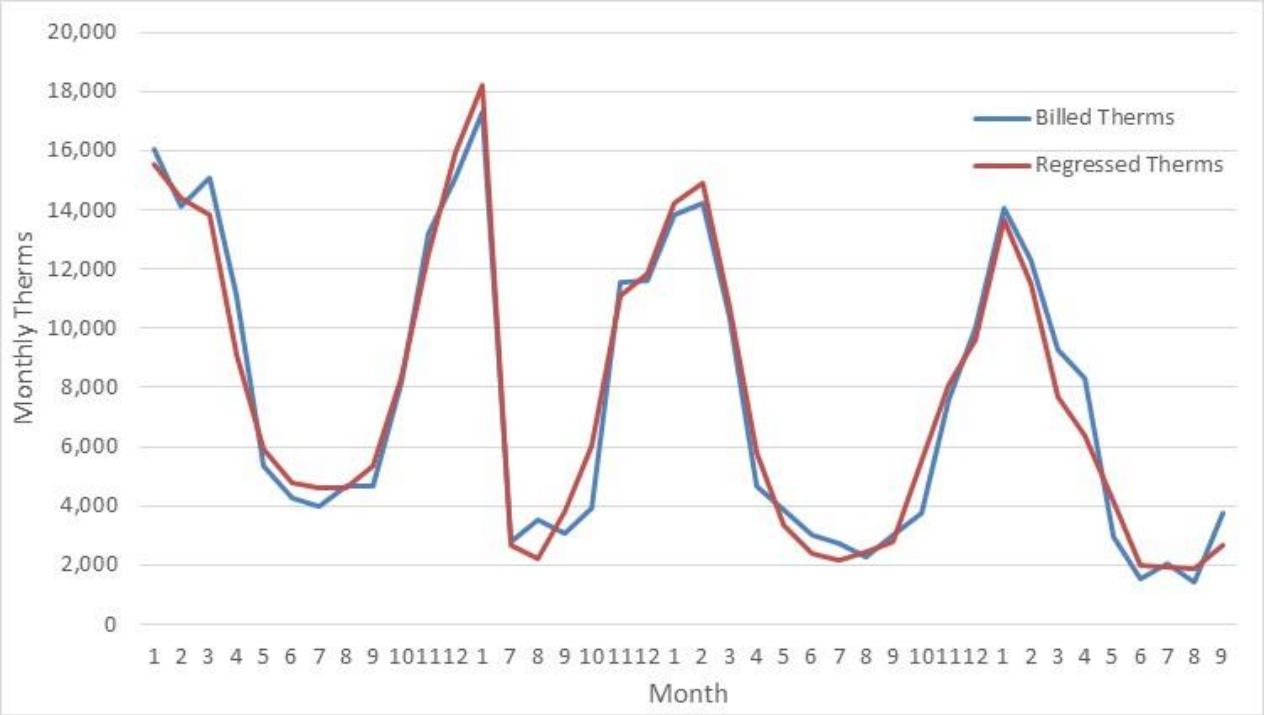
$$Therms_{Monthly} = 10 \times HDD - 5 \times CDD - 2{,}338 \times Post + 6{,}625$$

Where:

$Therms_{Monthly}$	= Monthly Therm consumption
HDD	= Number of Heating Degree Days for the month
CDD	= Number of Cooling Degree Days for the month
Post	= Binary value for pre/post monthly period (0=Pre, 1=Post)

The following graphs compare the monthly billed Therms to the Therms calculated through the use of the derived equation:

Billed Vs. Regressed Monthly Therms



Measure-level Gross Savings Results

The derived regression equations results in a typically monthly savings of 2,338 Therms which results in an annual energy savings of 28,059 Therms for the project.

The table shown below presents the verified gross savings for measures that received custom incentives:

Annual Therm Savings for Retro-commissioning

Measure	***Annual Gross Therms Savings***	
	Ex Ante	***ADM Calculated Ex Post***
RCx	65,670	28,059
Total	**65,670**	**28,059**

Project-level Gross Savings Results

The table shown below presents the verified gross savings for this project.

Verified Natural Gas Savings/Realization Rates

Incentive Type	*Measure Category*	*Annual Gross Savings*			*Lifetime Gross Savings*
		Ex Ante Therms	*Ex Post Therms*	*Realization Rate*	*Ex Post Therms*
Custom	RCx	65,670	28,059	43%	420,892
Total		**65,670**	**28,059**	**43%**	**420,892**

The natural gas realization rate is 43%. The difference in savings can be attributed to the ex ante analysis applying a constant 25% savings factor for natural gas RCx projects. The savings factor was based on average historical RCx project savings for numerous other buildings on their campus. While this method may be appropriate for estimating the overall RCx savings at the campus, at an individual building level, it isn't accurate for individual RCx measures that are performed at each building. The individual measures will vary and will result in difference savings magnitudes. Therefore, ADM relied on a billing analysis to calculate the annual savings for this particular RCx project.

Site ID: 8

Executive Summary

The program participant received Custom incentives for the retro-commissioning of a university building. The gross realization rate for these measures is 97%.

Project Description

The customer performed retro-commissioning (RCx) on one of their buildings, which included the following measures:

- Installed occupancy sensors in 37 rooms
- Installed zone dampers to eliminate air flow to rooms based on occupancy
- Designed and installed heat exchanger DDC controls
- Decommissioned AHU3
- Calibrated all thermostats and VAV boxes
- Added building pressurization controls
- Modified ADA operation to minimizer air loss
- Reduced exhaust flow by decommissioning 3 large exhaust fans
- Implemented tighter schedules on all air handling units

Methodology for Estimating Gross Savings

During the M&V visit, ADM staff verified the effectiveness of the RCx measures by reviewing the operation of the building and varying changes in the Energy Management System (EMS).

ADM calculated the annual energy savings for the installed measures through the use of a monthly pre/post trending data regression. The regression compared the monthly trending data to the local weather in an effort to determine the effects that weather has on the cooling system/heating system for both the pre and post conditions. The monthly data consisted of natural gas sub meters and steam meters. The steam metered energy was converted to Therms based on the efficiency of the campus's central plant. The derived regression has an R^2 of 0.95 and an adjusted R^2 of 0.94.

From the regression the following equation was derived and used to calculate the monthly energy consumption for the pre and post configurations:

$$Therms_{Monthly} = 8 \times HDD - 4 \times CDD - 5{,}764 \times Post + 14{,}281$$

Where:

$Therms_{Monthly}$	= Monthly Therm consumption
HDD	= Number of Heating Degree Days for the month
CDD	= Number of Cooling Degree Days for the month
Post	= Binary value for pre/post monthly period (0=Pre, 1=Post)

The following graphs compare the monthly billed Therms to the Therms calculated through the use of the derived equation:

Billed Vs. Regressed Monthly Therms

Measure-level Gross Savings Results

The derived regression equations results in a typically monthly savings of 5,764 Therms which results in an annual energy savings of 69,162 Therms for the project.

The table shown below presents the verified gross savings for measures that received custom incentives:

Annual Therm Savings for Retro-commissioning

Measure	***Annual Gross Therms Savings***	
	Ex Ante	***ADM Calculated Ex Post***
RCx	71,286	69,162
Total	**71,286**	**69,162**

Project-level Gross Savings Results

The tables shown below present the verified gross savings for this project.

Verified Natural Gas Savings/Realization Rates

Incentive Type	*Measure Category*	*Annual Gross Savings*			*Lifetime Gross Savings*
		Ex Ante Therms	*Ex Post Therms*	*Realization Rate*	*Ex Post Therms*
Custom	RCx	71,286	69,162	97%	1,037,430
Total		**71,286**	**69,162**	**97%**	**1,037,430**

The natural gas realization rate is 97%. The difference in savings can be attributed to the ex ante analysis applying a constant 25% savings factor for natural gas RCx projects. The savings factor was based on average historical RCx project savings for numerous other buildings on their campus. While this method may be appropriate for estimating the overall RCx savings at the campus, at an individual building level, it isn't accurate for individual RCx measures that are performed at each building. The individual measures will vary and will result in difference savings magnitudes. Therefore, ADM relied on a billing analysis to calculate the annual savings for this particular RCx project.

Site ID: 9

Executive Summary

The program participant received Custom incentives for the retro-commissioning of a university building. The gross realization rate for these measures is 70%.

Project Description

The customer performed retro-commissioning (RCx) on one of their buildings, which included the following measures:

- Installed occupancy sensors,
- Installed zone dampers to eliminate air flow to rooms based on occupancy,
- Calibrated all thermostats and VAV boxes,
- Added building pressurization controls, and
- Implemented tighter schedules on all air handling units.

Methodology for Estimating Gross Savings

During the M&V visit, ADM staff verified the effectiveness of the RCx measures by reviewing the operation of the building and varying changes in the Energy Management System (EMS).

ADM calculated the annual energy savings for the installed measures through the use of a monthly pre/post trending data regression. The regression compared the monthly trending data to the local weather in an effort to determine the effects that weather has on the cooling system/heating system for both the pre and post conditions. The monthly data consisted of natural gas sub meters and steam meters. The steam metered energy was converted to Therms based on the efficiency of the campus's central plant. The derived regression has an R^2 of 0.87 and an adjusted R^2 of 0.84.

From the regression the following equation was derived and used to calculate the monthly energy consumption for the pre and post configurations:

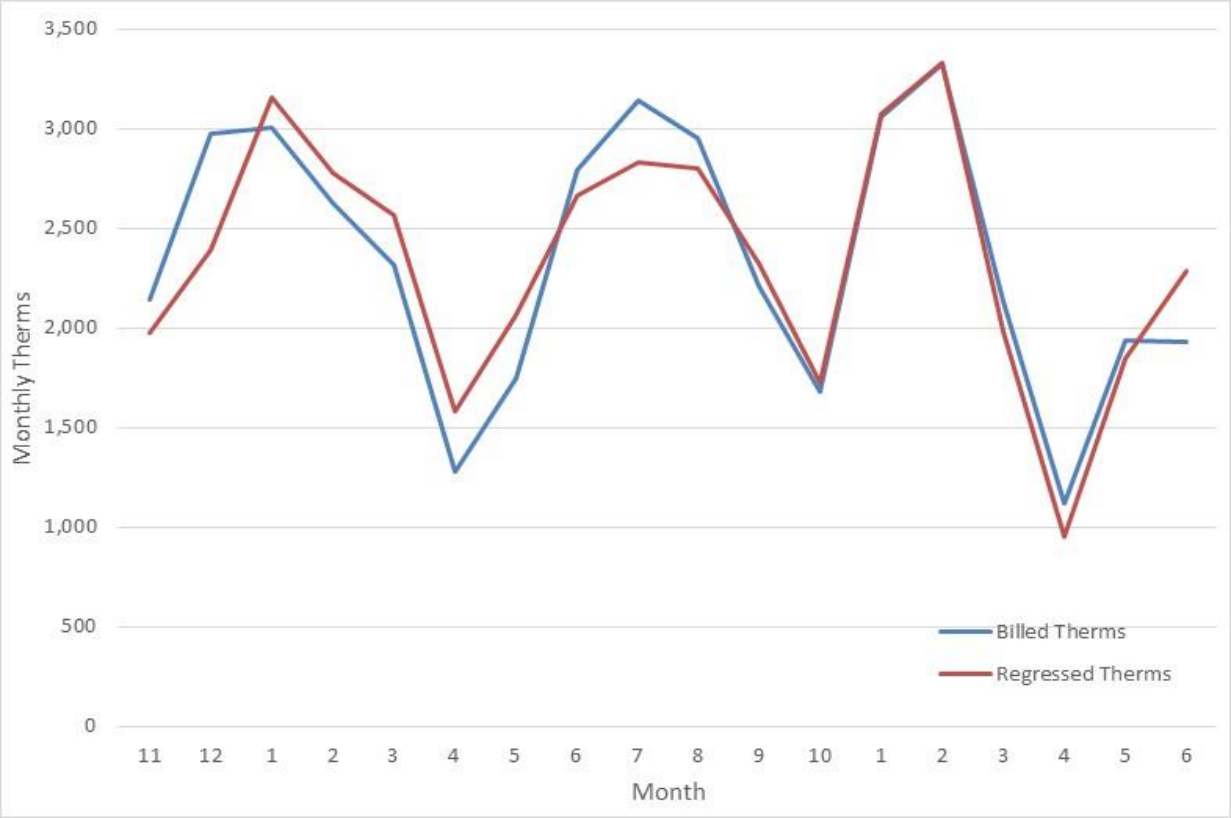
$$Therms_{Monthly} = 3 \times HDD + 4 \times CDD - 406 \times Post + 419$$

Where:

$Therms_{Monthly}$	= Monthly Therm consumption
HDD	= Number of Heating Degree Days for the month
CDD	= Number of Cooling Degree Days for the month
Post	= Binary value for pre/post monthly period (0=Pre, 1=Post)

The following graphs compare the monthly billed Therms to the Therms calculated through the use of the derived equation:

Billed Vs. Regressed Monthly Therms



Measure-level Gross Savings Results

The derived regression equations results in a typically monthly savings of 419 Therms which results in an annual energy savings of 4,873 Therms for the project.

The table shown below presents the verified gross savings for measures that received custom incentives:

Annual Therm Savings for Retro-commissioning

Measure	***Annual Gross Therms Savings***	
	Ex Ante	***ADM Calculated Ex Post***
RCx	6,916	4,873
Total	**6,916**	**4,873**

Project-level Gross Savings Results

The tables shown below present the verified gross savings for this project.

Verified Natural Gas Savings/Realization Rates

Incentive Type	*Measure Category*	*Annual Gross Savings*			*Lifetime Gross Savings*
		Ex Ante Therms	*Ex Post Therms*	*Realization Rate*	*Ex Post Therms*
Custom	RCx	6,916	4,873	70%	73,089
Total		**6,916**	**4,873**	**70%**	**73,089**

The natural gas realization rate is 70%. The difference in savings can be attributed to the ex ante analysis applying a constant 25% savings factor for natural gas RCx projects. The savings factor was based on average historical RCx project savings for numerous other buildings on their campus. While this method may be appropriate for estimating the overall RCx savings at the campus, at an individual building level, it isn't accurate for individual RCx measures that are performed at each building. The individual measures will vary and will result in difference savings magnitudes. Therefore, ADM relied on a billing analysis to calculate the annual savings for this particular RCx project.

Site ID: 10

Executive Summary

The program participant received Custom incentives for the retro-commissioning of a university building. The gross realization rate for these measures is 129%.

Project Description

The customer performed retro-commissioning on one of their buildings, which included the following measures:

- Scheduled AHUs off during unoccupied hours,
- AHU operations were optimized,
- Occupancy sensors to control lights and HVAC were installed in several areas,
- Demand control ventilation was installed,
- Building pressurization controls were improved to reduce infiltration, and
- Two AHUs servings the gymnasium were decommissioned.

Methodology for Estimating Gross Savings

During the M&V visit, ADM staff verified the effectiveness of the RCx measures by reviewing the operation of the building and varying changes in the Energy Management System (EMS).

ADM calculated the annual energy savings for the installed measures through the use of a monthly pre/post trending data regression. The regression compared the monthly trending data to the local weather in an effort to determine the effects that weather has on the cooling system/heating system for both the pre and post conditions. The monthly data consisted of natural gas sub meters and steam meters. The steam metered energy was converted to Therms based on the efficiency of the campus's central plant. The derived regression has an R^2 of 0.96 and an adjusted R^2 of 0.96.

From the regression the following equation was derived and used to calculate the monthly energy consumption for the pre and post configurations:

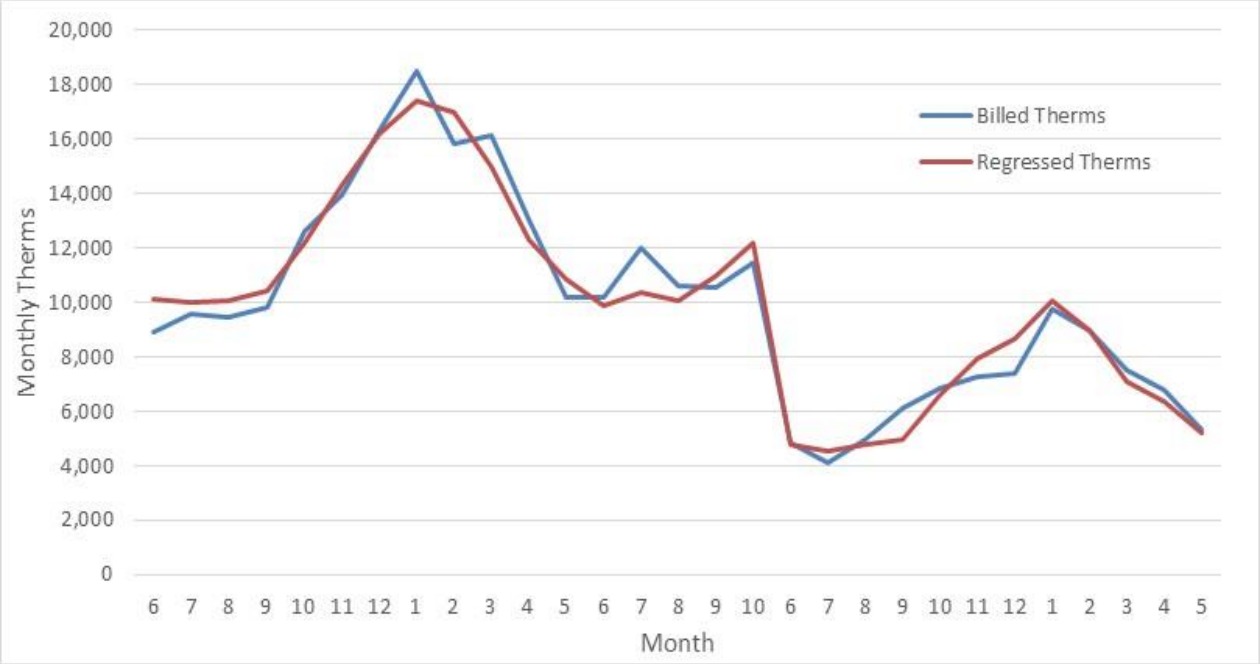
$$Therms_{Monthly} = 5 \times HDD - 6 \times CDD - 5{,}349 \times Post + 11{,}539$$

Where:

$Therms_{Monthly}$	= Monthly Therm consumption
HDD	= Number of Heating Degree Days for the month
CDD	= Number of Cooling Degree Days for the month
Post	= Binary value for pre/post monthly period (0=Pre, 1=Post)

The following graphs compare the monthly billed Therms to the Therms calculated through the use of the derived equation:

Billed Vs. Regressed Monthly Therms



Measure-level Gross Savings Results

The derived regression equations results in a typically monthly savings of 5,349 Therms which results in an annual energy savings of 64,185 Therms for the project.

The table shown below presents the verified gross savings for measures that received custom incentives:

Annual Therm Savings for Retro-commissioning

Measure	***Annual Gross Therms Savings***	
	Ex Ante	***ADM Calculated Ex Post***
RCx	49,711	64,185
Total	**49,711**	**64,185**

Project-level Gross Savings Results

The tables shown below present the verified gross savings for this project.

Verified Natural Gas Savings/Realization Rates

Incentive Type	***Measure Category***	***Annual Gross Savings***			***Lifetime Gross Savings***
		Ex Ante Therms	***Ex Post Therms***	***Realization Rate***	***Ex Post Therms***
Custom	RCx	49,711	64,185	129%	962,776
Total		**49,711**	**64,185**	**129%**	**962,776**

The natural gas realization rate is 129%. The difference in savings can be attributed to the ex ante analysis applying a constant 25% savings factor for natural gas RCx projects. The savings factor was based on average historical RCx project savings for numerous other buildings on their campus. While this method may be appropriate for estimating the overall RCx savings at the campus, at an individual building level, it isn't accurate for individual RCx measures that are performed at each building. The individual measures will vary and will result in difference savings magnitudes. Therefore, ADM relied on a billing analysis to calculate the annual savings for this particular RCx project.

Site ID: 11

Executive Summary

The program participant received Custom incentives for the retro-commissioning of a university building. The gross realization rate for these measures is 120%.

Project Description

The customer performed retro-commissioning on one of their buildings, which included the following measures:

- Scheduled AHUs off during unoccupied hours,
- AHU operations were optimized,
- Occupancy sensors to control lights and HVAC were installed in several areas,
- Demand control ventilation was installed,
- Building pressurization controls were improved to reduce infiltration, and
- Two AHUs were decommissioned.

Methodology for Estimating Gross Savings

During the M&V visit, ADM staff verified the effectiveness of the RCx measures by reviewing the operation of the building and varying changes in the Energy Management System (EMS).

ADM calculated the annual energy savings for the installed measures through the use of a monthly pre/post trending data regression. The regression compared the monthly trending data to the local weather in an effort to determine the effects that weather has on the cooling system/heating system for both the pre and post conditions. The monthly data consisted of electric sub meters and chilled water meters. The chilled water metered energy was converted to T based on the efficiency of the campus's central plant. The derived regression has an R^2 of 0.94 and an adjusted R^2 of 0.93.

From the regression the following equation was derived and used to calculate the monthly energy consumption for the pre and post configurations:

$$kWh_{Monthly} = -58 \times HDD + 530 \times CDD - 150{,}119 \times Post + 429{,}159$$

Where:

$kWh_{Monthly}$	= Monthly kWh consumption
HDD	= Number of Heating Degree Days for the month
CDD	= Number of Cooling Degree Days for the month
Post	= Binary value for pre/post monthly period (0=Pre, 1=Post)

The following graphs compare the monthly billed kWh to the kWh calculated through the use of the derived equation:

Billed Vs. Regressed Monthly kWh

Measure-level Gross Savings Results

The derived regression equations results in a typically monthly savings of 150,119 kWh which results in an annual energy savings of 1,801,427 kWh for the project.

The table shown below presents the verified gross savings for measures that received custom incentives:

Annual kWh Savings for Retro-commissioning

Measure	***Annual Gross kWh Savings***	
	Ex Ante	***ADM Calculated Ex Post***
RCx	1,497,234	1,801,427
Total	**1,497,234**	**1,801,427**

Project-level Gross Savings Results

The tables shown below present the verified gross savings for this project.

Verified Electric Savings/Realization Rates

Incentive Type	*Measure Category*	*Annual Gross Savings*				*Lifetime Gross Savings*	
		Ex Ante kWh	*Ex Post kWh*	*Realization Rate*	*Ex Post Peak kW Reduction*	*Ex Post kWh*	*Ex Post Peak kW Reduction*
Custom	RCx	1,497,234	1,801,427	120%	205.64	27,021,398	205.64
Total		**1,497,234**	**1,801,427**	**120%**	**205.64**	**27,021,398**	**205.64**

The natural gas realization rate is 120%. The difference in savings can be attributed to the ex-ante applying a straight 15% savings factor to the electric and 35% to the chilled water meters for the RCx projects. The savings factors were based on average historical RCx project savings for numerous other buildings on their campus. While this method may be appropriate for estimating the overall RCx savings at the campus, at an individual building level, it isn't accurate for individual RCx measures that are performed at each building. The individual measures will vary and will result in difference savings magnitudes. Therefore, ADM relied on a billing analysis to calculate the annual savings for this particular RCx project.

Site ID: 12

Executive Summary

The program participant received Custom incentives for the retro-commissioning of a university building. The gross realization rate for these measures is 83%.

Project Description

The customer performed retro-commissioning on one of their buildings, which included the following measures:

- Shutdown two of the four large air handling units for data center,
- Scheduled air handling units to shut off during unoccupied periods,
- Added occupancy sensors to the third floor,
- Finished control repairs to AHU-8 including VFDs and dampers,
- Removed abandoned steam coil and humidifier,
- Helped department with Liebert retirement project, and
- Cleaned coils, repaired canvas leaks, and fixed radiation pumps.

Methodology for Estimating Gross Savings

During the M&V visit, ADM staff verified the effectiveness of the RCx measures by reviewing the operation of the building and varying changes in the Energy Management System (EMS).

ADM calculated the annual energy savings for the installed measures through the use of a monthly pre/post trending data regression. The regression compared the monthly trending data to the local weather in an effort to determine the effects that weather has on the cooling system/heating system for both the pre and post conditions. The monthly data consisted of electric sub meters for the areas of the building that do not serve the data center, as during RCx project additional IT load was added to the datacenter. The derived regression has an R^2 of 0.94 and an adjusted R^2 of 0.93.

From the regression the following equation was derived and used to calculate the monthly energy consumption for the pre and post configurations:

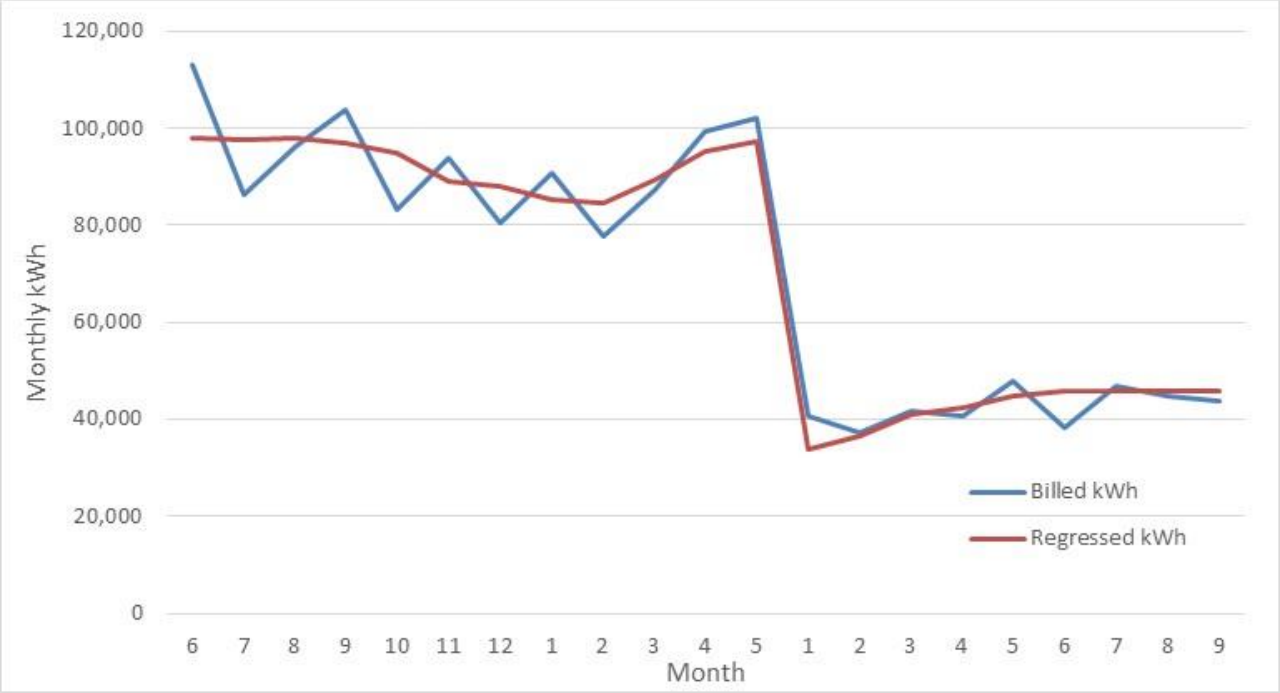
$$kWh_{Monthly} = -12 \times HDD - 51{,}950 \times Post + 97{,}382$$

Where:

$kWh_{Monthly}$	= Monthly kWh consumption
HDD	= Number of Heating Degree Days for the month
Post	= Binary value for pre/post monthly period (0=Pre, 1=Post)

The following graphs compare the monthly billed kWh to the kWh calculated through the use of the derived equation:

Billed Vs. Regressed Monthly kWh



Due to additional load being added to the datacenter during the RCx period, additional calculations were performed to calculate the chilled water savings that is attributed to the RCx project. Using historical chilled water metering data and IT electrical consumption, which is on a different meter than the one used in the regression, were plotted against one another for the pre and post RCx periods to determine a correlation. Using the average monthly data center load from the post RCx period and the data center load vs chilled water correlations, the following savings was calculated:

Annual Chilled Water kWh Savings for Retro-commissioning

Description	***Value***
Ave. Data Center Monthly kWh	279,428
Pre Chilled Water Monthly MMBTU	1,389
Post Chilled Water Monthly MMBTU	1,045
Pre Chilled Water Monthly kWh	100,834
Post Chilled Water Monthly kWh	75,834
Annual Chilled Water kWh Savings	299,997

The savings in the above table is in addition to the savings calculated in the billing regression for the building's other electric sub meter.

Measure-level Gross Savings Results

The table shown below presents the verified gross savings for measures that received custom incentives:

Annual kWh Savings for Retro-commissioning

Measure	***Annual Gross kWh Savings***	
	Ex Ante	***ADM Calculated Ex Post***
RCx	1,114,356	923,396
Total	**1,114,356**	**923,396**

Project-level Gross Savings Results

The tables shown below present the verified gross savings for this project.

Verified Electric Savings/Realization Rates

Incentive Type	***Measure Category***	***Annual Gross Savings***				***Lifetime Gross Savings***	
		Ex Ante kWh	***Ex Post kWh***	***Realization Rate***	***Ex Post Peak kW Reduction***	***Ex Post kWh***	***Ex Post Peak kW Reduction***
Custom	RCx	1,114,356	923,396	83%	105.41	13,850,937	105.41
Total		**1,114,356**	**923,396**	**83%**	**105.41**	**13,850,937**	**105.41**

The natural gas realization rate is 83%. The difference in savings can be attributed to the ex-ante applying a straight 15% savings factor to the electric and 35% to the chilled water meters for the RCx projects. The savings factors were based on average historical RCx project savings for numerous other buildings on their campus. While this method may be appropriate for estimating the overall RCx savings at the campus, at an individual building level, it isn't accurate for individual RCx measures that are performed at each building. The individual measures will vary and will result in difference savings magnitudes. Therefore, ADM relied on a billing analysis to calculate the annual savings for this particular RCx project.

Site ID: 13

Executive Summary

The program participant received Custom incentives for the retro-commissioning of a university building. The gross realization rate for these measures is 93%.

Project Description

The customer performed retro-commissioning on one of their buildings, which included the following measures:

- Eliminated existing building located chillers and connected to campus chilled water system,
- Implemented occupancy schedules for all air handling units,
- Performed air balance for AHU-5, AHU-13, and AHU-20 at the air handler level and VAV box level,
- New VFD for AHU-5 supply fan, and
- Installed occupancy sensors for spaces served by AHU-13 to control lighting and HVAC.

Methodology for Estimating Gross Savings

During the M&V visit, ADM staff verified the effectiveness of the RCx measures by reviewing the operation of the building and varying changes in the Energy Management System (EMS).

ADM calculated the annual energy savings for the installed measures through the use of a monthly pre/post trending data regression. The regression compared the monthly trending data to the local weather in an effort to determine the effects that weather has on the cooling system/heating system for both the pre and post conditions. The monthly data consisted of electric sub meters and chilled water meters. The chilled water metered energy was converted to T based on the efficiency of the campus's central plant. The derived regression has an R^2 of 0.84 and an adjusted R^2 of 0.82.

From the regression the following equation was derived and used to calculate the monthly energy consumption for the pre and post configurations:

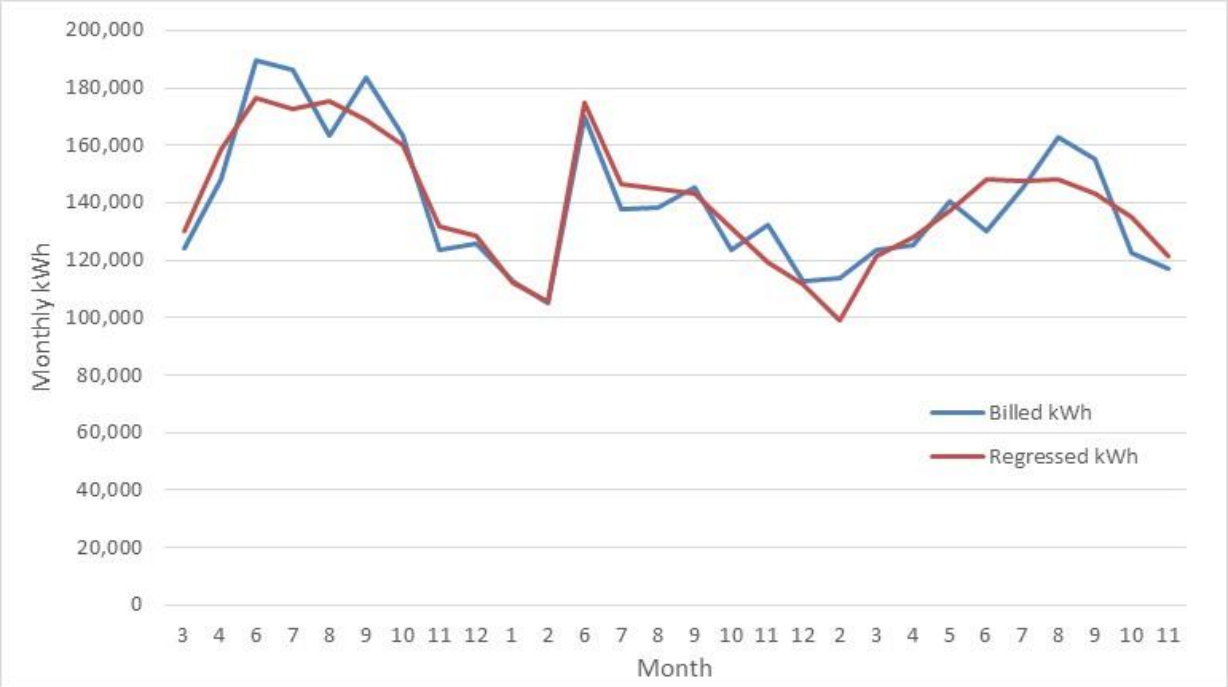
$$kWh_{Monthly} = -68 \times HDD + 46 \times CDD - 30{,}074 \times Post + 163{,}868$$

Where:

$kWh_{Monthly}$	= Monthly kWh consumption
HDD	= Number of Heating Degree Days for the month
CDD	= Number of Cooling Degree Days for the month
Post	= Binary value for pre/post monthly period (0=Pre, 1=Post)

The following graphs compare the monthly billed kWh to the kWh calculated through the use of the derived equation:

Billed Vs. Regressed Monthly kWh



Measure-level Gross Savings Results

The derived regression equations results in a typically monthly savings of 30,074 kWh which results in an annual energy savings of 360,887 kWh for the project.

The table shown below presents the verified gross savings for measures that received custom incentives:

Annual kWh Savings for Retro-commissioning

Measure	***Annual Gross kWh Savings***	
	Ex Ante	***ADM Calculated Ex Post***
RCx	389,413	360,887
Total	**389,413**	**360,887**

Project-level Gross Savings Results

The tables shown below present the verified gross savings for this project.

Verified Electric Savings/Realization Rates

Incentive Type	*Measure Category*	*Annual Gross Savings*				*Lifetime Gross Savings*	
		Ex Ante kWh	*Ex Post kWh*	*Realization Rate*	*Ex Post Peak kW Reduction*	*Ex Post kWh*	*Ex Post Peak kW Reduction*
Custom	RCx	389,413	360,887	93%	41.20	5,413,310	41.20
Total		**389,413**	**360,887**	**93%**	**41.20**	**5,413,310**	**41.20**

The natural gas realization rate is 93%. The difference in savings can be attributed to the ex ante applying a straight 15% savings factor to the electric and 35% to the chilled water meters for the RCx projects. The savings factors were based on average historical RCx project savings for numerous other buildings on their campus. While this method may be appropriate for estimating the overall RCx savings at the campus, at an individual building level, it isn't accurate for individual RCx measures that are performed at each building. The individual measures will vary and will result in difference savings magnitudes. Therefore, ADM relied on a billing analysis to calculate the annual savings for this particular RCx project.

Site ID: 14

Executive Summary

The program participant received Custom incentives for the retro-commissioning of a university building. The gross realization rate for these measures is 156%.

Project Description

The customer performed retro-commissioning on one of their buildings, which included the following measures:

- Installed DDC thermostats and occupancy sensors in classroom served by heat pumps to enable setback when space is unoccupied and enabled scheduling,
- New controls added to individual heat pumps, make up air handling units, exhaust fans, and the condenser water system to shut entire system down during unoccupied periods
- Installed occupancy sensors which were missing in some of the rooms served by AHU-3 VAV boxes and the unit is scheduled to turn off during unoccupied periods,
- Fixed time clock issues with pneumatic controls for AHU-2 and scheduled the unit to turn off during unoccupied periods, and
- Fixed failed steam radiator valves and traps.

Methodology for Estimating Gross Savings

During the M&V visit, ADM staff verified the effectiveness of the RCx measures by reviewing the operation of the building and varying changes in the Energy Management System (EMS).

ADM calculated the annual energy savings for the installed measures through the use of a monthly pre/post trending data regression. The regression compared the monthly trending data to the local weather in an effort to determine the effects that weather has on the cooling system/heating system for both the pre and post conditions. The monthly data consisted of electric sub meters and chilled water meters. The chilled water metered energy was converted to T based on the efficiency of the campus's central plant. The derived regression has an R^2 of 0.80 and an adjusted R^2 of 0.77.

From the regression the following equation was derived and used to calculate the monthly energy consumption for the pre and post configurations:

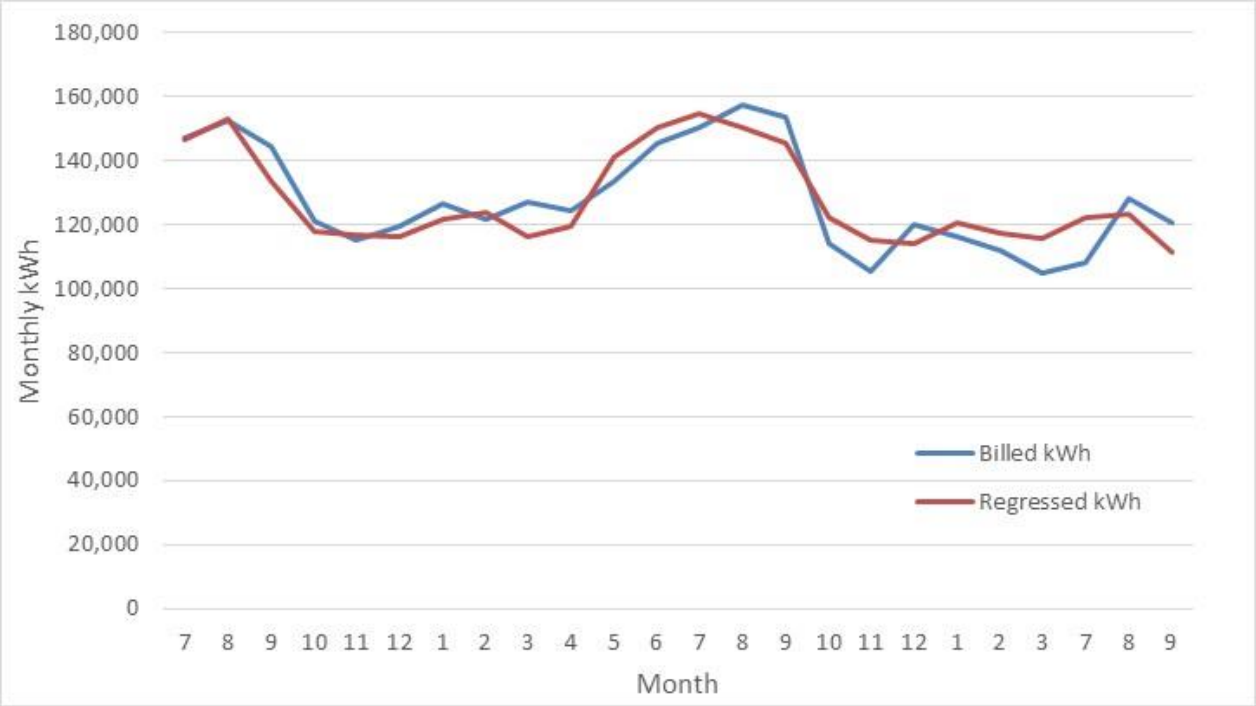
$$kWh_{Monthly} = 22 \times HDD + 74 \times CDD - 34{,}862 \times Post + 107{,}945$$

Where:

$kWh_{Monthly}$	= Monthly kWh consumption
HDD	= Number of Heating Degree Days for the month
CDD	= Number of Cooling Degree Days for the month
Post	= Binary value for pre/post monthly period (0=Pre, 1=Post)

The following graphs compare the monthly billed kWh to the kWh calculated through the use of the derived equation:

Billed Vs. Regressed Monthly kWh



Measure-level Gross Savings Results

The derived regression equations results in a typically monthly savings of 34,862 kWh which results in an annual energy savings of 418,350 kWh for the project.

The table shown below presents the verified gross savings for measures that received custom incentives:

Annual kWh Savings for Retro-commissioning

Measure	***Annual Gross kWh Savings***	
	Ex Ante	***ADM Calculated Ex Post***
RCx	268,546	418,350
Total	**268,546**	**418,350**

Project-level Gross Savings Results

The tables shown below present the verified gross savings for this project.

Verified Electric Savings/Realization Rates

Incentive Type	*Measure Category*	*Annual Gross Savings*				*Lifetime Gross Savings*	
		Ex Ante kWh	*Ex Post kWh*	*Realization Rate*	*Ex Post Peak kW Reduction*	*Ex Post kWh*	*Ex Post Peak kW Reduction*
Custom	RCx	268,546	418,350	156%	47.76	6,275,249	47.76
Total		**268,546**	**418,350**	**156%**	**47.76**	**6,275,249**	**47.76**

The natural gas realization rate is 156%. The difference in savings can be attributed to the ex ante applying a straight 15% savings factor to the electric and 35% to the chilled water meters for the RCx projects. The savings factors were based on average historical RCx project savings for numerous other buildings on their campus. While this method may be appropriate for estimating the overall RCx savings at the campus, at an individual building level, it isn't accurate for individual RCx measures that are performed at each building. The individual measures will vary and will result in difference savings magnitudes. Therefore, ADM relied on a billing analysis to calculate the annual savings for this particular RCx project.

Site ID: 15

Executive Summary

The program participant received Standard program incentives for retrofitting lighting. The gross realization rate for this measure is 103%.

Project Description

The participant implemented the following measure(s):

- (52) 1,000W MH, (41) 1,000W incandescent, (50) 2,000W incandescent, and (29) 400W MH fixtures replaced by (168) 394W interior LED fixtures

Methodology for Estimating Gross Savings.

ADM staff inspected project documentation pertaining to the lighting retrofit.

Energy savings for the lighting retrofit were calculated according to the Illinois TRM 4.0, measure 4.5.8. Algorithms pertaining to savings calculations are presented below.

Electric Energy Savings

$$\Delta kWh = \left(\frac{Watts_{base} - Watts_{EE}}{1000}\right) * Hours * WHF_e * ISR$$

Where:

$Watts_{base}$	= input wattage of the baseline system
$Watts_{EE}$	= new input wattage of EE fixture
WHF_e	= waste heat factor to account for cooling energy savings
ISR	= in service rate (% of units rebated that get installed) = 1

Summer Coincident Peak Demand Savings

$$\Delta kW = \left(\frac{Watts_{base} - Watts_{EE}}{1000}\right) * WHF_d * CF * ISR$$

Where:

WHF_d	= waste heat factor to account for cooling demand savings
CF	= Summer Peak Coincidence Factor

Measure-Level Gross Realized Savings

The table below presents the realized gross energy savings of the lighting retrofit, along with the numeric values of inputs to the savings calculation equation.

Annual kWh Savings for Lighting Retrofit

Measure	*Calculation Inputs*					*Annual Gross kWh Savings*		
	Quantity	*Baseline Wattage*	*Efficient Wattage*	*Hours*	*WHF_e*	*Ex Ante*	*TRM Ex Post*	*ADM Ex Post*
Miscellaneous Commercial/Industrial Lighting	Base = 93 EE = 89	1000	394	3,540	1.32	628,498	270,714	270,714
	50	2000	394	3,540	1.32		375,226	375,226
	29	400	394	3,540	1.32		813	813
Total						**628,498**	**646,753**	**646,753**

TRM and ADM ex post savings calculations reference pre-existing baseline and installed efficient wattages because the IL TRM 4.0 does not properly characterize the implemented lighting.

Summary of Project-Level Gross Realized Savings

The table shown below presents the realized gross energy savings of the lighting retrofit.

Verified Electric Savings/Realization Rates

Incentive Type	*Annual Gross Savings*			
	Ex Ante (kWh)	*Ex Post (kWh)*	*Realization Rate*	*Ex Post Peak kW Reduction*
Standard	628,498	646,753	103%	113.16
Total	**628,498**	**646,753**	**103%**	**113.16**

A CF value of 0.56 and a WHF_d value of 1.46 was used to determine kW reduction. These values were taken from the TRM 4.0 based on applicable facility type.

Baseline quantities were estimated using the ratio of incentives received ($110,387) to total incentives that were applied for ($363,725). This ratio was applied to the total quantity of pre-existing fixtures in the application to determine the quantity of fixtures replaced. This was due to only a fraction of the fixture replacements listed in the application being implemented.

Site ID: 16

Executive Summary

Under application 16, the customer received custom incentives from the Illinois Department of Commerce & Economic Opportunity for HVAC improvements. The natural gas realization rate is 58% and the electric realization rate is 168%.

Project Description

The customer performed HVAC improvements at one of their buildings, which included the following measures:

- Refurbish existing HVAC system and DDC control system, and
- Repair and Seal Air Handler.

Methodology for Estimating Gross Savings

During the M&V visit, ADM staff verified the effectiveness of the HVAC measures by reviewing the operation of the building and varying changes in the Energy Management System (EMS).

ADM calculated the annual energy savings for the installed measures through the use of monthly pre/post billing data regressions. The regressions compared the monthly billing data to the local weather in an effort to determine the effects that weather has on the cooling system/heating system for both the pre and post conditions. The monthly data consisted of natural gas sub-meters and electric meters. The derived gas regression has an R^2 of 0.97 and an adjusted R^2 of 0.94. The derived electric regression has an R^2 of 0.99 and an adjusted R^2 of 0.96.

From the regressions the following equations were derived and used to calculate the monthly energy consumption for the pre and post configurations:

$$Therms_{Monthly} = 1.28 \times HDD - 0.23 \times HDD\_Post$$

Where:

$Therms_{Monthly}$	= Monthly therms consumption
HDD	= Number of Heating Degree Days for the month
HDD_Post	= Binary value for pre/post monthly period (0=Pre, 1=Post) multiplied by HDD

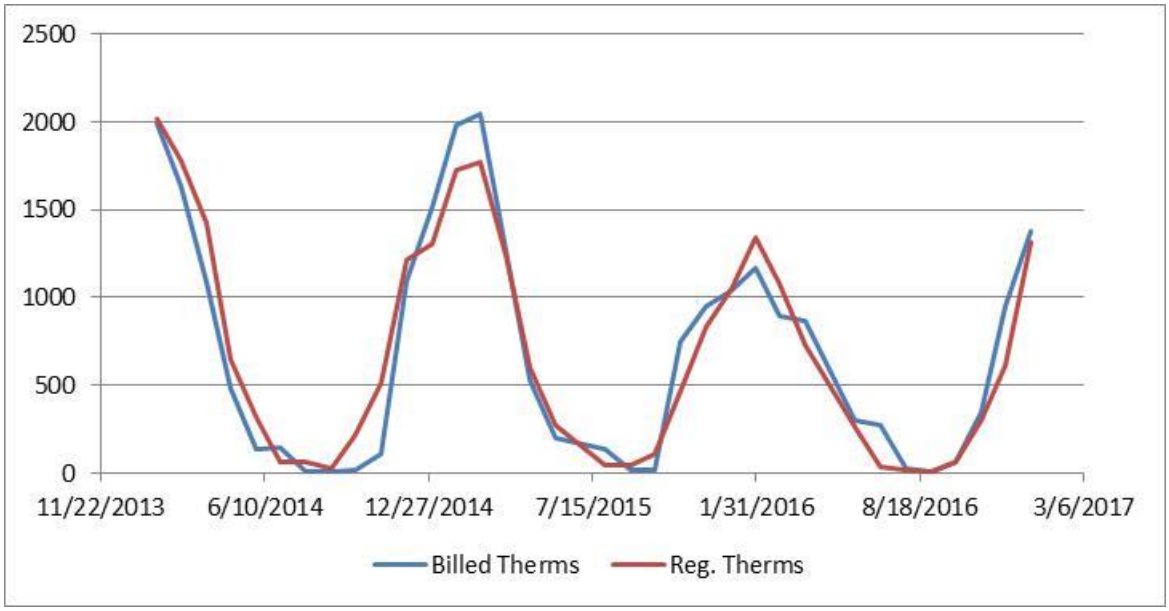
$$kWh_{Monthly} = 708 \times Days + 28.9 \times CDD + 3{,}723 \times Feb - 22.9 \times CDD\_Post - 6{,}103 \times Pre\_Post$$

Where:

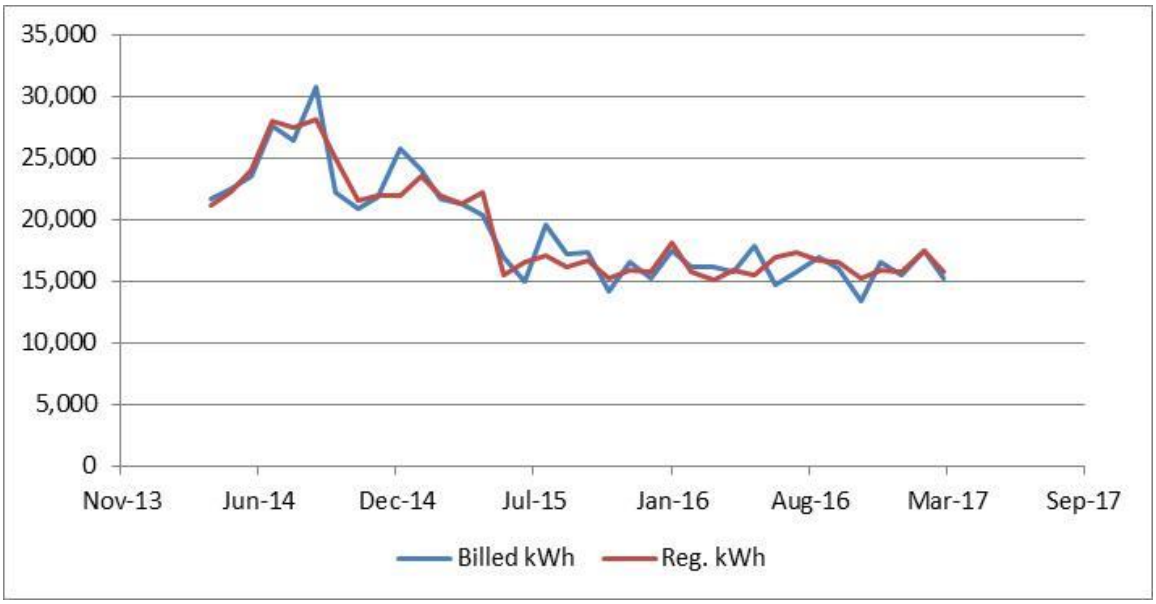
$kWh_{Monthly}$	= Monthly kWh consumption
CDD	= Number of Cooling Degree Days for the month
Days	= Number of Days for the month
Feb	= Binary value for the month of February (0=Not, 1=Feb)
Pre_Post	= Binary value for pre/post monthly period (0=Pre, 1=Post)
CDD_Post	= Pre_Post multiplied by CDD

The following plots compare the monthly billed therms and kWh to the therms and kWh calculated through the use of the derived equations:

Billed Vs. Regressed Monthly Therms



Billed Vs. Regressed Monthly kWh



Measure-level Gross Savings Results

Custom Incentives

The derived regression equations results in annual energy savings of 1,468 therms and 97,035 kWh for the project.

The table shown below presents the verified gross savings for measures that received custom incentives:

Annual Therms Savings for HVAC Improvements

Measure	***Annual Gross Therms Savings***	
	Ex Ante	***ADM Calculated Ex Post***
HVAC	2,532	1,468
Total	**2,532**	**1,468**

Annual kWh Savings for HVAC Improvements

Measure	***Annual Gross kWh Savings***	
	Ex Ante	***ADM Calculated***

		Ex Post
HVAC	57,860	97,035
Total	**57,860**	**97,035**

Project-level Gross Savings Results

The tables shown below present the verified gross savings for this project.

Verified Natural Gas Savings/Realization Rates

Incentive Type	***Measure Category***	***Annual Gross Savings***			***Lifetime Gross Savings***
		Ex Ante Therms	***Ex Post Therms***	***Realization Rate***	***Ex Post Therms***
Custom	HVAC	2,532	1,468	58%	22,020
Total	**HVAC**	**2,532**	**1,468**	**58%**	**22,020**

Verified Electric Savings/Realization Rates

Incentive Type	***Measure Category***	***Annual Gross Savings***				***Lifetime Gross Savings***	
		Ex Ante kWh	***Ex Post kWh***	***Realization Rate***	***Ex Post Peak kW Reduction***	***Ex Post kWh***	***Ex Post Peak kW Reduction***
Custom	HVAC	57,860	97,035	168%	11.08	1,455,527	11.08
Total	**HVAC**	**57,860**	**97,035**	**168%**	**11.08**	**1,455,527**	**11.08**

The natural gas realization rate is 58%, and the electric realization rate is 168%. The difference in savings can be attributed to the ex ante analysis engineering equations without using any actual data. The engineering equations don't account for actual building and equipment operations. Therefore, ADM relied on billing analysis to calculate the annual savings for the project. Billing analysis accounts for actual energy usage at the facility before and after the implementation of the project.

Site ID: 17

Executive Summary

The program participant received Standard program incentives for retrofitting lighting. The gross realization rate for these measures is 83%.

Project Description

The participant implemented the following measure(s):

- (123) 65W fixtures replaced by (67) 14W and 17W LED PAR lamps
- (742) 2L T5 fixtures installed

Methodology for Estimating Gross Savings.

ADM staff inspected project documentation pertaining to the lighting retrofit.

Energy savings for the lighting retrofit were calculated according to the Illinois TRM 4.0, measures 4.5.4 and 4.5.12. Algorithms pertaining to savings calculations are presented below.

Electric Energy Savings

$$\Delta kWh = \left(\frac{Watts_{base} - Watts_{EE}}{1000}\right) * Hours * WHF_e * ISR$$

Where:

$Watts_{base}$ = input wattage of the baseline system

$Watts_{EE}$ = new input wattage of EE fixture

WHF_e = waste heat factor to account for cooling energy savings

ISR = in service rate (% of units rebated that get installed) = 1

Summer Coincident Peak Demand Savings

$$\Delta kW = \left(\frac{Watts_{base} - Watts_{EE}}{1000}\right) * WHF_d * CF * ISR$$

Where:

WHF_d = waste heat factor to account for cooling demand savings

CF = summer peak coincidence factor

Measure-Level Gross Realized Savings

The table below presents the realized gross energy savings of the lighting retrofit, along with the numeric values of inputs to the savings calculation equation.

Annual kWh Savings for Lighting Retrofit

Measure	***Calculation Inputs***					***Annual Gross kWh Savings***			
	Quantity	***Baseline Wattage***	***Efficient Wattage***	***Hours***	***WHF_e***	***Ex Ante***	***TRM Ex Post***	***ADM Ex Post***	***Realization Rate***
LED Bulbs and Fixtures	Base = 123 EE = 67	TRM = 100 Actual = 65	TRM = 23.1 Actual = 17	4,439	1.46	28,192	72,334	72,334	257%
T5 Fixtures and Lamps	742	TRM = 68 Actual = 32	TRM = 64 Actual = 54	4,439	1.46	81,686	19,235	19,235	24%
Total						**109,877**	**91,569**	**91,569**	

The ADM calculated ex post savings estimate will be equal to the TRM savings estimate, except in cases in which the TRM is not applied. The TRM is not be applied in cases in which it does not properly characterize the newly installed lighting system.

Summary of Project-Level Gross Realized Savings

The table shown below presents the realized gross energy savings of the lighting retrofit.

Verified Electric Savings/Realization Rates

Incentive	***Annual Gross Savings***

Type	*Ex Ante (kWh)*	*Ex Post (kWh)*	*Realization Rate*	*Ex Post Peak kW Reduction*
Standard	109,877	91,569	83%	14.83
Total	**109,877**	**91,569**	**83%**	**14.83**

A CF value of 0.66 and a WHF_d value of 1.59 was used to determine kW reduction. These values were taken from the TRM 4.0 based on applicable facility type.

Site personnel clarified that both 14W and 17W LEDs were installed in reference to the second line item in the table above. Verified counts of each lamp type were not obtainable, therefore an efficient wattage of 17W was used for all newly-installed fixtures to calculate ex post savings.

Site ID: 18

Executive Summary

Under application 18, the customer received custom incentives from the Illinois Department of Commerce & Economic Opportunity for HVAC improvements. The natural gas realization rate is 127%, and the electric realization rate is 103%.

Project Description

The customer performed HVAC improvements at one of their buildings, which included the following measures:

- Refurbish existing HVAC system and DDC control system,
- Clean Cooling Tower Fill Material, and
- Replace Steam Traps.

Methodology for Estimating Gross Savings

During the M&V visit, ADM staff verified the effectiveness of the HVAC measures by reviewing: the operation of the building and equipment and varying changes in the Energy Management System (EMS).

ADM calculated the annual energy savings for the installed measures through the use of monthly pre/post billing data regressions. The regressions compared the monthly billing data to the local weather in an effort to determine the effects that weather has on the cooling system/heating system for both the pre and post conditions. The monthly data consisted of natural gas sub-meters and electric meters. The derived gas regression has an R^2 of 0.95 and an adjusted R^2 of 0.92. The derived electric regression has an R^2 of 0.99 and an adjusted R^2 of 0.96.

From the regressions the following equations were derived and used to calculate the monthly energy consumption for the pre and post configurations:

$$Therms_{Monthly} = 26.5 \times HDD - 11.8 \times HDD\_Post$$

Where:

$Therms_{Monthly}$	= Monthly therms consumption
HDD	= Number of Heating Degree Days for the month
HDD_Post	= Binary value for pre/post monthly period (0=Pre, 1=Post) multiplied by HDD

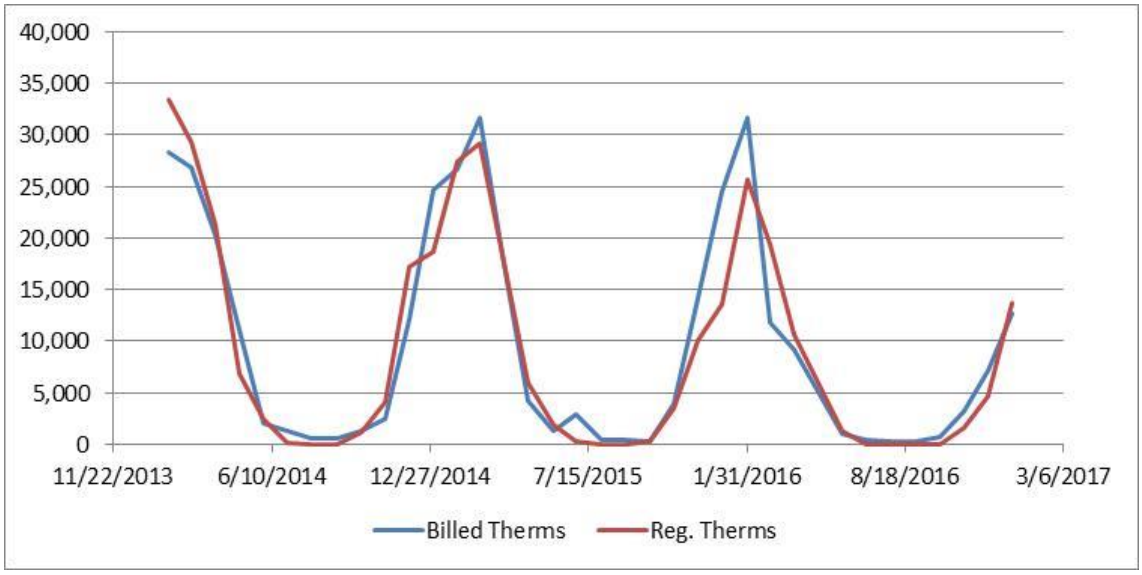
$$kWh_{Monthly} = 8{,}209 \times Days + 590 \times CDD + 72.8 \times HDD - 270 \times CDD\_Post - 8{,}074 \times Pre\_Post$$

Where:

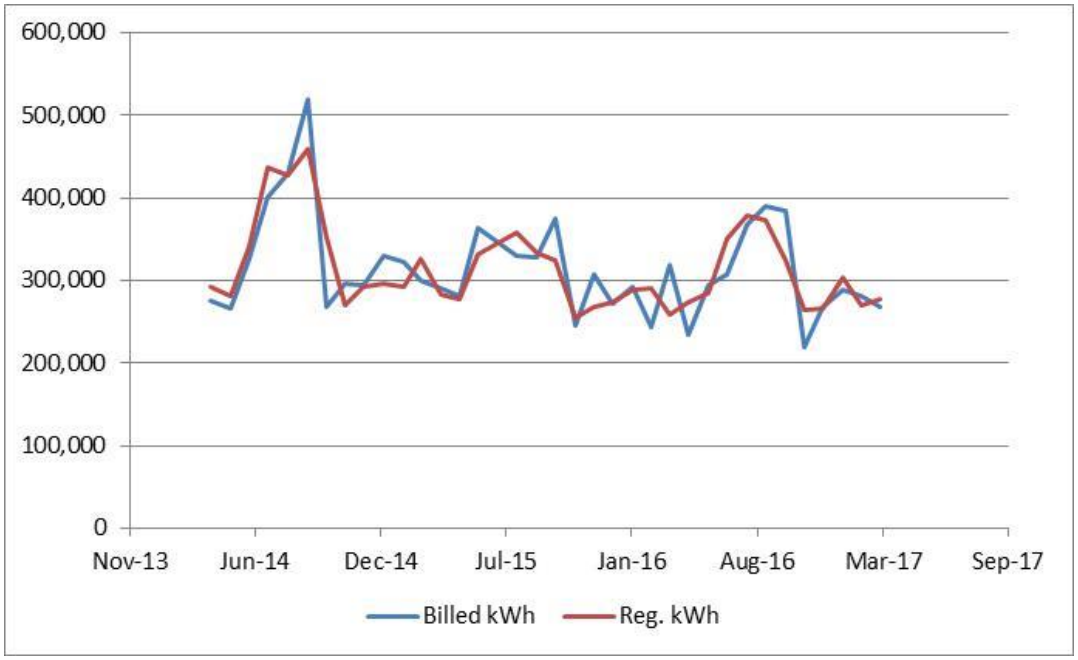
$kWh_{Monthly}$	= Monthly kWh consumption
HDD	= Number of Heating Degree Days for the month
CDD	= Number of Cooling Degree Days for the month
Days	= Number of Days for the month
Pre_Post	= Binary value for pre/post monthly period (0=Pre, 1=Post)
CDD_Post	= Pre_Post multiplied by CDD

The following plots compare the monthly billed therms and kWh to the therms and kWh calculated through the use of the derived equations:

Billed Vs. Regressed Monthly Therms



Billed Vs. Regressed Monthly kWh



Measure-level Gross Savings Results

Custom Incentives

The derived regression equations results in annual energy savings of 73,727 therms and 977,335 kWh for the project.

The table shown below presents the verified gross savings for measures that received custom incentives:

Annual Therms Savings for HVAC Improvements

Measure	***Annual Gross kWh Savings***	
	Ex Ante	***ADM Calculated Ex Post***
HVAC	57,860	73,727
Total	**57,860**	**73,727**

Annual kWh Savings for HVAC Improvements

Measure	***Annual Gross Therms Savings***	
	Ex Ante	***ADM Calculated Ex Post***
HVAC	952,002	977,335
Total	**952,002**	**977,335**

Project-level Gross Savings Results

The tables shown below present the verified gross savings for this project.

Verified Natural Gas Savings/Realization Rates

Incentive Type	***Measure Category***	***Annual Gross Savings***			***Lifetime Gross Savings***
		Ex Ante Therms	***Ex Post Therms***	***Realization Rate***	***Ex Post Therms***
Custom	HVAC	57,860	73,727	127%	1,105,910
Total	**HVAC**	**57,860**	**73,727**	**127%**	**1,105,910**

Verified Electric Savings/Realization Rates

Incentive Type	*Measure Category*	*Annual Gross Savings*				*Lifetime Gross Savings*	
		Ex Ante kWh	*Ex Post kWh*	*Realization Rate*	*Ex Post Peak kW Reduction*	*Ex Post kWh*	*Ex Post Peak kW Reduction*
Custom	HVAC	952,002	977,335	103%	111.57	14,660,020	111.57
Total	**HVAC**	**952,002**	**977,335**	**103%**	**111.57**	**14,660,020**	**111.57**

The natural gas realization rate is 127%, and the electric realization rate is 103%. The difference in savings can be attributed to the ex ante analysis engineering equations without using any actual data. The engineering equations don't account for actual building and equipment operations. Therefore, ADM relied on billing analysis to calculate the annual savings for the project. Billing analysis accounts for actual energy usage at the facility before and after the implementation of the project.

Site ID: 19

Executive Summary

Under application 19, the customer received custom incentives from the Illinois Department of Commerce & Economic Opportunity for HVAC improvements. The natural gas realization rate is 108%, and the electric realization rate is 102%.

Project Description

The customer performed HVAC improvements at one of their buildings, which included the following measures:

- Refurbish existing HVAC system and DDC control system.

Methodology for Estimating Gross Savings

During the M&V visit, ADM staff verified the effectiveness of the HVAC measures by reviewing: the operation of the building and equipment and varying changes in the Energy Management System (EMS).

ADM calculated the annual energy savings for the installed measures through the use of monthly pre/post billing data regressions. The regressions compared the monthly billing data to the local weather in an effort to determine the effects that weather has on the cooling system/heating system for both the pre and post conditions. The monthly data consisted of natural gas sub-meters and electric meters. The derived electric regression has an R^2 of 0.99 and an adjusted R^2 of 0.95. The gas billing data for the post period was incomplete for this project, so ADM relies on an average gas realization rate of 108% from similar projects for the same customer.

From the electric regression the following equation was derived and used to calculate the monthly energy consumption for the pre and post configurations:

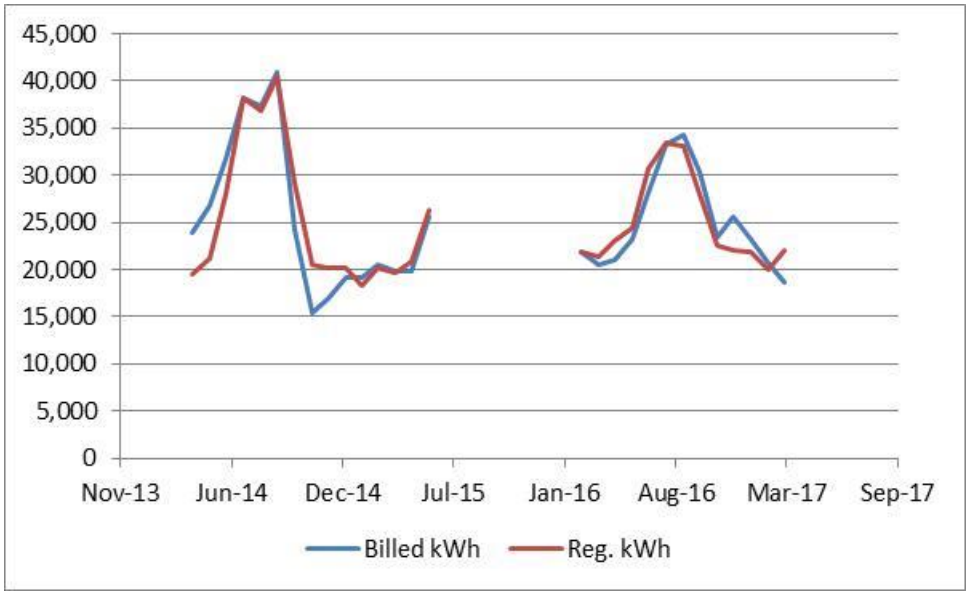
$$kWh_{Monthly} = 651 \times Days + 83.2 \times CDD - 44.9 \times CDD\_Post + 1{,}750 \times Pre\_Post$$

Where:

$kWh_{Monthly}$	= Monthly kWh consumption
CDD	= Number of Cooling Degree Days for the month
Days	= Number of Days for the month
Pre_Post	= Binary value for pre/post monthly period (0=Pre, 1=Post)
CDD_Post	= Pre_Post multiplied by CDD

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

Billed Vs. Regressed Monthly kWh



The implementation of the project was from July 2015 to March 2016, so that data is ignored in the regression.

Measure-level Gross Savings Results

Custom Incentives

The derived regression equations results in annual energy savings of 73,727 therms and 977,335 kWh for the project.

The table shown below presents the verified gross savings for measures that received custom incentives:

Annual Therms Savings for HVAC Improvements

Measure	***Annual Gross kWh Savings***	
	Ex Ante	***ADM Calculated Ex Post***
HVAC	2,188	2,356
Total	**2,188**	**2,356**

Annual kWh Savings for HVAC Improvements

Measure	*Annual Gross Therms Savings*	
	Ex Ante	*ADM Calculated Ex Post*
HVAC	25,244	25,673
Total	**25,244**	**25,673**

Project-level Gross Savings Results

The tables shown below present the verified gross savings for this project.

Verified Natural Gas Savings/Realization Rates

Incentive Type	*Measure Category*	*Annual Gross Savings*			*Lifetime Gross Savings*
		Ex Ante Therms	*Ex Post Therms*	*Realization Rate*	*Ex Post Therms*
Custom	HVAC	2,188	2,356	108%	35,345
Total	**HVAC**	**2,188**	**2,356**	**108%**	**35,345**

Verified Electric Savings/Realization Rates

Incentive Type	*Measure Category*	*Annual Gross Savings*				*Lifetime Gross Savings*	
		Ex Ante kWh	*Ex Post kWh*	*Realization Rate*	*Ex Post Peak kW Reduction*	*Ex Post kWh*	*Ex Post Peak kW Reduction*
Custom	HVAC	25,244	25,673	102%	2.93	385,095	2.93
Total	**HVAC**	**25,244**	**25,673**	**102%**	**2.93**	**385,095**	**2.93**

The natural gas realization rate is 108%, and the electric realization rate is 102%. The difference in savings can be attributed to the ex ante analysis engineering equations without using any actual data. The engineering equations don't account for actual building and equipment operations. Therefore, ADM relied on billing analysis to calculate the annual savings for the project. Billing analysis accounts for actual energy usage at the facility before and after the implementation of the project.

Site ID: 20

Executive Summary

Under application 20, the customer received custom incentives from the Illinois Department of Commerce & Economic Opportunity for HVAC improvements. The natural gas realization rate is 138%, and the electric realization rate is 98%.

Project Description

The customer performed HVAC improvements at one of their buildings, which included the following measures:

- Refurbish existing HVAC system and DDC control system.

Methodology for Estimating Gross Savings

During the M&V visit, ADM staff verified the effectiveness of the HVAC measures by reviewing: the operation of the building and equipment and varying changes in the Energy Management System (EMS).

ADM calculated the annual energy savings for the installed measures through the use of monthly pre/post billing data regressions. The regressions compared the monthly billing data to the local weather in an effort to determine the effects that weather has on the cooling system/heating system for both the pre and post conditions. The monthly data consisted of natural gas sub-meters and electric meters. The derived gas regression has an R^2 of 0.99 and an adjusted R^2 of 0.96. The derived electric regression has an R^2 of 0.99 and an adjusted R^2 of 0.96.

From the regressions the following equations were derived and used to calculate the monthly energy consumption for the pre and post configurations:

$$Therms_{Monthly} = 111 \times Days + 9.84 \times HDD - 5.47 \times CDD - 2.46 \times HDD\_Post$$

Where:

$Therms_{Monthly}$	= Monthly therms consumption
HDD	= Number of Heating Degree Days for the month
CDD	= Number of Cooling Degree Days for the month
Days	= Number of Days for the month
HDD_Post	= Binary value for pre/post monthly period (0=Pre, 1=Post) multiplied by HDD

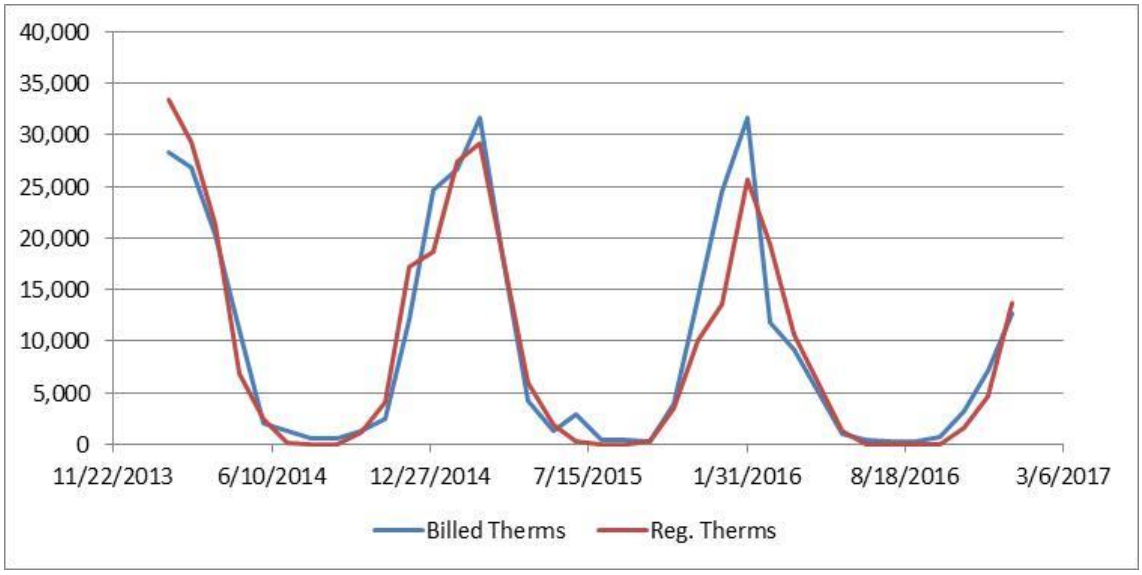
$$kWh_{Monthly} = 1{,}799 \times Days + 302 \times CDD + 35.5 \times HDD - 153 \times CDD\_Post$$

Where:

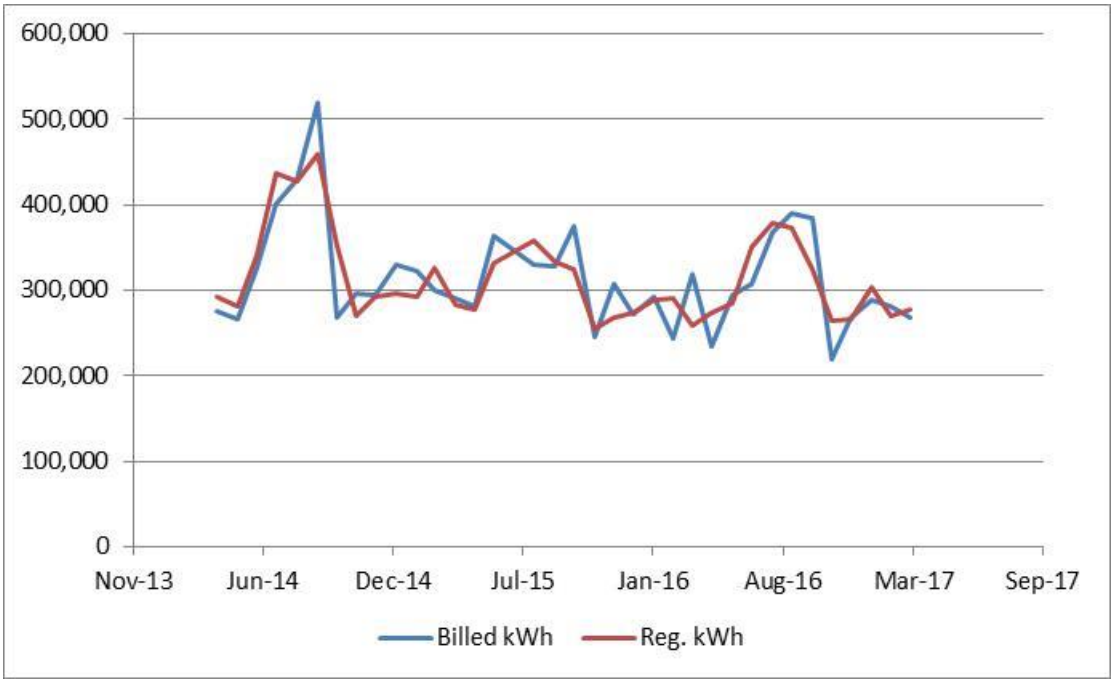
$kWh_{Monthly}$	= Monthly kWh consumption
CDD_Post	= Pre_Post multiplied by CDD

The following plots compare the monthly billed therms and kWh to the therms and kWh calculated through the use of the derived equations:

Billed Vs. Regressed Monthly Therms



Billed Vs. Regressed Monthly kWh



Measure-level Gross Savings Results

Custom Incentives

The derived regression equations results in annual energy savings of 9,675 therms and 159,552 kWh for the project.

The table shown below presents the verified gross savings for measures that received custom incentives:

Annual Therms Savings for HVAC Improvements

Measure	***Annual Gross kWh Savings***	
	Ex Ante	***ADM Calculated Ex Post***
HVAC	7,027	9,675
Total	**7,027**	**9,675**

Annual kWh Savings for HVAC Improvements

Measure	***Annual Gross Therms Savings***	
	Ex Ante	***ADM Calculated Ex Post***
HVAC	162,835	159,552
Total	**162,835**	**159,552**

Project-level Gross Savings Results

The tables shown below present the verified gross savings for this project.

Verified Natural Gas Savings/Realization Rates

Incentive Type	***Measure Category***	***Annual Gross Savings***			***Lifetime Gross Savings***
		Ex Ante Therms	***Ex Post Therms***	***Realization Rate***	***Ex Post Therms***
Custom	HVAC	7,027	9,675	138%	145,123
Total	**HVAC**	**7,027**	**9,675**	**138%**	**145,123**

Verified Electric Savings/Realization Rates

Incentive Type	*Measure Category*	*Annual Gross Savings*				*Lifetime Gross Savings*	
		Ex Ante kWh	*Ex Post kWh*	*Realization Rate*	*Ex Post Peak kW Reduction*	*Ex Post kWh*	*Ex Post Peak kW Reduction*
Custom	HVAC	162,835	159,552	98%	18.21	2,393,279	18.21
Total	**HVAC**	**162,835**	**159,552**	**98%**	**18.21**	**2,393,279**	**18.21**

The natural gas realization rate is 138%, and the electric realization rate is 98%. The difference in savings can be attributed to the ex ante analysis engineering equations without using any actual data. The engineering equations don't account for actual building and equipment operations. Therefore, ADM relied on billing analysis to calculate the annual savings for the project. Billing analysis accounts for actual energy usage at the facility before and after the implementation of the project.

Site ID: 21

Executive Summary

The program participant received Custom Program electric incentives from the Illinois Department of Commerce for replacing a pump station. The electric realization rate for this project is 0%.

Project Description

The customer completed construction of a new pump station replacing the existing influent pump station.

The existing pumps were installed in the 1950s and had reached the end of their useful life. Two of the pumps were constant speed, natural gas engine driven pumps. The third pump was VFD driven with an electric motor. The pumps were manually controlled by the plant operator.

The new pump station utilizes four VFD driven, high efficiency, dry-pit submersible pumps with automatic controls that match the pumping rate with the influent flow.

Methodology for Estimating Gross Savings

ADM staff reviewed project documentation to evaluate this project.

The project only has expected electric savings. Since the expected baseline is existing conditions, there are potentially negative electric impacts and positive gas impacts.

Measure-level Gross Savings Results

The table shown below presents the annual kWh savings associated with the pump station:

The table shown below presents the verified gross savings:

Measure	***Annual Gross kWh Savings***	
	Ex Ante	***ADM Calculated Ex Post***
Pump Station Replacement	1,258,892	0
Total	**1,258,892**	**0**

ADM is reporting 0 kWh savings although there are likely to be negative electric impacts and positive gas savings assuming existing conditions as a baseline. The sampled project was only for electric savings, so potential gas savings were not evaluated.

Project-level Gross Savings Results

The tables shown below present the verified gross savings for this project.

Verified Electric Savings/Realization Rates

Incentive Type	*Measure Category*	*Annual Gross Savings*				*Lifetime Gross Savings*	
		Ex Ante kWh	*Ex Post kWh*	*Realization Rate*	*Ex Post Peak kW Reduction*	*Ex Post kWh*	*Ex Post Peak kW Reduction*
Custom	Pumps	1,258,892	0	0%	0	0	0
Total		**1,258,892**	**0**	**0%**	**0**	**0**	**0**

The electric measure has a verified realization rate of 0%. ADM notes that this is a fuel switching project, but only electric incentives were given and evaluated.

The project only has expected electric savings. The ex ante baseline is the existing pump station. The ex ante converted the gas usage of the natural gas engine driven pumps into electric usage. The expected savings are the difference between the converted total electric baseline usage and the usage of the installed pump station.

If the baseline is existing conditions, there are most likely negative electric impacts and positive gas savings. ADM concludes that there are 0 kWh electric savings and chose not to evaluate gas savings since this was an electric only application. Furthermore, it is stated that the pumps were at the end of their useful life. The baseline would be new construction, and the customer already had an existing efficient pump with a VFD. Thus, the baseline equipment is the installed equipment (electric motors with VFDs). In this case, 0 kWh savings is further justified for this project.

Site ID: 22

Executive Summary

The program participant received Standard program incentives for retrofitting lighting. The gross realization rate for these measures is 143%.

Project Description

The participant implemented the following measure(s):

- (2) 2', 1 lamp, 19W FO20T8 fixtures relamped with 2', 1 lamp, 9W LEDs
- (2) 4', 2 lamp, 59W F32T8 fixtures relamped with 4', 4 lamp, 12W LEDs
- (3) 3', 1 lamp, 24W FO25T8 fixtures relamped with 3', 1 lamp, 12W LEDs
- (1) 3', 2 lamp, 74W F30T12 fixtures relamped with 3', 2 lamp, 12W LEDs
- (7) 2', 1 U-tube lamp, 32W FB32T8 fixtures relamped with 6", 2 U-tube, 12W LEDs
- (1) 4', 2 lamp, 86W F40T12 fixtures relamped with 4', 2 lamp, 12W LEDs
- (5) 3', 2 lamp, 46W F25T8 fixtures relamped with 3', 2 lamp, 12W LEDs
- (7) 4', 1 lamp, 32W F32T8 fixtures relamped with 4', 1 lamp, 12W LEDs
- (3) 6", 60W incandescent downlight fixtures relamped with 13W LEDs
- (2) 6', 4 lamp, 132W F30T12 fixtures relamped with 3', 1 lamp, 48W LEDs
- (2) 4', 4 lamp, 122W FO32T8 fixtures relamped with 4', 2 lamp, 12W LEDs
- (14) 2', 2 lamp, 34W FO17T8 fixtures relamped with 2', 2 lamp, 9W LEDs
- (13) 4', 1 lamp, 42W F40T12 fixtures relamped with 4', 1 lamp, 12W LEDs
- (13) 3', 1 lamp, 46W F30T12 fixtures relamped with 3', 1 lamp, 12W LEDs
- (13) 4', 4 lamp, 122W FO32T8 fixtures relamped with 4', 4 lamp, 12W LEDs
- (40) 2', 3 lamp, 59W FO17T8 fixtures relamped with 2', 3 lamp, 9W LEDs
- (28) 2', 2 U-tube lamp, 76W FB40T12 fixtures relamped with 6", 2 U-tube, 12W LEDs
- (95) 4 lamp, 64W FO17T8 fixtures relamped with 2', 4 lamp, 9W LEDs
- (88) 2', 4 lamp, 68W FO17T8 fixtures relamped with 2', 4 lamp, 9W LEDs
- (136) 52W compact fluorescent downlight fixtures replaced by 27W LEDs
- (56) 4', 2 lamp, 85W F40T12 fixtures relamped with 4', 2 lamp, 12W LEDs
- (209) 4', 2 lamp, 59W F32T8 fixtures relamped with 4', 3 lamp, 12W LEDs
- (185) 2', 3 lamp, 54W FO17T8 fixtures relamped with 2', 3 lamp, 9W LEDs
- (60) 8', 4 lamp, 148W F40T12 fixtures relamped with 4', 4 lamp, 12W LEDs
- (228) 4', 2 lamp, 59W F32T8 fixtures relamped with 4', 2 lamp, 12W LEDs
- (1,950) 2', 2 U-tube, 60W FB32T8 fixtures relamped with 6", 2 U-tube, 12W LEDs
- (6,500) 4', 3 lamp, 90W F32T8 fixtures relamped with 4', 3 lamp, 12W LEDs

Methodology for Estimating Gross Savings.

ADM staff inspected project documentation pertaining to the lighting retrofit.

Energy savings for the lighting retrofit were calculated according to the Illinois TRM 4.0, measure 4.5.4. Algorithms pertaining to savings calculations are presented below.

Electric Energy Savings

$$\Delta kWh = \left(\frac{Watts_{base} - Watts_{EE}}{1000}\right) * Hours * WHF_e * ISR$$

Where:

$Watts_{base}$ = input wattage of the baseline system

$Watts_{EE}$ = new input wattage of EE fixture

WHF_e = waste heat factor to account for cooling energy savings

ISR = in service rate (% of units rebated that get installed) = 1

Summer Coincident Peak Demand Savings

$$\Delta kW = \left(\frac{Watts_{base} - Watts_{EE}}{1000}\right) * WHF_d * CF * ISR$$

Where:

WHF_d = waste heat factor to account for cooling demand savings

CF = summer peak coincidence factor

Measure-Level Gross Realized Savings

The table below presents the realized gross energy savings of the lighting retrofit, along with the numeric values of inputs to the savings calculation equation.

Annual kWh Savings for Lighting Retrofit

Measure	*Calculation Inputs*					*Annual Gross kWh Savings*			
	Quantity	***Baseline Wattage***	***Efficient Wattage***	***Hours***	***WHF_e***	***Ex Ante***	***TRM Ex Post***	***ADM Ex Post***	***Realization Rate***
LED Bulbs and Fixtures	2	TRM = N/A Actual = 19	9	4,439	1.35	83	120	120	144%
	2	TRM = 88 Actual = 59	48	4,439	1.35	92	479	479	523%
	3	TRM = N/A Actual = 24	12	4,439	1.35	150	216	216	144%
	1	TRM = N/A Actual = 74	24	4,439	1.35	208	300	300	144%

Measure	*Calculation Inputs*					*Annual Gross kWh Savings*			
	Quantity	***Baseline Wattage***	***Efficient Wattage***	***Hours***	***WHF_e***	***Ex Ante***	***TRM Ex Post***	***ADM Ex Post***	***Realization Rate***
	7	TRM = 61 Actual = 32	24	4,439	1.35	233	1,552	1,552	665%
	1	TRM = 88 Actual = 86	24	4,439	1.35	258	384	384	148%
	5	TRM = N/A Actual = 46	24	4,439	1.35	459	659	659	144%
	7	TRM = 59 Actual = 32	12	4,439	1.35	584	1,972	1,972	338%
	3	TRM = 54.3 Actual = 60	13	4,439	1.35	588	742	742	126%
	2	TRM = N/A Actual = 132	48	4,439	1.35	700	1,007	1,007	144%
	2	TRM = 88 Actual = 122	24	4,439	1.35	817	767	767	94%
	14	TRM = 61 Actual = 34	18	4,439	1.35	934	3,608	3,608	386%
	13	TRM = 59 Actual = 42	12	4,439	1.35	1,626	3,662	3,662	225%
	13	TRM = N/A Actual = 46	12	4,439	1.35	1,843	2,649	2,649	144%
	13	TRM = 88 Actual = 122	48	4,439	1.35	4,010	3,116	3,116	78%
	40	TRM = 61 Actual = 59	27	4,439	1.35	5,336	8,150	8,150	153%
	28	TRM = 61 Actual = 76	24	4,439	1.35	6,070	6,208	6,208	102%
	95	TRM = 61 Actual = 64	36	4,439	1.35	11,089	14,233	14,233	128%
	88	TRM = 61 Actual = 68	36	4,439	1.35	11,739	13,184	13,184	112%
	136	TRM = 54.3 Actual = 52	27	4,439	1.35	14,174	22,250	22,250	157%
	56	TRM = 88 Actual = 85	24	4,439	1.35	14,241	21,478	21,478	151%
	209	TRM = 88 Actual = 59	36	4,439	1.35	20,039	65,128	65,128	325%
	185	TRM = 61 Actual = 54	27	4,439	1.35	20,823	37,694	37,694	181%
	60	TRM = 88 Actual = 148	48	4,439	1.35	25,013	14,382	14,382	58%
	228	TRM = 88 Actual = 59	24	4,439	1.35	33,267	87,445	87,445	263%
	1,950	TRM = 61 Actual = 60	24	4,439	1.35	292,650	432,370	432,370	148%

Measure	*Calculation Inputs*					*Annual Gross kWh Savings*			
	Quantity	***Baseline Wattage***	***Efficient Wattage***	***Hours***	***WHF_e***	***Ex Ante***	***TRM Ex Post***	***ADM Ex Post***	***Realization Rate***
	6,500	TRM = 88 Actual = 90	36	4,439	1.35	1,463,249	2,025,516	2,025,516	138%
Total						**1,930,275**	**2,769,268**	**2,769,268**	

The ADM calculated ex post savings estimate will be equal to the TRM savings estimate, except in cases in which the TRM is not applied. The TRM is not be applied in cases in which it does not properly characterize the newly installed lighting system.

Summary of Project-Level Gross Realized Savings

The table shown below presents the realized gross energy savings of the lighting retrofit.

Verified Electric Savings/Realization Rates

Incentive Type	*Annual Gross Savings*			
	Ex Ante (kWh)	***Ex Post (kWh)***	***Realization Rate***	***Ex Post Peak kW Reduction***
Standard	1,930,275	2,769,268	143%	481.89
Total	**1,930,275**	**2,769,268**	**143%**	**481.89**

A CF value of 0.66 and a WHF_d value of 1.58 was used to determine kW peak demand reduction. These values were taken from the TRM 4.0 based on applicable facility type.

Pre-existing fixture wattages were referenced regarding baseline wattage for measures that include the installation of 3' lamps or 1x2 linear fixtures since the TRM does not properly characterize these lighting systems. Installed LED wattages were referenced for efficient wattage as stipulated by the TRM.

Site ID: 23

Executive Summary

The program participant received Standard program incentives for retrofitting lighting. The gross realization rate for these measures is 101%.

Project Description

The participant implemented the following measure(s):

- (1) 3', 1 lamp, 38W F30T12 fixtures relamped with 3', 1 lamp, 12W LEDs
- (4) 2', 1 lamp, 19W FO17T8 fixtures relamped with 2', 1 lamp, 9W LEDs
- (1) 4', 4 lamp, 146W F40T12 fixtures relamped with 4', 4 lamp 17W LEDs
- (5) 2', 2 lamp, 34W FO17T8 fixtures relamped with 2', 2 lamp, 9W LEDs
- (4) 4', 4 lamp, 113W FO32T8 fixtures relamped with 4', 4 lamp, 17W LEDs
- (8) 4', 2 lamp, 73W F40T12 fixtures relamped with by 4', 2 lamp, 17W LEDs
- (4) 200W incandescent globe fixtures replaced by 14W LED drum fixtures
- (27) 2', 2 lamp, 56W F20T12 fixtures relamped with 2', 2 lamp, 9W LEDs
- (92) 3', 1 lamp, 24W F25T8 fixtures relamped with 3', 1 lamp, 12W LEDs
- (57) 60W F32T8 fixtures replaced with 28W LED Bi-Level occupancy fixtures
- (57) 4', 2 lamp, 60W F32T8 fixtures relamped with 4', 1 lamp, 28W LED fixtures
- (115) 3', 6 lamp, 46W FO25T8 lamps relamped with 3', 2 lamp, 12W LEDs
- (32) 295W HPS pole mounted fixtures replaced by 133W LED pole mounted fixtures
- (175) 3', 4 lamp, 90W FO25T8 lamps relamped with 3', 4 lamp, 12W LEDs
- (139) 93W mercury vapor downlight fixtures relamped with 14W LEDs
- (924) 4', 1 lamp, 32W F32T8 lamps relamped with 4', 1 lamp, 17W LEDs
- (80) 2'x2', 297W mercury vapor fixtures replaced by 2'x2', 60W LED fixtures
- (727) 4', 2 lamp, 60W F32T8 lamps relamped with 4', 2 lamp, 17W LEDs
- (152) 214W mercury vapor downlight fixtures relamped with 42W LEDs

- (49) 590W HPS pole mounted fixtures replaced by (98) 133W LED pole mounted fixtures
- (2,167) 3', 6 lamp, 135W FO25T8 fixtures relamped with 3', 6 lamp, 12W LEDs
- (655) 297W mercury vapor downlight fixtures relamped with 55W LEDs
- (1) 190W HPS wall pack replaced by 32W LED wall pack

Methodology for Estimating Gross Savings.

ADM staff inspected project documentation pertaining to the lighting retrofit.

Energy savings for the lighting retrofit were calculated according to the Illinois TRM 4.0, measures 4.5.4 and 4.5.13. Algorithms pertaining to savings calculations are presented below.

Electric Energy Savings

$$\Delta kWh\ (reduced\ wattage) = \left(\frac{Watts_{base} - Watts_{EE}}{1000}\right) * Hours * WHF_e * ISR$$

Where:

$Watts_{base}$	= input wattage of the baseline system
$Watts_{EE}$	= new input wattage of EE fixture
WHF_e	= waste heat factor to account for cooling energy savings
ISR	= in service rate (% of units rebated that get installed) = 1

$$\Delta kWh\ (bi - level\ fix.) = (kW_{baseline} - (kW_{controlled} * (1 - ESF))) * Hours * WHF_e$$

Where:

$kW_{controlled}$	= total lighting load connected to the control in kilowatts
ESF	= energy savings factor (% reduction to the operating hours from the non-controlled baseline lighting system) = % Standby Mode * (1 - % Full Light at Standby Mode)

Summer Coincident Peak Demand Savings

$$\Delta kW\ (reduced\ wattage) = \left(\frac{Watts_{base} - Watts_{EE}}{1000}\right) * WHF_d * CF * ISR$$

Where:

WHF_d	= waste heat factor to account for cooling demand savings
CF	= summer peak coincidence factor

$$\Delta kW\ (bi-level\ fix.) = (kW_{base} - (kW_{controlled} * (1 - ESF))) * WHF_d * (CF_{base} - CF_{OS})$$

Where:

CF_{OS} = 0.15

Measure-Level Gross Realized Savings

The table below presents the realized gross energy savings of the lighting retrofit, along with the numeric values of inputs to the savings calculation equation.

Annual kWh Savings for Lighting Retrofit

Measure	***Calculation Inputs***						***Annual Gross kWh Savings***			
	Quantity	***Baseline Wattage***	***Efficient Wattage***	***Hours***	***WHF_e***	***ESF***	***Ex Ante***	***TRM Ex Post***	***ADM Ex Post***	***Realization Rate***
LED Bulbs and Fixtures	1	TRM = N/A Actual = 38	TRM = N/A Actual = 12	4,439	1.46	N/A	117	169	169	144%
	4	TRM = N/A Actual = 19	TRM = N/A Actual = 9	4,439	1.46	N/A	180	259	259	144%
	1	TRM = 88 Actual = 146	TRM = 53.6 Actual = 68	4,439	1.46	N/A	352	130	130	37%
	5	TRM = 61 Actual = 34	TRM = 44.9 Actual = 18	4,439	1.46	N/A	361	1,393	1,393	386%
	4	TRM = 88 Actual = 113	TRM = 53.6 Actual = 68	4,439	1.46	N/A	812	518	518	64%
	8	TRM = 88 Actual = 73	TRM = 53.6 Actual = 34	4,439	1.46	N/A	3,165	2,800	2,800	88%
	4	TRM = N/A Actual = 200	TRM = N/A Actual = 14	4,439	1.46	N/A	3,354	4,822	4,822	144%
	27	TRM = 61 Actual = 56	TRM = 44.9 Actual = 18	4,439	1.46	N/A	4,626	7,524	7,524	163%
	92	TRM = N/A Actual = 24	TRM = N/A Actual = 12	4,439	1.46	N/A	4,977	7,155	7,155	144%
Occupancy Controlled Bi-Level Fixtures	57	28	28	8,766	1.46	0.71	5,107	14,431	14,431	283%
LED Bulbs and Fixtures	57	TRM = 59 Actual = 60	TRM = 32.2 Actual = 28	4,439	1.46	N/A	8,223	11,452	11,452	139%
	115	TRM = N/A Actual = 46	TRM = N/A Actual = 24	4,439	1.46	N/A	11,406	16,397	16,397	144%
	32	TRM = 361.4 Actual = 295	TRM = 116.8 Actual = 133	4,903	1.00	N/A	25,417	35,835	35,835	141%
	175	TRM = N/A Actual = 90	TRM = N/A Actual = 48	4,439	1.46	N/A	33,137	47,635	47,635	144%

Measure	*Calculation Inputs*						*Annual Gross kWh Savings*			
	Quantity	***Baseline Wattage***	***Efficient Wattage***	***Hours***	***WHF_e***	***ESF***	***Ex Ante***	***TRM Ex Post***	***ADM Ex Post***	***Realization Rate***
	139	TRM = 54.3 Actual = 93	TRM = 17.6 Actual = 14	4,439	1.46	N/A	49,508	36,304	36,304	73%
	924	TRM = 59 Actual = 32	TRM = 32.2 Actual = 17	4,439	1.46	N/A	62,488	251,512	251,512	402%
	80	TRM = 61 Actual = 297	TRM = 44.9 Actual = 60	4,439	1.46	N/A	85,481	518	518	1%
	727	TRM = 59 Actual = 60	TRM = 32.2 Actual = 34	4,439	1.46	N/A	114,876	117,791	117,791	103%
	152	TRM = 54.3 Actual = 214	TRM = 17.6 Actual = 42	4,439	1.46	N/A	117,870	12,117	12,117	10%
	Base = 49 EE = 98	TRM = 361.4 Actual = 590	TRM = 116.8 Actual = 133	4,903	1.00	N/A	219,586	22,920	22,920	10%
	2,167	TRM = N/A Actual = 135	TRM = N/A Actual = 72	4,439	1.46	N/A	615,502	884,784	884,784	144%
	655	TRM = 54.3 Actual = 297	TRM = 17.6 Actual = 55	4,439	1.46	N/A	714,639	1,027,294	1,027,294	144%
	1	TRM = 182.9 Actual = 190	TRM = 52.5 Actual = 32	4,439	1.46	N/A	845	978	978	116%
Total							**2,487,383**	**2,504,738**	**2,504,738**	

The ADM calculated ex post savings estimate will be equal to the TRM savings estimate, except in cases in which the TRM is not applied. The TRM is not be applied in cases in which it does not properly characterize the newly installed lighting system.

Summary of Project-Level Gross Realized Savings

The table shown below presents the realized gross energy savings of the lighting retrofit.

Verified Electric Savings/Realization Rates

Incentive Type	*Annual Gross Savings*			
	Ex Ante (kWh)	***Ex Post (kWh)***	***Realization Rate***	***Ex Post Peak kW Reduction***
Standard	2,487,383	2,504,738	101%	394.90
Total	**2,487,383**	**2,504,738**	**101%**	**394.90**

A CF value of 0.66 and a WHF_d value of 1.59 were referenced to determine kW reduction. These values were taken from the TRM 4.0 based on applicable facility type. No kW reduction was determined for exterior fixtures.

TRM measure 4.5.13 is limited to 24/7 operation, thus 8,766 annual hours of operation are used. An ESF value of 0.71 was referenced from the table in the TRM using 10% full light during standby mode in stairwell applications.

Pre-existing fixture wattages were referenced regarding baseline wattage for measures that include the installation of 3' lamps or 1x2 linear fixtures since the TRM does not properly characterize these lighting systems. Installed LED wattages were referenced for efficient wattage as stipulated by the TRM.

Line items seven and twenty two in the first table above reference pre-existing fixture wattage instead of the TRM tables because the installed lighting has a higher output than what is characterized in the TRM.

Site ID: 24

Executive Summary

The program participant received Standard Program incentives for retrofitting lighting and installing lighting controls. The gross realization rate for these measures is 139%.

Project Description

The participant implemented the following measure(s):

- (2) 179W mercury vapor wall packs replaced by 32W LED wall packs
- (1) 4', 2 lamp, 73W F40T12 fixtures relamped with 4', 2 lamp, 17W LEDs
- (4) 130W pole mounted HPS fixtures replaced by 70W pole mounted LEDs
- (9) 4', 4 lamp, 113W FO32T8 fixtures relamped with 4', 4 lamp, 17W LEDs
- (16) 65W incandescent downlight fixtures replaced by 12W LED screw in bulbs
- (33) 4', 2L, 60W F32T8 fixtures replaced with 4', 1L, 28W LED bi-level occupancy fixtures
- (29) Fixture mounted occupancy sensors installed (1,042 controlled watts)
- (33) 4', 2 lamp, 60W F32T8 fixtures relamped with 4', 1 lamp, 28W LEDs
- (39) 2', 3 lamp, 54W FO17T8 fixtures relamped with 2', 2 lamp, 9W LEDs
- (44) 2', 2 lamp, 56W F20T12 fixtures relamped with 2', 2 lamp, 9W LEDs
- (19) 120W mercury vapor downlight fixtures relamped with 26W LEDs
- (110) 2', 2 U-tube, 58W FB32T8 fixtures relamped with 2', 3 lamp, 9W LEDs
- (71) 93W mercury vapory downlight fixtures relamped with 14W LEDs
- (36) 295W pole mounted HPS fixtures replaced by 133W LED pole mounted fixtures
- (919) 4', 1 lamp, 32W F32T8 fixtures relamped with 4', 1 lamp, 17W LEDs
- (100) 214W mercury vapor downlight fixtures relamped with 42W LEDs
- (417) 3', 4 lamp, 90W FO25T8 fixtures relamped with 3', 4 lamp, 12W LEDs

- (78) 2'x2', 297W mercury vapor fixtures replaced by 2'x2', 1 lamp, 60W LED fixtures
- (1,050) 4', 2 lamp, 60W F32T8 fixtures relamped by 4', 2 lamp, 17W LEDs
- (38) 590W pole mounted HPS fixtures replaced by (76) 133W pole mounted LED fixtures
- (1,946) 3', 6 lamp, 135W FO25T8 fixtures relamped with 3', 6 lamp, 12W LEDs
- (535) 297W mercury vapor downlight fixtures relamped with 55W LEDs

Methodology for Estimating Gross Savings.

ADM staff inspected project documentation pertaining to the lighting retrofit.

Energy savings for the lighting retrofit were calculated according to the Illinois TRM 4.0, measures 4.5.4, 4.5.10, and 4.5.13. Algorithms pertaining to savings calculations are presented below.

Electric Energy Savings

$$\Delta kWh\ (reduced\ wattage) = \left(\frac{Watts_{base} - Watts_{EE}}{1000}\right) * Hours * WHF_e * ISR$$

Where:

$Watts_{base}$	= input wattage of the baseline system
$Watts_{EE}$	= new input wattage of EE fixture
WHF_e	= waste heat factor to account for cooling energy savings
ISR	= in service rate (% of units rebated that get installed) = 1

$$\Delta kWh\ (occupancy\ sensor) = kW_{controlled} * Hours * ESF * WHF_e$$

$$\Delta kWh\ (bi-level\ fix.) = (kW_{baseline} - (kW_{controlled} * (1 - ESF))) * Hours * WHF_e$$

Where:

$kW_{controlled}$	= total lighting load connected to the control in kilowatts
ESF	= energy savings factor (% reduction to the operating hours from the non-controlled baseline lighting system)

Summer Coincident Peak Demand Savings

$$\Delta kW\ (reduced\ wattage) = \left(\frac{Watts_{base} - Watts_{EE}}{1000}\right) * WHF_d * CF * ISR$$

Where:

WHF_d	= waste heat factor to account for cooling demand savings
CF	= summer peak coincidence factor

$$\Delta kW\ (occupancy\ sensor) = kW_{controlled} * WHF_d * (CF_{baseline} - CF_{OS})$$

$$\Delta kW\ (bi-level\ fix.) = (kW_{base} - (kW_{controlled} * (1 - ESF))) * WHF_d * (CF_{base} - CF_{OS})$$

Where:

CF_{OS} = 0.15

Measure-Level Gross Realized Savings

The table below presents the realized gross energy savings of the lighting retrofit, along with the numeric values of inputs to the savings calculation equation.

Annual kWh Savings for Lighting Retrofit

Measure	*Calculation Inputs*					*Annual Gross kWh Savings*			
	Quantity	***Baseline Wattage***	***Efficient Wattage***	***Hours***	***WHF_e***	***Ex Ante***	***TRM Ex Post***	***ADM Ex Post***	***Realization Rate***
LED Bulbs and Fixtures	2	TRM = 182.9 Actual = 176	TRM = 52.5 Actual = 32	4,903	1.00	1,690	1,480	1,480	88%
	1	TRM = 88 Actual = 73	TRM = 53.6 Actual = 34	4,439	1.46	176	350	350	199%
	4	TRM = 182.9 Actual = 130	TRM = 52.5 Actual = 70	4,903	1.00	1,177	2,214	2,214	188%
	9	TRM = 88 Actual = 113	TRM = 53.6 Actual = 68	4,439	1.46	1,826	1,167	1,167	64%
	16	TRM = 43 Actual = 65	TRM = N/A Actual = 12	4,439	1.46	3,823	3,215	3,215	84%
Occupancy Controlled Bi-Level Fixtures	33	28	28	8,766	1.46	898	8,355	8,355	930%
Occupancy Sensor Lighting Controls	29	1,042	N/A	4,439	1.46	2,026	2,026	2,026	100%
LED Bulbs and Fixtures	33	TRM = 59 Actual = 60	TRM = 32.2 Actual = 28	4,439	1.46	4,761	6,630	6,630	139%
	39	TRM = 61 Actual = 54	TRM = 44.9 Actual = 18	4,439	1.46	6,330	10,869	10,869	172%
	44	TRM = 61 Actual = 56	TRM = 44.9 Actual = 18	4,439	1.46	7,538	12,262	12,262	163%
	19	TRM = 54.3 Actual = 120	TRM = 17.6 Actual = 26	4,439	1.46	8,052	3,485	3,485	43%
	110	TRM = 61 Actual = 58	TRM = 44.9 Actual = 27	4,439	1.46	15,374	24,239	24,239	158%
	71	TRM = 54.3 Actual = 93	TRM = 17.6 Actual = 14	4,439	1.46	25,288	18,544	18,544	73%

Measure	*Calculation Inputs*					*Annual Gross kWh Savings*			
	Quantity	***Baseline Wattage***	***Efficient Wattage***	***Hours***	***WHF_e***	***Ex Ante***	***TRM Ex Post***	***ADM Ex Post***	***Realization Rate***
	36	TRM = 361.4 Actual = 295	TRM = 116.8 Actual = 133	4,903	1.00	28,594	40,314	40,314	141%
	919	TRM = 59 Actual = 32	TRM = 32.2 Actual = 17	4,439	1.46	62,149	250,151	250,151	403%
	100	TRM = 54.3 Actual = 214	TRM = 17.6 Actual = 42	4,439	1.46	77,546	7,972	7,972	10%
	417	TRM = N/A Actual = 90	TRM = N/A Actual = 48	4,439	1.46	78,962	113,507	113,507	144%
	78	TRM = 61 Actual = 297	TRM = 44.9 Actual = 60	4,439	1.46	83,344	506	506	1%
	1,050	TRM = 88 Actual = 60	TRM = 53.6 Actual = 34	4,439	1.46	123,082	367,469	367,469	299%
	Baseline = 38 EE = 76	TRM = 361.4 Actual = 590	TRM = 116.8 Actual = 133	4,903	1.00	170,291	42,554	42,554	25%
	1,946	TRM = N/A Actual = 135	TRM = N/A Actual = 72	4,439	1.46	552,731	794,550	794,550	144%
	535	TRM = 54.3 Actual = 297	TRM = 17.6 Actual = 55	4,439	1.46	583,713	839,087	839,087	144%
Total						**1,839,371**	**2,550,945**	**2,550,945**	

The ADM calculated ex post savings estimate will be equal to the TRM savings estimate, except in cases in which the TRM is not applied. The TRM is not be applied in cases in which it does not properly characterize the newly installed lighting system.

Summary of Project-Level Gross Realized Savings

The table shown below presents the realized gross energy savings of the lighting retrofit.

Verified Electric Savings/Realization Rates

Incentive Type	*Annual Gross Savings*			
	Ex Ante (kWh)	***Ex Post (kWh)***	***Realization Rate***	***Ex Post Peak kW Reduction***
Standard	1,839,371	2,550,945	139%	398.90
Total	**1,839,371**	**2,550,945**	**139%**	**398.90**

A CF value of 0.66 and a WHF_d value of 1.59 was used to determine kW reduction. These values were taken from the TRM 4.0 based on applicable facility type. No kW reduction was determined for exterior fixtures.

Pre-existing fixture wattages were referenced regarding baseline wattage for measures that include the installation of 3’ lamps since the TRM does not properly characterize this size. Installed LED wattages were referenced for efficient wattage as stipulated by the TRM.

The last line item in the first table above references pre-existing fixture wattage instead of the TRM tables because the installed lighting has a higher output than what is characterized in the TRM.

The sixth line item in the first table above regarding bi-level occupancy fixtures was improperly characterized as “Multi-level Lighting Switch” when determining ex ante savings. Ex post savings reference measure 4.5.13 of the IL TRM 4.0 regarding “Occupancy Controlled Bi-Level Fixtures”. TRM measure 4.5.13 is limited to 24/7 operation, thus 8,766 annual hours of operation are used. An ESF value of 0.71 was referenced from the table in the TRM using 10% full light during standby mode in stairwell applications.

Site ID: 25

Executive Summary

The program participant received Standard program incentives for retrofitting lighting. The gross realization rate for these measures is 162%.

Project Description

The participant implemented the following measure(s):

- (4) 2', 1 lamp, 19W FO20T8 fixtures relamped with 2', 1 lamp, 9W LEDs
- (42) 32W LED wall packs installed
- (3) 6', 2 lamp, 82W F72T8 fixtures relamped with 6', 2 lamp, 30W LEDs
- (19) 4', 1 lamp, 32W F32T8 fixtures replaced by 4', 1 lamp, 28W LED fixtures
- (1) 120W MH fixture replaced by 2', 1 lamp, 40W LED fixture
- (1) 120W MH fixture replaced by 3', 1 lamp, 30W LED fixture
- (4) 4', 1 lamp, 42W F40T12 fixtures relamped with 4', 1 lamp, 17W LEDs
- (8) 3', 1 lamp, 38W F30T12 fixtures relamped with 3', 1 lamp, 12W LEDs
- (7) 4', 2 lamp, 73W F40T12 fixtures relamped with 4', 2 lamp, 17W LEDs
- (5) 6', 1 lamp, 105W F72T12 fixtures relamped with 6', 1 lamp, 30W LEDs
- (4) 6', 4 lamp, 146W F30T12 fixtures relamped with 3', 4 lamp, 48W LEDs
- (3) 190W HPS pendant mounted fixtures replaced by 2', 1 lamp, 40W LEDs
- (3) 214W MH fixtures replaced by 60W LED flood light fixtures
- (52) 3', 1 lamp, 24W FO25T8 fixtures relamped with 3', 1 lamp, 12W LEDs
- (4) 297W mercury vapor fixtures replaced by 133W pole mounted LED fixtures
- (22) 70W compact fluorescent downlight fixtures relamped with 26W LEDs
- (10) 4', 4 lamp, 146W F40T12 fixtures relamped with 4', 2 lamp, 17W LEDs
- (30) 2', 2 U-tube, 58W FB32T8 fixtures relamped with 2', 2 lamp, 9W LEDs
- (68) 8', 1 lamp, 58W FO96T8 fixtures relamped with 8', 1 lamp, 36W LEDs
- (18) 8' 125W pendant mounted F96T12HO fixtures relamped with 8' 36W LEDs
- (103) 3', 2 lamp, 46W F25T8 fixtures relamped with 3', 2 lamp, 12W LEDs

- (14) 295W pole mounted MH fixtures replaced by 133W pole mounted LED fixtures
- (17) 295W low bay MH fixtures replaced by 2', 1 lamp, 80W LED fixtures
- (244) 4', 1 lamp, 32W F32T8 fixtures relamped with 4', 1 lamp, 17W LEDs
- (143) 8', 2 lamp, 110W FO96T8 fixtures relamped with 8', 2 lamp, 36W LEDs
- (144) 4', 4 lamp, 113W FO32T8 fixtures relamped with 4', 4 lamp, 17W LEDs
- (196) 4', 3 lamp, 88W F32T8 fixtures relamped with 4', 2 lamp, 17W LEDs
- (365) 4', 4 lamp, 113W FO32T8 fixtures relamped with 4', 2 lamp, 17W LEDs
- (433) 191W low bay MH fixtures replaced by 55W LED parking garage fixtures
- (3,037) 4', 2 lamp, 60W F32T8 fixtures relamped with 4', 2 lamp, 17W LEDs

Methodology for Estimating Gross Savings.

ADM staff inspected project documentation pertaining to the lighting retrofit.

Energy savings for the lighting retrofit were calculated according to the Illinois TRM 4.0, measure 4.5.4. Algorithms pertaining to savings calculations are presented below.

Electric Energy Savings

$$\Delta kWh = \left(\frac{Watts_{base} - Watts_{EE}}{1000}\right) * Hours * WHF_e * ISR$$

Where:

$Watts_{base}$	= input wattage of the baseline system
$Watts_{EE}$	= new input wattage of EE fixture
WHF_e	= waste heat factor to account for cooling energy savings
ISR	= in service rate (% of units rebated that get installed) = 1

Summer Coincident Peak Demand Savings

$$\Delta kW = \left(\frac{Watts_{base} - Watts_{EE}}{1000}\right) * WHF_d * CF * ISR$$

Where:

WHF_d	= waste heat factor to account for cooling demand savings
CF	= summer peak coincidence factor

Measure-Level Gross Realized Savings

The table below presents the realized gross energy savings of the lighting retrofit, along with the numeric values of inputs to the savings calculation equation.

Annual kWh Savings for Lighting Retrofit

Measure	*Calculation Inputs*	*Annual Gross kWh Savings*

	Quantity	*Baseline Wattage*	*Efficient Wattage*	*Hours*	*WHF_e*	*Ex Ante*	*TRM Ex Post*	*ADM Ex Post*	*Realization Rate*
LED Bulbs and Fixtures	4	TRM = N/A Actual = 19	TRM = N/A Actual = 9	4,439	1.46	180	259	259	144%
	10	TRM = 182.9 Actual = 210	TRM = 52.5 Actual = 32	4,903	1.00	35,495	7,399	7,399	88%
	32	TRM = 182.9 Actual = 95	TRM = 52.5 Actual = 32	4,903	1.00		23,676	23,676	
	3	TRM = N/A Actual = 82	TRM = N/A Actual = 60	4,439	1.46	298	428	428	144%
	19	TRM = 59 Actual = 32	TRM = 32.2 Actual = 28	4,439	1.46	343	3,817	3,817	1113%
	1	TRM = N/A Actual = 120	TRM = N/A Actual = 40	4,439	1.46	361	518	518	144%
	1	TRM = N/A Actual = 120	TRM = N/A Actual = 30	4,439	1.46	406	583	583	144%
	4	TRM = 59 Actual = 42	TRM = 32.2 Actual = 17	4,439	1.46	451	1,089	1,089	241%
	8	TRM = N/A Actual = 38	TRM = N/A Actual = 12	4,439	1.46	938	1,348	1,348	144%
	7	TRM = 88 Actual = 73	TRM = 53.6 Actual = 34	4,439	1.46	1,231	2,450	2,450	199%
	5	TRM = N/A Actual = 105	TRM = N/A Actual = 30	4,439	1.46	1,691	2,430	2,430	144%
	4	TRM = N/A Actual = 146	TRM = N/A Actual = 48	4,439	1.46	1,767	2,541	2,541	144%
	3	TRM = N/A Actual = 190	TRM = N/A Actual = 40	4,439	1.46	2,029	2,916	2,916	144%
	3	TRM = 182.9 Actual = 214	TRM = 52.5 Actual = 60	4,903	1.00	2,083	1,808	1,808	87%
	52	TRM = N/A Actual = 24	TRM = N/A Actual = 12	4,439	1.46	2,813	4,044	4,044	144%
	4	TRM = 361.4 Actual = 297	TRM = 116.8 Actual = 133	4,903	1.00	3,216	4,479	4,479	139%
	22	TRM = 54.3 Actual = 70	TRM = 17.6 Actual = 26	4,439	1.46	4,364	4,035	4,035	92%
	10	TRM = 88 Actual = 146	TRM = 53.6 Actual = 34	4,439	1.46	5,049	3,500	3,500	69%
	30	TRM = 61 Actual = 58	TRM = 44.9 Actual = 18	4,439	1.46	5,410	8,360	8,360	155%
	68	TRM = N/A Actual = 58	TRM = N/A Actual = 36	4,439	1.46	6,745	9,695	9,695	144%
	18	TRM = N/A Actual = 125	TRM = N/A Actual = 36	4,439	1.46	7,223	10,382	10,382	144%
	103	TRM = N/A Actual = 46	TRM = N/A Actual = 24	4,439	1.46	10,216	14,686	14,686	144%

Measure	*Calculation Inputs*					*Annual Gross kWh Savings*			
	Quantity	***Baseline Wattage***	***Efficient Wattage***	***Hours***	***WHF_e***	***Ex Ante***	***TRM Ex Post***	***ADM Ex Post***	***Realization Rate***
	14	TRM = 361.4 Actual = 295	TRM = 116.8 Actual = 133	4,903	1.00	11,120	15,678	15,678	141%
	17	TRM = N/A Actual = 295	TRM = N/A Actual = 80	4,439	1.46	16,478	23,688	23,688	144%
	244	TRM = 59 Actual = 32	TRM = 32.2 Actual = 17	4,439	1.46	16,501	66,417	66,417	403%
	143	TRM = N/A Actual = 110	TRM = N/A Actual = 72	4,439	1.46	24,499	35,217	35,217	144%
	144	TRM = 88 Actual = 113	TRM = 53.6 Actual = 68	4,439	1.46	29,215	18,665	18,665	64%
	196	TRM = 88 Actual = 88	TRM = 53.6 Actual = 34	4,439	1.46	47,718	68,594	68,594	144%
	365	TRM = 88 Actual = 113	TRM = 53.6 Actual = 34	4,439	1.46	130,002	127,739	127,739	98%
	433	TRM = 182.9 Actual = 191	TRM = 52.5 Actual = 55	8,760	1.00	516,212	485,135	485,135	94%
	3,037	TRM = 88 Actual = 60	TRM = 53.6 Actual = 34	4,439	1.46	355,999	1,062,861	1,062,861	299%
Total						**1,240,053**	**2,014,439**	**2,014,439**	

The ADM calculated ex post savings estimate will be equal to the TRM savings estimate, except in cases in which the TRM is not applied. The TRM is not be applied in cases in which it does not properly characterize the newly installed lighting system.

Summary of Project-Level Gross Realized Savings

The table shown below presents the realized gross energy savings of the lighting retrofit.

Verified Electric Savings/Realization Rates

Incentive Type	*Annual Gross Savings*			
	Ex Ante (kWh)	***Ex Post (kWh)***	***Realization Rate***	***Ex Post Peak kW Reduction***
Standard	1,240,053	2,014,439	162%	239.04
Total	**1,240,053**	**2,014,439**	**162%**	**239.04**

A CF value of 0.66 and a WHF_d value of 1.59 were used to determine kW reduction. These values were taken from the TRM 4.0 based on applicable facility type. No kW reduction was determined for exterior fixtures.

Pre-existing fixture wattages were used for measures that include the installation of 3', 6', and 8' lamps, or 1x2 LED fixtures since neither version of the TRM properly characterizes these lighting systems. Installed LED wattages were referenced as efficient wattage as stipulated by the TRM.

Site ID: 26

Executive Summary

The program participant received Standard program incentives for retrofitting lighting and installing occupancy controls. The gross realization rate for these measures is 111%.

Project Description

The participant implemented the following measure(s):

- (1) 2', 2 lamp, 19W FO17T8 fixtures relamped with 2', 1 lamp, 9W LEDs
- (1) 60W incandescent downlight fixtures replaced by 31W LED canopy fixtures
- (2) 2', 2 lamp, 34W FO17T8 fixtures relamped with 2', 2 lamp, 9W LEDs
- (6) 40W incandescent downlight fixtures replaced by 31W LED canopy fixtures
- (59) 20W LED wall packs installed
- (1) 2 lamp, 120W incandescent drum fixtures replaced by 31W LED canopy fixtures
- (98) 42W and (6) 32W LED wall packs installed
- (7) 4', 1 lamp, 32W F32T8 fixtures relamped with 4', 1 lamp, 17W LEDs
- (1) 214W pole mounted mercury vapor fixtures replaced by 101W LED flood fixtures
- (2) 130W wall mounted HPS fixtures replaced by 47W LED flood fixtures
- (2) 120W MH flood fixtures replaced by 28W LED flood fixtures
- (1) 295W HPS fixtures replaced by 101W LED flood fixtures
- (1) 297W mercury vapor fixtures replaced by 101W LED flood fixtures
- (2) 150W incandescent fixtures replaced by 31W LED canopy fixtures
- (2) 8', 3 lamp, 195W F96T12 fixtures relamped with 8', 2 lamp, 36W LEDs
- (1) 300W incandescent flood fixtures replaced by 46W LED flood fixtures
- (2) 190W pole mounted HPS fixtures replaced by 53W pole mounted LED fixtures
- (22) 2', 2 U-tube, 58W FB32T8 fixtures relamped with 2', 4 lamp, 9W LEDs
- (9) 4', 3 lamp, 105W F40T12 fixtures relamped with 4', 3 lamp, 17W LEDs
- (3) 297W mercury vapor flood fixture replaced by 105W LED flood fixtures
- (7) 8', 2 lamp, 160W FO96T8HO fixtures relamped with 8', 2 lamp, 36W LEDs
- (8) 4', 4 lamp, 146W F40T12 fixtures relamped with 4', 4 lamp, 17W LEDs

- (10) 100W incandescent downlight fixtures replaced by 31W LED canopy fixtures
- (3) 295W HPS low bay fixtures replaced by 4', 1 lamp, 40W LED fixtures
- (27) 2', 2 U-tube, 58W FB32T8 fixtures relamped with 2', 2 lamp, 9W LEDs
- (6) 297W mercury vapor high bay fixtures replaced by 100W LED fixtures
- (4) 455W HPS high bay fixtures replaced by 100W LED fixtures
- (26) 92W incandescent downlight fixtures replaced by 31W LED canopy fixtures
- (8) 295W pole mounted HPS fixtures replaced by 101W pole mounted LED fixtures
- (46) 8', 2 lamp, 110W FO96T8 fixtures relamped with 8', 2 lamp, 36W LEDs
- (5) 455W mercury vapor flood fixtures replaced by 101W LED flood fixtures
- (28) 95W MH downlight fixtures replaced by 31W LED canopy fixtures
- (10) 210W MH flood fixtures replaced by 28W LED flood fixtures
- (47) 4', 4 lamp, 113W FO32T8 fixtures relamped with 4', 4 lamp, 17W LEDs
- (14) 295W MH pole mounted fixtures replaced by 133W pole mounted LED fixtures
- (8) 455W mercury vapor flood fixtures replaced by 141W LED flood fixtures
- (9) 455W pole mounted HPS fixtures replaced by 168W pole mounted LED fixtures
- (2) 890W pole mounted MH fixtures replaced by (4) 202W pole mounted LED fixtures
- (75) 4', 3 lamp, 88W F32T8 fixtures relamped with 4', 3 lamp, 17W LEDs
- (29) 4', 4 lamp, 146W F40T12 fixtures relamped with 4', 2 lamp, 17W LEDs
- (139) 4', 2 lamp, 60W F32T8 fixtures relamped with 4', 2 lamp, 17W LEDs
- (97) 4', 2 lamp, 73W F40T12 fixtures relamped with 4', 2 lamp, 17W LEDs
- (18) 295W HPS low bay fixture replaced by 2', 1 lamp, 80W LED fixtures
- (119) 8', 2 lamp, 123W F96T12 fixtures relamped with 8', 2 lamp, 36W LEDs
- (30) 455W pole mounted mercury vapor fixtures replaced by 105W pole mounted LED fixtures
- (180) 4', 4 lamp, 113W FO32T8 fixtures relamped with 4', 2 lamp, 17W LEDs
- (246) fixture-mounted occupancy sensors installed (26,220 watts controlled)
- (106) 455W MH low bay fixtures replaced by 4',1 lamp, 160W LED fixtures
- (270) 295W HPS low bay fixtures replaced by 2', 1 lamp, 100W LED fixtures

Methodology for Estimating Gross Savings.

ADM staff inspected project documentation pertaining to the lighting retrofit.

Energy savings for the lighting retrofit were calculated according to the Illinois TRM 4.0, measures 4.5.4, and 4.5.10. Algorithms pertaining to savings calculations are presented below.

Electric Energy Savings

$$\Delta kWh\ (reduced\ wattage) = \left(\frac{Watts_{base} - Watts_{EE}}{1000}\right) * Hours * WHF_e * ISR$$

Where:

$Watts_{base}$ = input wattage of the baseline system

$Watts_{EE}$ = new input wattage of EE fixture

WHF_e = waste heat factor to account for cooling energy savings

ISR = in service rate (% of units rebated that get installed) = 1

$$\Delta kWh\ (occupancy\ sensor) = kW_{controlled} *\ Hours * ESF * WHF_e$$

Where:

$kW_{controlled}$ = total lighting load connected to the control in kilowatts

ESF = energy savings factor (% reduction to the operating hours from the non-controlled baseline lighting system)

Summer Coincident Peak Demand Savings

$$\Delta kW\ (reduced\ wattage) = \left(\frac{Watts_{base} - Watts_{EE}}{1000}\right) *\ WHF_d * CF * ISR$$

Where:

WHF_d = waste heat factor to account for cooling demand savings

CF = summer peak coincidence factor

$$\Delta kW\ (occupancy\ sensor) = kW_{controlled} * WHF_d * (CF_{baseline} - CF_{OS})$$

Where:

CF_{OS} = 0.15

Measure-Level Gross Realized Savings

The table below presents the realized gross energy savings of the lighting retrofit, along with the numeric values of inputs to the savings calculation equation.

Annual kWh Savings for Lighting Retrofit

Measure	***Calculation Inputs***					***Annual Gross kWh Savings***			
	Quantity	***Baseline Wattage***	***Efficient Wattage***	***Hours***	***WHF_e***	***Ex Ante***	***TRM Ex Post***	***ADM Ex Post***	***Realization Rate***
LED Bulbs and Fixtures	1	TRM = N/A Actual = 19	TRM = N/A Actual = 9	4,439	1.46	45	65	65	144%
	1	TRM = 182.9 Actual = 60	TRM = 52.5 Actual = 31	4,903	1.00	131	745	745	569%

Measure	*Calculation Inputs*					*Annual Gross kWh Savings*			
	Quantity	***Baseline Wattage***	***Efficient Wattage***	***Hours***	***WHF_e***	***Ex Ante***	***TRM Ex Post***	***ADM Ex Post***	***Realization Rate***
	2	TRM = 61 Actual = 34	TRM = 44.9 Actual = 18	4,439	1.46	144	557	557	387%
	6	TRM = 182.9 Actual = 40	TRM = 52.5 Actual = 31	4,903	1.00	243	4,469	4,469	1839%
	56	TRM = 124.3 Actual = 60	TRM = 18.6 Actual = 20	4,903	1.00		28,637	28,637	
	2	TRM = 124.3 Actual = 130	TRM = 18.6 Actual = 20	4,903	1.00	40,417	1,023	1,023	75%
	1	TRM = 124.3 Actual = 100	TRM = 18.6 Actual = 20	4,903	1.00		511	511	
	1	TRM = 182.9 Actual = 120	TRM = 52.5 Actual = 31	4,903	1.00	401	745	745	186%
	6	TRM = 182.9 Actual = 130	TRM = 52.5 Actual = 32	4,903	1.00		4,439	4,439	
	36	TRM = 182.9 Actual = 295	TRM = 52.5 Actual = 42	4,903	1.00		24,870	24,870	
	2	TRM = 182.9 Actual = 297	TRM = 52.5 Actual = 42	4,903	1.00	87,892	1,382	1,382	82%
	14	TRM = 182.9 Actual = 214	TRM = 52.5 Actual = 42	4,903	1.00		9,672	9,672	
	46	TRM = 182.9 Actual = 210	TRM = 52.5 Actual = 42	4,903	1.00		31,778	31,778	
	7	TRM = 59 Actual = 32	TRM = 32.2 Actual = 17	4,439	1.46	473	1,905	1,905	403%
	1	TRM = 361.4 Actual = 214	TRM = 116.8 Actual = 101	4,903	1.00	509	1,277	1,277	251%
	2	TRM = 182.9 Actual = 130	TRM = 52.5 Actual = 47	4,903	1.00	748	1,333	1,333	178%
	2	TRM = 124.3 Actual = 120	TRM = 18.6 Actual = 28	4,903	1.00	830	944	944	114%
	1	TRM = 361.4 Actual = 295	TRM = 116.8 Actual = 101	4,903	1.00	875	1,277	1,277	146%
	1	TRM = 361.4 Actual = 297	TRM = 116.8 Actual = 101	4,903	1.00	884	1,277	1,277	144%
	2	TRM = 182.9 Actual = 150	TRM = 52.5 Actual = 31	4,903	1.00	1,073	1,490	1,490	139%
	2	TRM = N/A Actual = 195	TRM = N/A Actual = 72	4,439	1.46	1,109	1,594	1,594	144%
	1	TRM = 182.9 Actual = 300	TRM = 52.5 Actual = 46	4,903	1.00	1,145	671	671	59%

Measure	*Calculation Inputs*					*Annual Gross kWh Savings*			
	Quantity	***Baseline Wattage***	***Efficient Wattage***	***Hours***	***WHF_e***	***Ex Ante***	***TRM Ex Post***	***ADM Ex Post***	***Realization Rate***
	2	TRM = 182.9 Actual = 190	TRM = 52.5 Actual = 53	4,903	1.00	1,343	1,274	1,274	95%
	22	TRM = 61 Actual = 58	TRM = 44.9 Actual = 36	4,439	1.46	2,182	3,565	3,565	163%
	9	TRM = 88 Actual = 105	TRM = 53.6 Actual = 51	4,439	1.46	2,191	2,158	2,158	99%
	3	TRM = 361.4 Actual = 297	TRM = 116.8 Actual = 105	4,903	1.00	2,597	3,771	3,771	145%
	7	TRM = N/A Actual = 160	TRM = N/A Actual = 72	4,439	1.46	2,777	3,992	3,992	144%
	8	TRM = 88 Actual = 146	TRM = 53.6 Actual = 68	4,439	1.46	2,813	1,037	1,037	37%
	10	TRM = 182.9 Actual = 100	TRM = 52.5 Actual = 31	4,903	1.00	3,111	7,448	7,448	239%
LED Bulbs and Fixtures	3	TRM = 61 Actual = 295	TRM = 44.9 Actual = 40	4,439	1.46	3,449	408	408	12%
	27	TRM = 61 Actual = 58	TRM = 44.9 Actual = 18	4,439	1.46	4,869	7,524	7,524	155%
	6	TRM = N/A Actual = 297	TRM = N/A Actual = 100	4,439	1.46	5,329	7,660	7,660	144%
	4	TRM = N/A Actual = 455	TRM = N/A Actual = 100	4,439	1.46	6,402	9,203	9,203	144%
	26	TRM = 182.9 Actual = 92	TRM = 52.5 Actual = 31	4,439	1.46	7,150	25,596	25,596	358%
	8	TRM = 361.4 Actual = 295	TRM = 116.8 Actual = 101	4,903	1.00	7,609	10,214	10,214	134%
	46	TRM = N/A Actual = 110	TRM = N/A Actual = 72	4,439	1.46	7,881	11,329	11,329	144%
	5	TRM = 361.4 Actual = 455	TRM = 116.8 Actual = 101	4,903	1.00	7,980	6,384	6,384	80%
	28	TRM = 182.9 Actual = 95	TRM = 52.5 Actual = 31	4,903	1.00	8,079	20,853	20,853	258%
	10	TRM = 124.3 Actual = 210	TRM = 18.6 Actual = 28	4,903	1.00	8,205	4,722	4,722	58%
	47	TRM = 88 Actual = 113	TRM = 53.6 Actual = 68	4,439	1.46	9,535	6,092	6,092	64%
	14	TRM = 361.4 Actual = 295	TRM = 116.8 Actual = 133	4,903	1.00	11,120	15,678	15,678	141%
	8	TRM = 361.4 Actual = 455	TRM = 116.8 Actual = 141	4,903	1.00	11,325	8,645	8,645	76%

Measure	*Calculation Inputs*					*Annual Gross kWh Savings*			
	Quantity	***Baseline Wattage***	***Efficient Wattage***	***Hours***	***WHF_e***	***Ex Ante***	***TRM Ex Post***	***ADM Ex Post***	***Realization Rate***
	9	TRM = 361.4 Actual = 455	TRM = 116.8 Actual = 168	4,903	1.00	12,511	8,534	8,534	68%
	Base = 2 EE = 4	TRM = N/A Actual = 890	TRM = N/A Actual = 202	4,903	1.00	12,664	4,766	4,766	38%
	75	TRM = 88 Actual = 88	TRM = 53.6 Actual = 51	4,439	1.46	13,493	17,985	17,985	133%
	29	TRM = 88 Actual = 146	TRM = 53.6 Actual = 34	4,439	1.46	14,644	10,149	10,149	69%
	139	TRM = 88 Actual = 60	TRM = 53.6 Actual = 34	4,439	1.46	16,294	48,646	48,646	299%
	97	TRM = 88 Actual = 73	TRM = 53.6 Actual = 34	4,439	1.46	17,056	33,947	33,947	199%
	18	TRM = N/A Actual = 295	TRM = N/A Actual = 80	4,439	1.46	17,448	25,081	25,081	144%
	119	TRM = N/A Actual = 123	TRM = N/A Actual = 72	4,439	1.46	27,362	39,333	39,333	144%
LED Bulbs and Fixtures	30	TRM = 361.4 Actual = 455	TRM = 116.8 Actual = 105	4,903	1.00	47,339	37,714	37,714	80%
	180	TRM = 88 Actual = 113	TRM = 53.6 Actual = 34	4,439	1.46	64,111	62,995	62,995	98%
Occupancy Sensor Lighting Controls	246	26,220	N/A	4,439	1.46	50,979	50,979	50,979	100%
LED Bulbs and Fixtures	106	TRM = N/A Actual = 455	TRM = N/A Actual = 160	4,903	1.00	140,980	153,317	153,317	109%
	270	TRM = N/A Actual = 295	TRM = N/A Actual = 100	4,903	1.00	237,371	258,143	258,143	109%
Total						**925,118**	**1,029,801**	**1,029,801**	

The ADM calculated ex post savings estimate will be equal to the TRM savings estimate, except in cases in which the TRM is not applied. The TRM is not be applied in cases in which it does not properly characterize the newly installed lighting system.

Summary of Project-Level Gross Realized Savings

The table shown below presents the realized gross energy savings of the lighting retrofit.

Verified Electric Savings/Realization Rates

Incentive Type	***Annual Gross Savings***			
	Ex Ante (kWh)	***Ex Post (kWh)***	***Realization Rate***	***Ex Post Peak kW***

				Reduction
Standard	925,118	1,029,801	111%	73.21
Total	**925,118**	**1,029,801**	**111%**	**73.21**

A CF value of 0.66 and a WHFd value of 1.59 were used to determine kW reduction. These values were taken from the TRM 4.0 based on applicable facility type. No kW reduction was determined for exterior fixtures.

Pre-existing fixture wattages were used for measures that include the installation of 8’ lamps or 1x2 LED linear fixtures since neither version of the TRM properly characterizes these systems. Installed LED wattages were referenced as efficient wattage as stipulated by the TRM.

Line items forty four and fifty four in the first table above reference pre-existing fixture wattage instead of the TRM tables because the installed lighting has a higher output than what is characterized in the TRM.

Site ID: 27

Executive Summary

The program participant received custom incentives for upgrading an existing HVAC system. The gross realization rate for these measures is 33%.

Project Description

The participant upgraded the existing HVAC system. Upgraded HVAC system include: upgraded HVAC software, fix issues causing heat dumping into the pond during heating season, reduce system pumping, and replace water to water heat pumps.

Methodology for Estimating Gross Savings

During the M&V visit, field staff verified the HVAC measures by reviewing the operation of the building and verifying new equipment installation.

ADM calculated the annual energy savings for the installed measures through the use of a monthly pre/post trending data regression. The regression compared the monthly trending data to the local weather in an effort to determine the effects that weather has on the cooling system/heating system for both the pre and post conditions. The derived regression has an R^2 of 0.98 and an adjusted R^2 of 0.91.

From the regression the following equation was derived and used to calculate the monthly energy consumption for the pre and post configurations:

$$kWh_{Monthly} = 630 \times HDD + 262 \times CDD - 146 \times HDD_{Post} + 2{,}253 \times School\ Days$$

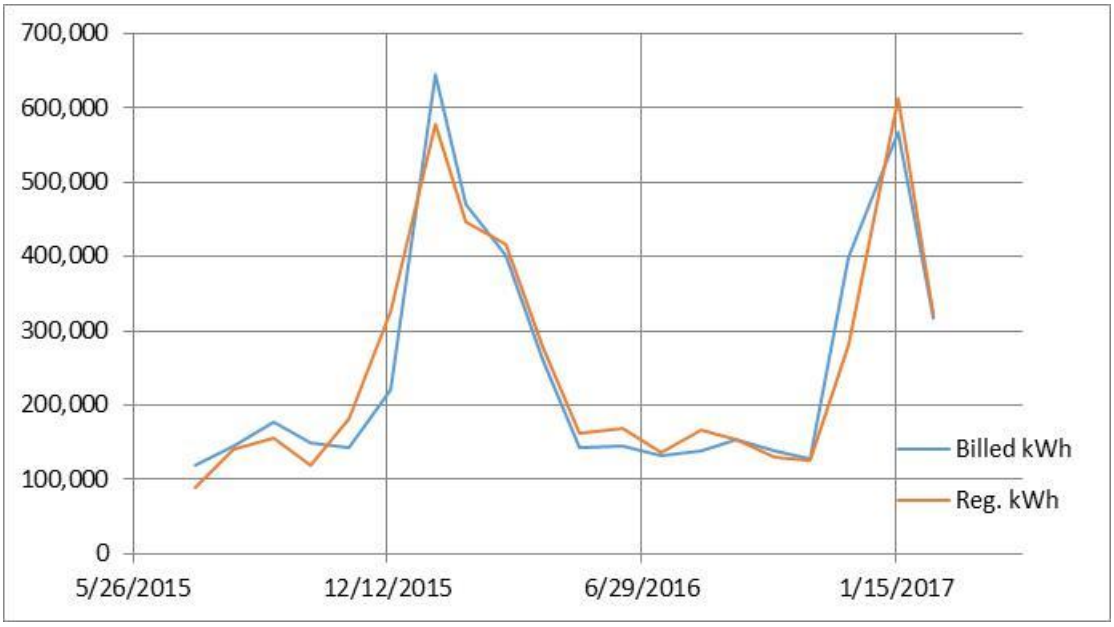
Where:

$kWh_{Monthly}$	= Monthly kWh consumption
HDD	= Number of Heating Degree Days for the month

CDD	= Number of Cooling Degree Days for the month
HDD_Post	= Binary value for pre/post monthly period (0=Pre, 1=Post) multiplied by HDD
School Days	= Number of School Days for the month

The following graphs compare the monthly billed kWh to the kWh calculated through the use of the derived equation:

Billed Vs. Regressed Monthly kWh



The following table presents the typical year savings for the project:

Typical Year kWh Savings for Retro-commissioning

Month	***School Days***	***HDD***	***CDD***	***kWh***		
				Baseline	***As-Built***	***Savings***
Jan	26	1,033	1	709,570	558,863	150,707
Feb	27	733	1	522,886	415,949	106,937
Mar	29	466	25	365,758	297,711	68,047
Apr	25	149	57	165,175	143,427	21,748
May	30	65	112	137,736	128,278	9,458
Jun	1	9	449	125,873	124,530	1,343
Jul	0	0	661	173,239	173,239	0
Aug	10	0	607	181,846	181,846	0
Sep	28	1	425	175,067	174,964	103

Oct	30	108	139	172,069	156,302	15,767
Nov	25	278	48	243,952	203,391	40,561
Dec	21	755	0	522,939	412,780	110,159
Total				**3,496,111**	**2,971,279**	**524,832**

Measure-level Gross Savings Results

The table shown below presents the verified gross savings for measures that received custom incentives:

Annual kWh Savings for Retro-commissioning

Measure	***Annual Gross kWh Savings***	
	Ex Ante	***ADM Calculated Ex Post***
HVAC	1,614,817	524,832
Total	**1,614,817**	**524,832**

Project-level Gross Savings Results

The tables shown below present the verified gross savings for this project.

Verified Electric Savings/Realization Rates

Incentive Type	***Measure Category***	***Annual Gross Savings***				***Lifetime Gross Savings***	
		Ex Ante kWh	***Ex Post kWh***	***Realization Rate***	***Ex Post Peak kW Reduction***	***Ex Post kWh***	***Ex Post Peak kW Reduction***
Custom	HVAC	1,614,817	524,832	33%	1.84	7,872,478	1.84
Total		**1,614,817**	**524,832**	**33%**	**1.84**	**7,872,478**	**1.84**

The project-level realization rate is 33%. The difference in savings can be attributed to the ex ante analysis using engineering equations with several assumptions that don't rely on actual data. The ex ante analysis expected 1.6 MWh savings for the project. A conservative school baseload is 1.65 MWh, which leaves a maximum 1.8 MWh for HVAC loads. It's not reasonable to assume an 88% reduction of HVAC load for this project.

The ex post analysis uses actual pre and post billing data to determine savings. The realized savings are a 15% reduction in total energy usage, which is consistent with other schools HVAC projects.

Site ID: 28

Executive Summary

The program participant received Standard Program incentives for installing a high efficiency boiler. The gross realization rate for this measure is 100%.

Project Description

The participant implemented the following measure(s):

- (2) 3,000,000 btu/h, high efficiency, hot water boilers installed.

Methodology for Estimating Gross Savings

ADM staff inspected project documentation pertaining to the equipment installation.

Energy savings for the equipment installation were calculated according to the Illinois TRM 4.0, measure 4.4.10. The algorithm pertaining to savings calculations are presented below.

Natural Gas Energy Savings

$$\Delta Therms = \frac{EFLH * Capacity * \frac{EfficiencyRating(actual) - EfficiencyRating(base)}{EfficiencyRating(base)}}{100{,}000}$$

Where:

EFLH	= equivalent full load hours for heating
Capacity	= Btu/h for efficient unit
EfficiencyRating(base)	= baseline boiler efficiency rating, dependent on installation year and boiler type
EfficiencyRating(actual)	= actual efficient boiler efficiency rating

Measure-Level Gross Realized Savings

The table below presents the realized gross energy savings of the equipment installation, along with the numeric values of inputs to the savings calculation equation.

Annual Therms Savings for High Efficiency Boiler

Measure	***Calculation Inputs***					***Annual Gross Therms Savings***			
	Quantity	***Type***	***Size (btu/h)***	***Baseline Efficiency***	***Installed Efficiency***	***Ex Ante***	***TRM Ex Post***	***ADM Ex Post***	***Realization Rate***
High Efficiency Boiler	2	Hot Water	3,000,000	80%	93.5%	14,428	14,428	14,428	100%
Total						**14,428**	**14,428**	**14,428**	

The ADM calculated ex post savings estimate will be equal to the TRM savings estimate, except in cases in which the TRM is not applied. The TRM is not be applied in cases in which it does not properly characterize the newly installed equipment.

Summary of Project-Level Gross Realized Savings

The table shown below presents the realized gross energy savings of the equipment installation.

Verified Therms Savings/Realization Rates

Incentive Type	***Annual Gross Savings***		
	Ex Ante (therms)	***Ex Post (therms)***	***Realization Rate***
Standard	14,428	14,428	100%
Total	**14,428**	**14,428**	**100%**

The ex post savings calculation references a default baseline efficiency value found in the TRM. The baseline efficiency (80%) is based on installed boiler capacity, application, and installation year. An installed efficiency of 93.5% was referenced from the boiler specification sheet.

Site ID: 29

Executive Summary

The program participant received Custom Program incentives for replacing faulty steam traps. The gross realization rate for this measure is 94%.

Project Description

The participant implemented the following measure(s):

- (118) steam traps replaced

Methodology for Estimating Gross Savings

ADM staff inspected project documentation pertaining to the measure.

Energy savings for the steam trap replacement was calculated according to the Illinois TRM 4.0, measure 4.4.16. An algorithm pertaining to natural gas energy savings is presented below.

Natural Gas Energy Savings

$$\Delta Therms = \frac{S * \left(\frac{Hv}{B}\right) * Hours * A * L}{100{,}000}$$

Where:

S	= maximum theoretical steam loss per trap (lb/hr/trap)
Hv	= heat of vaporization of steam (btu/lb)
B	= boiler efficiency
A	= adjustment factor
	= 50%
L	= leaking and blow-thru

Measure-Level Gross Realized Savings

The table below presents the realized gross energy savings of the steam trap replacement, along with the numeric values of inputs to the savings calculation equation.

Annual Natural Gas Savings for Steam Trap Replacement

Measure	*Calculation Inputs*				*Annual Gross Therms Savings*		
	Quantity	*Type*	*Boiler Efficiency*	*Leaking Percentage*	*Ex Ante*	*TRM Ex Post*	*ADM Ex Post*
Steam Trap Replacement or Repair	118	Industrial Low Pressure, <15 psig	80.7%	16%	12,714	11,901	11,901
Total					**12,714**	**11,901**	**11,901**

Summary of Project-Level Gross Realized Savings

The table shown below presents the realized gross energy savings of the measures.

Verified Natural Gas Savings/Realization Rates

Incentive Type	*Measure Category*	*Quantity*	*Annual Gross Savings*		
			Ex Ante (therms)	*Ex Post (therms)*	*Realization Rate*
Custom	4.4.16	118	12,714	11,901	94%
Total			**12,714**	**11,901**	**94%**

TRM reference tables were used to determine maximum steam loss, heat of vaporization, hours, and leaking percentage based on facility location and steam application. A default boiler efficiency of 80.7% was also referenced from the TRM.

Site ID: 30

Executive Summary

The program participant received Standard program incentives for retrofitting lighting. The gross realization rate for these measures is 114%.

Project Description

The participant implemented the following measure(s):

- (36) 210W MH fixtures replaced by 58W LED fixtures
- (40) 295W HPS fixtures replaced by 138W LED fixtures

Methodology for Estimating Gross Savings.

ADM staff inspected project documentation pertaining to the lighting retrofit.

Energy savings for the lighting retrofit were calculated according to the Illinois TRM 4.0, measure 4.5.4. Algorithms pertaining to savings calculations are presented below.

Electric Energy Savings

$$\Delta kWh = \left(\frac{Watts_{base} - Watts_{EE}}{1000}\right) * Hours * WHF_e * ISR$$

Where:

$Watts_{base}$	= input wattage of the baseline system
$Watts_{EE}$	= new input wattage of EE fixture
WHF_e	= waste heat factor to account for cooling energy savings
ISR	= in service rate (% of units rebated that get installed) = 1

Summer Coincident Peak Demand Savings

$$\Delta kW = \left(\frac{Watts_{base} - Watts_{EE}}{1000}\right) * WHF_d * CF * ISR$$

Where:

WHF_d	= waste heat factor to account for cooling demand savings

CF = summer peak coincidence factor

Measure-Level Gross Realized Savings

The table below presents the realized gross energy savings of the lighting retrofit, along with the numeric values of inputs to the savings calculation equation.

Annual kWh Savings for Lighting Retrofit

Measure	*Calculation Inputs*					*Annual Gross kWh Savings*			
	Quantity	***Baseline Wattage***	***Efficient Wattage***	***Hours***	***WHF_e***	***Ex Ante***	***TRM Ex Post***	***ADM Ex Post***	***Realization Rate***
LED Bulbs and Fixtures	36	TRM = 182.9 Actual = 210	TRM = 52.5 Actual = 58	4,903	1.00	26,829	22,046	22,046	82%
	40	TRM = 361.4 Actual = 295	TRM = 116.8 Actual = 138	4,903	1.00	30,791	43,813	43,813	142%
Total						**57,620**	**65,859**	**65,859**	

The ADM calculated ex post savings estimate will be equal to the TRM savings estimate, except in cases in which the TRM is not applied. The TRM is not be applied in cases in which it does not properly characterize the newly installed lighting system.

Summary of Project-Level Gross Realized Savings

The table shown below presents the realized gross energy savings of the lighting retrofit.

Verified Electric Savings/Realization Rates

Incentive Type	*Annual Gross Savings*			
	Ex Ante (kWh)	***Ex Post (kWh)***	***Realization Rate***	***Ex Post Peak kW Reduction***
Standard	57,620	65,859	114%	0.00
Total	**57,620**	**65,859**	**114%**	**0.00**

No demand reduction was calculated due to only exterior lighting being implemented.

The TRM stipulates that for newly installed LED lighting, measure 4.5.4, baseline wattage is taken from the appropriate TRM reference table, and efficient wattage references the actual installed LED wattage.

The ex ante savings estimate references pre-existing lighting for baseline wattage, which results in the measure level realization rates in the first table above.

Site ID: 31

Executive Summary

The program participant received Standard and Custom program incentives for retrofitting lighting. The gross realization rate for these measures is 149%.

Project Description

The participant implemented the following Standard measure(s):

- (58) 120W, 2 lamp, T12F48 fixtures replaced by 88W, 2 lamp, T8F48 fixtures

The participant implemented the following Custom measure(s):

- (47) 85W T12F72 fixtures replaced by 65W T8F72 fixtures

Methodology for Estimating Gross Savings.

ADM staff inspected project documentation pertaining to the lighting retrofit.

Energy savings for the lighting retrofit were calculated according to the Illinois TRM 4.0, measure 4.5.3. Algorithms pertaining to savings calculations are presented below.

Electric Energy Savings

$$\Delta kWh = \left(\frac{Watts_{base} - Watts_{EE}}{1000}\right) * Hours * WHF_e * ISR$$

Where:

$Watts_{base}$	= input wattage of the baseline system
$Watts_{EE}$	= new input wattage of EE fixture
WHF_e	= waste heat factor to account for cooling energy savings
ISR	= in service rate (% of units rebated that get installed) = 1

Summer Coincident Peak Demand Savings

$$\Delta kW = \left(\frac{Watts_{base} - Watts_{EE}}{1000}\right) * WHF_d * CF * ISR$$

Where:

WHF_d = waste heat factor to account for cooling demand savings

CF = summer peak coincidence factor

Measure-Level Gross Realized Savings

The table below presents the realized gross energy savings of the lighting retrofit, along with the numeric values of inputs to the savings calculation equation.

Annual kWh Savings for Lighting Retrofit

Measure	*Calculation Inputs*					*Annual Gross kWh Savings*			
	Quantity	*Baseline Wattage*	*Efficient Wattage*	*Hours*	*WHF_e*	*Ex Ante*	*TRM Ex Post*	*ADM Ex Post*	*Realization Rate*
Miscellaneous Commercial/Industrial Lighting	58	120	88	4,903	1.00	4,266	9,100	9,100	213%
Custom	47	85	65	4,380	1.00	4,609	4,117	4,117	89%
Total						**8,874**	**13,217**	**13,217**	

Ex post savings calculations reference pre-existing lighting and installed efficient lighting regarding baseline wattages because the installed lighting is not categorized adequately in the TRM reference tables.

Summary of Project-Level Gross Realized Savings

The table shown below presents the realized gross energy savings of the lighting retrofit.

Verified Electric Savings/Realization Rates

Incentive Type	*Annual Gross Savings*			
	Ex Ante (kWh)	*Ex Post (kWh)*	*Realization Rate*	*Ex Post Peak kW Reduction*
Standard	4,266	9,100	213%	0.00
Custom	4,609	4,117	89%	0.00
Total	**8,874**	**13,217**	**149%**	**0.00**

No demand reduction was calculated due to only exterior lighting being implemented.

The custom lighting is controlled by a photocell detector, therefore 4,380 annual non-daylight hours are used.

The installed T8 lighting was not on the approved efficient lighting list provided in the TRM. The first line item in the first table above was changed to the "Miscellaneous Commercial/Industrial Lighting" measure category because it did not meet the criteria for measure 4.5.3 baseline equipment.

Site ID: 32

Executive Summary

The program participant received Standard and Custom program incentives for retrofitting lighting. The gross realization rate for these measures is 134%.

Project Description

The participant implemented the following Standard measure(s):

- (42) 120W, 2 lamp, T12F48 fixtures replaced by 88W, 2 lamp, T8F48 fixtures

The participant implemented the following Custom measure(s):

- (55) 85W T12F72 fixtures replaced by 65W T8F72 fixtures

Methodology for Estimating Gross Savings.

ADM staff inspected project documentation pertaining to the lighting retrofit.

Energy savings for the lighting retrofit were calculated according to the Illinois TRM 4.0, measure 4.5.3. Algorithms pertaining to savings calculations are presented below.

Electric Energy Savings

$$\Delta kWh = \left(\frac{Watts_{base} - Watts_{EE}}{1000}\right) * Hours * WHF_e * ISR$$

Where:

$Watts_{base}$	= input wattage of the baseline system
$Watts_{EE}$	= new input wattage of EE fixture
WHF_e	= waste heat factor to account for cooling energy savings
ISR	= in service rate (% of units rebated that get installed) = 1

Summer Coincident Peak Demand Savings

$$\Delta kW = \left(\frac{Watts_{base} - Watts_{EE}}{1000}\right) * WHF_d * CF * ISR$$

Where:

WHF_d = waste heat factor to account for cooling demand savings

CF = summer peak coincidence factor

Measure-Level Gross Realized Savings

The table below presents the realized gross energy savings of the lighting retrofit, along with the numeric values of inputs to the savings calculation equation.

Annual kWh Savings for Lighting Retrofit

Measure	*Calculation Inputs*					*Annual Gross kWh Savings*			
	Quantity	*Baseline Wattage*	*Efficient Wattage*	*Hours*	*WHF_e*	*Ex Ante*	*TRM Ex Post*	*ADM Ex Post*	*Realization Rate*
Miscellaneous Commercial/Industrial Lighting	42	120	88	4,903	1.00	3,089	6,590	6,590	213%
Custom	55	85	65	4,380	1.00	5,393	4,818	4,818	89%
Total						**8,482**	**11,408**	**11,408**	

Ex post savings calculations reference pre-existing lighting and installed efficient lighting regarding baseline wattages because the installed lighting is not categorized adequately in the TRM reference tables.

Summary of Project-Level Gross Realized Savings

The table shown below presents the realized gross energy savings of the lighting retrofit.

Verified Electric Savings/Realization Rates

Incentive Type	*Annual Gross Savings*			
	Ex Ante (kWh)	*Ex Post (kWh)*	*Realization Rate*	*Ex Post Peak kW Reduction*
Standard	3,089	6,590	213%	0.00
Custom	5,393	4,818	89%	0.00
Total	**8,482**	**11,408**	**134%**	**0.00**

No demand reduction was calculated due to only exterior lighting being implemented.

The custom lighting is controlled by a photocell detector, therefore 4,380 annual non-daylight hours are used.

The installed T8 lighting was not on the approved efficient lighting list provided in the TRM. The first line item in the first table above was changed to the "Miscellaneous Commercial/Industrial Lighting" measure category because it did not meet the criteria for measure 4.5.3 baseline equipment.

Site ID: 33

Executive Summary

The program participant received Standard program incentives for retrofitting lighting. The gross realization rate for these measures is 100%.

Project Description

The participant implemented the following measure(s):

- (16) 120W, 2 lamp, T12F48 fixtures replaced by 64W, 2 lamp, T8F48 fixtures
- (27) HPS and mercury vapor fixtures of various wattages replaced by (1) 70W, (14) 100W, and (12) 55W induction fixtures
- (65) 400W HPS fixtures replaced by 192W, 6 lamp, T8F48 fixtures

Methodology for Estimating Gross Savings.

ADM staff inspected project documentation pertaining to the lighting retrofit.

Energy savings for the lighting retrofit were calculated according to the Illinois TRM 4.0, measures 4.5.3 and 4.5.8. Algorithms pertaining to savings calculations are presented below.

Electric Energy Savings

$$\Delta kWh = \left(\frac{Watts_{base} - Watts_{EE}}{1000}\right) * Hours * WHF_e * ISR$$

Where:

$Watts_{base}$	= input wattage of the baseline system
$Watts_{EE}$	= new input wattage of EE fixture
WHF_e	= waste heat factor to account for cooling energy savings
ISR	= in service rate (% of units rebated that get installed) = 1

Summer Coincident Peak Demand Savings

$$\Delta kW = \left(\frac{Watts_{base} - Watts_{EE}}{1000}\right) * WHF_d * CF * ISR$$

Where:

WHF_d = waste heat factor to account for cooling demand savings

CF = summer peak coincidence factor

Measure-Level Gross Realized Savings

The table below presents the realized gross energy savings of the lighting retrofit, along with the numeric values of inputs to the savings calculation equation.

Annual kWh Savings for Lighting Retrofit

Measure	***Calculation Inputs***						***Annual Gross kWh Savings***			
	Baseline Quantity	***Baseline Wattage***	***Efficient Quantity***	***Efficient Wattage***	***Hours***	***WHF_e***	***Ex Ante***	***TRM Ex Post***	***ADM Ex Post***	***Realization Rate***
Miscellaneous Commercial/Industrial Lighting	16	120	16	64	4,903	1.00	4,393	4,393	4,393	100%
	27	3,725 total connected watts	1	70	4,903	1.00	7,820	7,820	7,820	100%
			14	100	4,903	1.00				
			12	55	4,903	1.00				
	65	400	65	192	4,903	1.00	66,289	66,289	66,289	100%
Total							**78,502**	**78,502**	**78,502**	

Ex post savings calculations reference pre-existing lighting and installed efficient lighting regarding baseline wattages because the installed lighting is not categorized adequately in the TRM reference tables.

Summary of Project-Level Gross Realized Savings

The table shown below presents the realized gross energy savings of the lighting retrofit.

Verified Electric Savings/Realization Rates

Incentive Type	***Annual Gross Savings***			
	Ex Ante (kWh)	***Ex Post (kWh)***	***Realization Rate***	***Ex Post Peak kW Reduction***

Standard	78,502	78,502	100%	0.00
Total	**78,502**	**78,502**	**100%**	**0.00**

No demand reduction was calculated due to only exterior lighting being implemented.

Individual baseline wattages for measure 4.5.8 were not available, therefore a pre-existing total connected load was referenced.

The installed T8 lighting was not on the approved efficient lighting list provided in the TRM. The first line item in the first table above was changed to the "Miscellaneous Commercial/Industrial Lighting" measure category because it did not meet the criteria for measure 4.5.3 baseline equipment.

Site ID: 34

Executive Summary

The program participant received Standard program incentives for retrofitting lighting. The gross realization rate for this measure is 100%.

Project Description

The participant implemented the following measure(s):

- (120) 120W, 2 lamp, T12F48 fixtures replaced by 64W, 2 lamp, T8F48 fixtures

Methodology for Estimating Gross Savings.

ADM staff inspected project documentation pertaining to the lighting retrofit.

Energy savings for the lighting retrofit were calculated according to the Illinois TRM 4.0, measure 4.5.3. Algorithms pertaining to savings calculations are presented below.

Electric Energy Savings

$$\Delta kWh = \left(\frac{Watts_{base} - Watts_{EE}}{1000}\right) * Hours * WHF_e * ISR$$

Where:

$Watts_{base}$	= input wattage of the baseline system
$Watts_{EE}$	= new input wattage of EE fixture
WHF_e	= waste heat factor to account for cooling energy savings
ISR	= in service rate (% of units rebated that get installed) = 1

Summer Coincident Peak Demand Savings

$$\Delta kW = \left(\frac{Watts_{base} - Watts_{EE}}{1000}\right) * WHF_d * CF * ISR$$

Where:

WHF_d = waste heat factor to account for cooling demand savings

CF = summer peak coincidence factor

Measure-Level Gross Realized Savings

The table below presents the realized gross energy savings of the lighting retrofit, along with the numeric values of inputs to the savings calculation equation.

Annual kWh Savings for Lighting Retrofit

Measure	*Calculation Inputs*					*Annual Gross kWh Savings*			
	Quantity	***Baseline Wattage***	***Efficient Wattage***	***Hours***	***WHF_e***	***Ex Ante***	***TRM Ex Post***	***ADM Ex Post***	***Realization Rate***
Miscellaneous Commercial/Industrial Lighting	120	120	64	4,903	1.00	32,948	32,948	32,948	100%
Total						**32,948**	**32,948**	**32,948**	

Ex post savings calculations reference pre-existing lighting and installed efficient lighting regarding baseline wattages because the installed lighting is not categorized adequately in the TRM reference tables.

Summary of Project-Level Gross Realized Savings

The table shown below presents the realized gross energy savings of the lighting retrofit.

Verified Electric Savings/Realization Rates

Incentive Type	*Annual Gross Savings*			
	Ex Ante (kWh)	***Ex Post (kWh)***	***Realization Rate***	***Ex Post Peak kW Reduction***
Standard	32,948	32,948	100%	0.00

Total	**32,948**	**32,948**	**100%**	**0.00**

No demand reduction was calculated due to only exterior lighting being implemented.

The installed T8 lighting was not on the approved efficient lighting list provided in the TRM. The first line item in the first table above was changed to the "Miscellaneous Commercial/Industrial Lighting" measure category because it did not meet the criteria for measure 4.5.3 baseline equipment.

Site ID: 35

Executive Summary

The program participant received Standard and Custom program incentives for retrofitting lighting. The gross realization rate for these measures is 123%.

Project Description

The participant implemented the following Standard measure(s):

- (72) 120W, 2 lamp, T12F48 fixtures replaced by 88W, 2 lamp, T8F48 fixtures

The participant implemented the following Custom measure(s):

- (72) 170W, 2 lamp, T12F72 fixtures replaced by 130W, 2 lamp, T8F72 fixtures

Methodology for Estimating Gross Savings.

ADM staff inspected project documentation pertaining to the lighting retrofit.

Energy savings for the lighting retrofit were calculated according to the Illinois TRM 4.0, measure 4.5.3. Algorithms pertaining to savings calculations are presented below.

Electric Energy Savings

$$\Delta kWh = \left(\frac{Watts_{base} - Watts_{EE}}{1000}\right) * Hours * WHF_e * ISR$$

Where:

$Watts_{base}$ = input wattage of the baseline system

$Watts_{EE}$ = new input wattage of EE fixture

WHF_e = waste heat factor to account for cooling energy savings

ISR = in service rate (% of units rebated that get installed) = 1

Summer Coincident Peak Demand Savings

$$\Delta kW = \left(\frac{Watts_{base} - Watts_{EE}}{1000}\right) * WHF_d * CF * ISR$$

Where:

WHF_d = waste heat factor to account for cooling demand savings

CF = summer peak coincidence factor

Measure-Level Gross Realized Savings

The table below presents the realized gross energy savings of the lighting retrofit, along with the numeric values of inputs to the savings calculation equation.

Annual kWh Savings for Lighting Retrofit

Measure	*Calculation Inputs*					*Annual Gross kWh Savings*			
	Quantity	***Baseline Wattage***	***Efficient Wattage***	***Hours***	***WHF_e***	***Ex Ante***	***TRM Ex Post***	***ADM Ex Post***	***Realization Rate***
Miscellaneous Commercial/Industrial Lighting	72	120	88	4,903	1.00	5,295	11,297	11,297	213%
Custom	72	170	130	4,380	1.00	14,121	12,614	12,614	89%
Total						**19,416**	**23,911**	**23,911**	

Ex post savings calculations reference pre-existing lighting and installed efficient lighting regarding baseline wattages because the installed lighting is not categorized adequately in the TRM reference tables.

Summary of Project-Level Gross Realized Savings

The table shown below presents the realized gross energy savings of the lighting retrofit.

Verified Electric Savings/Realization Rates

Incentive Type	*Annual Gross Savings*			
	Ex Ante (kWh)	***Ex Post (kWh)***	***Realization Rate***	***Ex Post Peak kW***

				Reduction
Standard	5,295	11,297	213%	0.00
Custom	14,121	12,614	89%	0.00
Total	**19,416**	**23,911**	**123%**	**0.00**

No demand reduction was calculated due to only exterior lighting being implemented.

The custom lighting is controlled by a photocell detector, therefore 4,380 annual non-daylight hours are used.

The installed T8 lighting was not on the approved efficient lighting list provided in the TRM. The first line item in the first table above was changed to the "Miscellaneous Commercial/Industrial Lighting" measure category because it did not meet the criteria for measure 4.5.3 baseline equipment.

Site ID: 36

Executive Summary

The program participant received Standard program incentives for retrofitting lighting. The gross realization rate for this measure is 93%.

Project Description

The participant implemented the following measure(s):

- (2) 2' 20W T12, (14) 4' 40W T12, (6) 6' 55W T12, and (20) 20W incandescent lamps replaced by (1) 2' 9W, (12) 4' 18W, (2) 56" 21W, (6) 6' 27W and (20) 2W LED lamps for 56 rail cars

Methodology for Estimating Gross Savings.

ADM staff inspected project documentation pertaining to the lighting retrofit.

Energy savings for the lighting retrofit were calculated according to the Illinois TRM 4.0, measure 4.5.8. Algorithms pertaining to savings calculations are presented below.

Electric Energy Savings

$$\Delta kWh = \left(\frac{Watts_{base} - Watts_{EE}}{1000}\right) * Hours * WHF_e * ISR$$

Where:

$Watts_{base}$ = input wattage of the baseline system

$Watts_{EE}$ = new input wattage of EE fixture

WHF_e = waste heat factor to account for cooling energy savings

ISR = in service rate (% of units rebated that get installed) = 1

Summer Coincident Peak Demand Savings

$$\Delta kW = \left(\frac{Watts_{base} - Watts_{EE}}{1000}\right) * WHF_d * CF * ISR$$

Where:

WHF_d = waste heat factor to account for cooling demand savings

CF = summer peak coincidence factor

Measure-Level Gross Realized Savings

The table below presents the realized gross energy savings of the lighting retrofit, along with the numeric values of inputs to the savings calculation equation.

Annual kWh Savings for Lighting Retrofit

Measure	*Calculation Inputs*						*Annual Gross kWh Savings*			
	Baseline Quantity	***Baseline Wattage***	***Efficient Quantity***	***Efficient Wattage***	***Hours***	***WHF_e***	***Ex Ante***	***TRM Ex Post***	***ADM Ex Post***	***Realization Rate***
LED Bulbs and Fixtures	112	20	56	9	4,903	1.00	252,877	236,403	236,403	93%
	784	40	672	18						
	336	55	112	21						
	448	20	336	27						
	672	20	448	2						
			672	2						
Total							**252,877**	**236,403**	**236,403**	

Ex post savings calculations reference pre-existing lighting and installed efficient lighting regarding baseline wattages because the installed lighting is not categorized adequately in the TRM reference tables.

Summary of Project-Level Gross Realized Savings

The table shown below presents the realized gross energy savings of the lighting retrofit.

Verified Electric Savings/Realization Rates

Incentive Type	***Annual Gross Savings***			
	Ex Ante (kWh)	***Ex Post (kWh)***	***Realization Rate***	***Ex Post Peak kW Reduction***
Standard	252,877	236,403	93%	48.69
Total	**252,877**	**236,403**	**93%**	**48.69**

Demand reduction was calculated using "unknown" space type deemed values.

Site ID: 37

Executive Summary

The program participant received Standard program incentives for installing variable speed drives (VSDs) on HVAC hot water pumps. The gross realization rate for these measures is 100%.

Project Description

The participant implemented the following measure(s):

- (1) VSD installed on a 300 hp HVAC hot water pump
- (1) VSD installed on a 440 hp HVAC hot water pump
- (1) VSD installed on a 440 hp HVAC hot water pump
- (1) VSD installed on a 20 hp HVAC hot water pump
- (1) VSD installed on a 15 hp HVAC hot water pump

Methodology for Estimating Gross Savings.

ADM staff inspected project documentation pertaining to the VSD installation.

Energy savings for the lighting retrofit were calculated according to the Illinois TRM 4.0, measure 4.4.17. Algorithms pertaining to savings calculations are presented below.

Electric Energy Savings

$$\Delta kWh = \frac{BHP}{EFFi} * Hours * ESF$$

Where:

BHP	= System brake horsepower
	= (nominal motor HP * motor load factor)
EFFi	= Motor efficiency, installed
Hours	= Default hours are provided for HVAC applications which vary by HVAC application and building type
ESF	= Energy savings factor

Summer Coincident Peak Demand Savings

$$\Delta kW = \frac{BHP}{EFFi} * DSF$$

Where:

DSF	= Demand Savings Factor

Measure-Level Gross Realized Savings

The table below presents the realized gross energy savings of the VSD installation, along with the numeric values of inputs to the savings calculation equation.

Annual kWh Savings for Lighting Retrofit

Measure	***Calculation Inputs***					***Annual Gross kWh Savings***			
	Quantity	***Application***	***Size***	***Hours***	***ESF***	***Ex Ante***	***TRM Ex Post***	***ADM Ex Post***	***Realization Rate***
VSD for HVAC Pumps and Cooling Tower Fans	1	Hot Water Pump	195 bhp	3,222	0.424	286,446	286,446	286,446	100%
	1		286 bhp	3,222	0.424	420,121	420,121	420,121	100%
	1		286 bhp	3,222	0.424	420,121	420,121	420,121	100%
	1		13 bhp	3,222	0.424	19,096	19,096	19,096	100%

	1		9.75 bhp	3,222	0.424	14,322	14,322	14,322	100%
Total						**1,160,107**	**1,160,107**	**1,160,107**	

The ADM calculated ex post savings estimate will be equal to the TRM savings estimate, except in cases in which the TRM is not applied. The TRM is not to be applied in cases in which it does not properly characterize the newly installed lighting system.

Summary of Project-Level Gross Realized Savings

The table shown below presents the realized gross energy savings of the VSD installation.

Verified Electric Savings/Realization Rates

Incentive Type	***Annual Gross Savings***			
	Ex Ante (kWh)	***Ex Post (kWh)***	***Realization Rate***	***Ex Post Peak kW Reduction***
Standard	1,160,107	1,160,107	100%	0.00
Total	**1,160,107**	**1,160,107**	**100%**	**0.00**

No demand reduction was calculated due to there being no DSF value for installing a VSD on a heat pump.

Site ID: 38

Executive Summary

The program participant received Standard and Custom program incentives for retrofitting lighting and installing energy efficient equipment. The gross realization rate for these measures is 39%.

Project Description

The participant implemented the following Standard measure(s):

- (8) 400W HID fixtures replaced with 144W 4L T8 fixtures
- (1) 15W LED wall pack installed

The participant implemented the following Custom measure(s):

- (1) 49 ft^3 solid door refrigerator and (2) 18.3 ft^3 milk coolers installed
- (1) split A/C system installed

Methodology for Estimating Gross Savings

ADM staff inspected project documentation pertaining to the above measures.

Energy savings were calculated according to the Illinois TRM 4.0, measures 4.2.2, 4.4.15, 4.5.3 and 4.5.4. Algorithms pertaining to savings calculations are presented below.

Electric Energy Savings

$$\Delta kWh \text{ (lighting)} = \left(\frac{Watts_{base} - Watts_{EE}}{1000}\right) * Hours * WHF_e * ISR$$

Where:

$Watts_{base}$ = input wattage of the baseline system

$Watts_{EE}$ = new input wattage of EE fixture

WHF_e = waste heat factor to account for cooling energy savings

ISR = in service rate (% of units rebated that get installed) = 1

$$\Delta kWh \text{ (refrigerator/milk cooler)} = (kWhbase - kWhee) * 365.25$$

Where:

kWhbase = baseline maximum daily energy consumption (see TRM reference table below)

Type	kWhbase
Solid Door Refrigerator	0.10 * V + 2.04
Glass Door Refrigerator	0.12 * V + 3.34
Solid Door Freezer	0.40 * V + 1.38
Glass Door Freezer	0.75 * V + 4.10

kWhee = efficient maximum daily energy consumption (see TRM reference table below)

Type	kWhee
0 < V < 15	≤ 0.089V + 1.411
15 ≤ V < 30	≤ 0.037V + 2.200
30 ≤ V < 50	≤ 0.056V + 1.635
V ≥ 50	≤ 0.060V + 1.416

$$\Delta kWh \text{ (split A/C)} = (kBtu/hr) * [(1/SEERbase) - (1/SEERee)] * EFLH$$

Where:

kbtu/hr	= cooling capacity in kbtu/hr
SEERbase	= seasonal energy efficiency ratio of baseline equipment
SEERee	= seasonal energy efficiency ratio of efficient equipment
EFLH	= equivalent full load hours

Summer Coincident Peak Demand Savings

$$\Delta kW\ (lighting) = \left(\frac{Watts_{base} - Watts_{EE}}{1000}\right) * WHF_d * CF * ISR$$

Where:

WHF_d	= waste heat factor to account for cooling demand savings
CF	= summer peak coincidence factor

$$\Delta kWh \text{ (refrigerator/milk cooler)} = \Delta kWh/Hours * CF$$

Where:

Hours	= 8766
CF	= 0.937

$$\Delta kWh \text{ (split A/C)} = (kBtu/hr) * [(1/EERbase) - (1/EERee)] * CF_{SSP}$$

Where:

CF	= 0.913

Measure-Level Gross Realized Savings

The table below presents the realized gross energy savings of the above retrofits, along with the numeric values of inputs to the savings calculation equation.

Annual kWh Savings for Lighting Retrofit

Measure	***Calculation Inputs***					***Annual Gross kWh Savings***			
	Quantity	***Baseline Wattage***	***Efficient Wattage***	***Hours***	***WHF_e***	***Ex Ante***	***TRM Ex Post***	***ADM Ex Post***	***Realization Rate***

HP and RW T8 Fixtures and Lamps	8	TRM = 232 Actual = 400	TRM = 146 Actual = 144	2,422	1.31	7,970	2,183	2,183	27%
LED Bulbs and Fixtures	1	TRM = 124.3 Actual = 95	TRM = 18.6 Actual = 15	4,903	1.00	518	536	536	103%
Total						**8,488**	**2,719**	**2,719**	**32%**

The ADM calculated ex post savings estimate will be equal to the TRM savings estimate, except in cases in which the TRM is not applied. The TRM is not to be applied in cases in which it does not properly characterize the newly installed lighting system.

Annual kWh Savings for Equipment Installation

Measure	***Calculation Inputs***					***Annual Gross kWh Savings***			
	Quantity	***Type***	***Size***	***Base Efficiency***	***EE Efficiency***	***Ex Ante***	***TRM Ex Post***	***ADM Ex Post***	***Realization Rate***
Custom	1	Solid Door Refrigerator	49 cu. ft.	N/A	N/A	3,424	935	935	49%
	2	Milk Cooler	18.3 cu. ft.	N/A	N/A		725	725	
	1	Split A/C	1.8 tons	13 SEER	15 SEER	415	385	385	93%
Total						**3,839**	**2,045**	**2,045**	**53%**

Summary of Project-Level Gross Realized Savings

The table shown below presents the realized gross energy savings of the above retrofits.

Verified Electric Savings/Realization Rates

Incentive Type	***Annual Gross Savings***			
	Ex Ante (kWh)	***Ex Post (kWh)***	***Realization Rate***	***Ex Post Peak kW Reduction***
Standard	8,488	2,719	32%	0.21
Custom	3,839	2,045	53%	0.36
Total	**12,327**	**4,764**	**39%**	**0.57**

A CF value of 0.22 and a WHF_d value of 1.4 was used to determine kW reduction regarding lighting measures. These values were taken from the TRM 4.0 based on applicable facility type. No kW reduction for the LED measure was calculated due to only exterior lighting being implemented.

The ex post energy savings estimate used TRM methods and algorithms pertaining to energy efficient refrigerators (4.2.2) regarding the milk cooler installations.

The split A/C capacity was estimated using one ton per 500 ft^2 of cooling space. SEERbase was estimated using the TRM reference tables while SEERee was estimated using similar 2 ton split A/C systems.

Site ID: 39

Executive Summary

The program participant received Standard program incentives for retrofitting lighting. The gross realization rate for these measures is 106%.

Project Description

The participant implemented the following measure(s):

- (10) 4', 4L, F34T12 fixture replaced with 4', 4L, HPT8 fixtures
- (9) 295W MH low bay fixtures replaced with 81.5W LED fixtures
- (1) 42.18 ft^3 solid door freezer installed
- (1) VSD installed on a 20hp HVAC return fan motor

Methodology for Estimating Gross Savings

ADM staff inspected project documentation pertaining to the lighting retrofit.

Energy savings for the lighting retrofit were calculated according to the Illinois TRM 4.0, measures 4.2.2, 4.4.17, 4.5.3 and 4.5.4. Algorithms pertaining to savings calculations are presented below.

Electric Energy Savings

$$\Delta kWh\ (lighting) = \left(\frac{Watts_{base} - Watts_{EE}}{1000}\right) * \ Hours * WHF_e * ISR$$

Where:

A reference table at the beginning of TRM measure 4.5 "Lighting End Use" provides values for Hours, WHFe, WHFd, and CF based on applicable building type.

$Watts_{base}$	= input wattage of the baseline system
$Watts_{EE}$	= new input wattage of EE fixture
WHF_e	= waste heat factor to account for cooling energy savings
ISR	= in service rate (% of units rebated that get installed) = 1

$$\Delta kWh\ (freezer) = (kWhbase - kWhee) * 365.25$$

Where:

kWhbase = baseline maximum daily energy consumption (see TRM reference table below)

Type	kWhbase
Solid Door Refrigerator	0.10 * V + 2.04
Glass Door Refrigerator	0.12 * V + 3.34
Solid Door Freezer	0.40 * V + 1.38
Glass Door Freezer	0.75 * V + 4.10

kWhee = efficient maximum daily energy consumption (see TRM reference table below)

Type	kWhee
0 < V < 15	≤ 0.250V + 1.250
15 ≤ V < 30	≤ 0.400V – 1.000
30 ≤ V < 50	≤ 0.163V + 6.125
V ≥ 50	≤ 0.158V + 6.333

$$\Delta kWh\ (VSD) = \frac{BHP}{EFFi} * Hours * ESF$$

Where:

BHP = brake horsepower, nominal motor HP * motor load factor (65% default)

EFFi = motor efficiency (93% default)

ESF = energy savings factor (see TRM reference table below)

Application	ESF
Hot Water Pump	0.424
Chilled Water Pump	0.411
Air Foil/backward incline	0.354
Air Foil/ backward incline inlet Guide Vanes	0.227
Forward Curved Fan, with discharge dampers	0.179
Forward Curved Inlet Guide Vanes	0.092

Summer Coincident Peak Demand Savings

$$\Delta kW\ (lighting) = \left(\frac{Watts_{base} - Watts_{EE}}{1000}\right) * \ WHF_d * CF * ISR$$

Where:

WHF_d = waste heat factor to account for cooling demand savings

CF = summer peak coincidence factor

$$\Delta kW\ (freezer) = \Delta kWh/Hours * CF$$

Where:

Hours = 8766

CF = 0.937

$$\Delta kW\ (VSD) = \frac{BHP}{EFFi} * DSF$$

Where:

DSF = demand savings factor (see TRM reference table below)

Application	DSF
Hot Water Pump	0
Chilled Water Pump	0.299
Air foil / backward incline	0.260
Air Foil / backward incline inlet Guide Vanes	0.130
Forward Curved Fan, with discharge dampers	0.136
Forward Curved Inlet Guide Vanes	0.029

Measure-Level Gross Realized Savings

The table below presents the realized gross energy savings of the lighting retrofit, along with the numeric values of inputs to the savings calculation equation.

Annual kWh Savings for Lighting Retrofit

Measure	*Calculation Inputs*					*Annual Gross kWh Savings*			
	Quantity	*Baseline Wattage*	*Efficient Wattage*	*Hours*	*WHF_e*	*Ex Ante*	*TRM Ex Post*	*ADM Ex Post*	*Realization Rate*
HP and RW T8 Fixtures and Lamps	10	TRM = 139 Actual = N/A	TRM = 94 Actual = N/A	2,422	1.31	952	1,428	1,428	150%
LED Bulbs and Fixtures	9	TRM = 295 Actual = 295	TRM = 160.2 Actual = 81.5	2,422	1.31	6,098	6,097	6,097	100%
Total						**7,050**	**7,524**	**7,524**	

The ADM calculated ex post savings estimate will be equal to the TRM savings estimate, except in cases in which the TRM is not applied. The TRM is not to be applied in cases in which it does not properly characterize the newly installed lighting system.

Annual kWh Savings for Equipment Installation

Measure	*Calculation Inputs*			*Annual Gross kWh Savings*			
	Quantity	*Type*	*Size*	*Ex Ante*	*TRM Ex Post*	*ADM Ex Post*	*Realization Rate*
Solid and Glass Door Refrigerators & Freezers	1	Solid Door Freezer	42.18 cu. ft.	1,215	1,918	1,918	158%
VSD for HVAC Pumps and Cooling Tower Fans	1	Air Foil/backward incline	13 bhp	10,901	10,901	10,901	100%
Total				**12,116**	**12,819**	**12,819**	

Summary of Project-Level Gross Realized Savings

The table shown below presents the realized gross energy savings of the lighting retrofit.

Verified Electric Savings/Realization Rates

Incentive Type	*Annual Gross Savings*			
	Ex Ante (kWh)	*Ex Post (kWh)*	*Realization Rate*	*Ex Post Peak kW*

				Reduction
Standard	19,166	20,343	106%	4.57
Total	**19,166**	**20,343**	**106%**	**4.57**

A CF value of 0.22 and a WHF_d value of 1.4 was used to determine kW reduction for lighting measures. These values were taken from the TRM 4.0 based on applicable facility type.

Measures regarding the installation of T8 fixtures references TRM tables for baseline and efficient wattage. Measures regarding the installation of LED fixtures references TRM tables for baseline wattages and installed LED wattage for efficient wattages.

Site ID: 40

Executive Summary

The program participant received Standard and Custom program incentives for retrofitting lighting and installing energy efficient equipment. The gross realization rate for these measures is 61%.

Project Description

The participant implemented the following Standard measure(s):

- (9) 2x4 4L F32T8 112W fixtures replaced by 2x4 LED 69.25W fixtures
- (1) occupancy sensor installed with a total connected load of 623.3W
- (21) commercial LED exit signs installed
- (0) LED wall packs installed
- (1) 42.18 ft^3 solid door freezer installed
- (2) 6-pan commercial steam cookers installed
- (2) full sized hot food holding cabinets installed
- (0) energy efficient electric convection ovens installed
- (2) VSD's installed on 10 hp and 25 hp HVAC return fan motors
- (2) VSD's installed on 5 hp and 15 hp HVAC return fan motors
- (2) VSD's installed on a 10 hp HVAC return fan motors

The participant implemented the following Custom measure(s):

- (1) 49 ft^3 solid door refrigerator and (2) 18.3 ft^3 milk coolers installed

Methodology for Estimating Gross Savings.

ADM staff inspected project documentation pertaining to the lighting retrofit and equipment installation.

Energy savings for these measures were calculated according to the Illinois TRM 4.0, measures 4.2.2, 4.2.3, 4.2.9, 4.4.17, 4.4.19, 4.5.4, 4.5.5, and 4.5.10. Algorithms pertaining to savings calculations are presented below.

Electric Energy Savings

$$\Delta kWh\ (reduced\ wattage) = \left(\frac{Watts_{base} - Watts_{EE}}{1000}\right) * \ Hours * WHF_e * ISR$$

Where:

A reference table at the beginning of TRM measure 4.5 "Lighting End Use" provides values for Hours, WHFe, WHFd, and CF based on applicable building type.

$Watts_{base}$ = input wattage of the baseline system

$Watts_{EE}$ = new input wattage of EE fixture

WHF_e = waste heat factor to account for cooling energy savings

ISR = in service rate (% of units rebated that get installed) = 1

$$\Delta kWh\ (occupancy\ sensor) = kW_{controlled} * \ Hours * ESF * WHF_e$$

Where:

$kW_{controlled}$ = total lighting load connected to the control in kilowatts

ESF = energy savings factor (see TRM reference table below)

Lighting Control Type	Energy Savings Factor
Wall or Ceiling-Mounted Occupancy Sensors	41% or custom
Fixture Mounted Occupancy Sensors	30% or custom
Wall-Mounted Occupancy Sensors Configured as "Vacancy Sensors"	53% or custom

$$\Delta kWh\ (freezer) = (kWhbase - kWhee) * 365.25$$

Where:

kWhbase = baseline maximum daily energy consumption (see TRM reference table below)

Type	kWhbase
Solid Door Refrigerator	0.10 * V + 2.04
Glass Door Refrigerator	0.12 * V + 3.34
Solid Door Freezer	0.40 * V + 1.38
Glass Door Freezer	0.75 * V + 4.10

kWhee = efficient maximum daily energy consumption (see TRM reference table below)

Type	kWhee
0 < V < 15	≤ 0.250V + 1.250
15 ≤ V < 30	≤ 0.400V – 1.000
30 ≤ V < 50	≤ 0.163V + 6.125
V ≥ 50	≤ 0.158V + 6.333

$$\Delta kWh\ (VSD) = \frac{BHP}{EFFi} * Hours * ESF$$

Where:

BHP = brake horsepower, nominal motor HP * motor load factor

EFFi = motor efficiency (93% default)

ESF = energy savings factor (see TRM reference table below)

Application	ESF
Hot Water Pump	0.424
Chilled Water Pump	0.411
Air Foil/backward incline	0.354
Air Foil/ backward incline inlet Guide Vanes	0.227

Application	ESF
Forward Curved Fan, with discharge dampers	0.179
Forward Curved Inlet Guide Vanes	0.092

$$\Delta Savings\ (steam\ cooker) = (\Delta\text{Idle Energy} + \Delta\text{Preheat Energy} + \Delta\text{Cooking Energy}) * \text{Z}$$

Where:

Algorithms pertaining to these energy differentials, as well as reference tables, can be found in TRM measure section 4.2.3

Z = days/year steamer operating (365.25 default)

$$\Delta\text{kWh (hot food cabinet)} = \text{HFHCBaselinekWh} - \text{HFHCENERGYSTARkWh}$$

Where:

HFHCBaselinekWh = PowerBaseline*Hoursday*Days/1000

Cabinet Size	Power (W)
Full Size HFHC	2500
¾ Size HFHC	1200
½ Size HFHC	800

HFHCENERGYSTARkWh = PowerENERGYSTAR*Hoursday*Days/1000

Cabinet Size	Power (W)
Full Size HFHC	800
¾ Size HFHC	480
½ Size HFHC	320

Hoursday = average daily operation (15 default)

Days = annual days of operation (365.25 default)

Summer Coincident Peak Demand Savings

$$\Delta kW\ (reduced\ wattage) = \left(\frac{Watts_{base} - Watts_{EE}}{1000}\right) * WHF_d * CF * ISR$$

Where:

WHF_d = waste heat factor to account for cooling demand savings

CF = summer peak coincidence factor

$$\Delta kW\ (occupancy\ sensor) = kW_{controlled} * WHF_d * (CF_{baseline} - CF_{OS})$$

Where:

CF_{OS} = 0.15

$$\Delta kW\ (freezer) = \Delta kWh/Hours * CF$$

Where:

Hours = 8766

CF = 0.937

$$\Delta kW\ (VSD) = \frac{BHP}{EFFi} * DSF$$

Where:

DSF = demand savings factor (see TRM reference table below)

Application	DSF
Hot Water Pump	0
Chilled Water Pump	0.299
Air foil / backward incline	0.260
Air Foil / backward incline inlet Guide Vanes	0.130
Forward Curved Fan, with discharge dampers	0.136
Forward Curved Inlet Guide Vanes	0.029

$$\Delta kW\ (steam\ cooker) = \left(\frac{\Delta kWh}{Hoursday * Daysyear}\right) * CF$$

Where:

Daysyear = annual days of operation (365.25 default)

CF = summer peak coincidence factor (see TRM reference table below

Location	CF

Fast Food Limited Menu	0.32
Fast Food Expanded Menu	0.41
Pizza	0.46
Full Service Limited Menu	0.51
Full Service Expanded Menu	0.36
Cafeteria	0.36

$$\Delta kW\ (hot\ food\ cabinet) = \frac{\Delta kWh}{Hoursday * Days} * CF$$

Where:

CF = summer peak coincidence factor (see TRM CF reference table for steam cooker above)

Measure-Level Gross Realized Savings

The tables below presents the realized gross energy savings of these measures, along with the numeric values of inputs to the savings calculation equation.

Annual kWh Savings for Lighting Retrofit

Measure	***Calculation Inputs***						***Annual Gross kWh Savings***			
	Quantity	***Baseline Wattage***	***Efficient Wattage***	***Hours***	***WHF_e***	***ESF***	***Ex Ante***	***TRM Ex Post***	***ADM Ex Post***	***Realization Rate***
LED Bulbs and Fixtures	9	TRM = 88 Actual = 112	TRM = 53.6 Actual = 69.25	2,422	1.31	N/A	924	535	535	58%
Occupancy Sensor Lighting Controls	1	623.3	N/A	2,422	1.31	0.53	1,042	1,048	1,048	101%
Commercial LED Exit Signs	21	TRM = 23 Actual = N/A	TRM= 2 Actual = 3	8,766	1.31	N/A	5,064	4,823	4,823	95%
LED Bulbs and Fixtures	-	-	-	-	-	N/A	12,787	-	-	0%
Total							**19,817**	**6,407**	**6,407**	

The ADM calculated ex post savings estimate will be equal to the TRM savings estimate, except in cases in which the TRM is not applied. The TRM is not to be applied in cases in which it does not properly characterize the newly installed lighting system.

Annual kWh Savings for Equipment Installation

Measure	***Calculation Inputs***			***Annual Gross kWh Savings***			
	Quantity	***Type***	***Size***	***Ex Ante***	***TRM Ex Post***	***ADM Ex Post***	***Realization Rate***
Solid and Glass Door Refrigerators & Freezers	1	Solid Door Freezer	42.18 cu. ft.	1,411	1,918	1,918	136%
Custom	1	Solid Door Refrigerator	49 cu. ft.	3,424	935	935	49%
	2	Milk Cooler	18.3 cu. ft.		725	725	
Commercial Steam Cooker	2	6 pan	N/A	114,772	57,386	57,386	50%
Hot Food Holding Cabinets	2	Cafeteria	Full Size	18,628	18,628	18,628	100%
Electric Convection Oven	0	-	-	4,401	-	-	0%
VSD for HVAC Pumps and Cooling Tower Fans	1 1	Air Foil/backward incline	10 hp 25 hp	19,077	5,451 13,627	5,451 13,627	100%
VSD for HVAC Pumps and Cooling Tower Fans	1 1	Forward Curved Inlet Guide Vanes	5 hp 15 hp	2,833	708 2,125	708 2,125	100%
VSD for HVAC Pumps and Cooling Tower Fans	2	Hot Water Pump	10 hp	13,057	13,057	13,057	100%
Total				**177,603**	**114,560**	**114,560**	

Summary of Project-Level Gross Realized Savings

The table shown below presents the realized gross energy savings of the above retrofits.

Verified Electric Savings/Realization Rates

Incentive Type	***Annual Gross Savings***			
	Ex Ante (kWh)	***Ex Post (kWh)***	***Realization Rate***	***Ex Post Peak kW Reduction***
Standard	193,996	119,306	61%	18.04

Custom	3,424	1,661	49%	0.18
Total	**197,420**	**120,967**	61%	**18.04**

A CF value of 0.22 and a WHF_d value of 1.40 was used to determine kW reduction for lighting measures. These values were taken from the TRM 4.0 based on applicable facility type.

There were two errors in the application process that resulted in a realization rate of zero. The LED wall packs were not installed, and was intended to be removed from the database. The installed convection oven is natural gas powered and was mistakenly applied for under the electric convection oven measure category.

The ex ante energy savings regarding the installation of commercial steam cookers references an installed quantity of 4 steam cookers. It was verified through facility personnel that one double rack style commercial steam cooker was installed, resulting in a quantity of 2 used to calculate ex post savings.

The ex post energy savings estimate used TRM methods and algorithms pertaining to energy efficient refrigerators (4.2.2) regarding the milk cooler installations.

Site ID: 41

Executive Summary

The program participant received Standard program incentives for retrofitting lighting and installing energy efficient equipment. The gross realization rate for these measures is 93%.

Project Description

The participant implemented the following measure(s):

- (0) LED wall packs installed
- (1) 42.18 ft^3 solid door freezer installed
- (2) 6-pan commercial steam cookers installed
- (2) full sized hot food holding cabinets installed
- (1) 8,500 BTU/hr room air conditioner installed
- (0) 8,500 BTU/hr room air conditioner installed
- (1) 90 ton air cooled chiller installed
- (1) VSD installed on a 35 hp HVAC return fan motor
- (2) VSDs installed on 10 hp and 3 hp HVAC return fan motors

- (1) VSD installed on a 5 hp hot water pump motor and (1) VSD installed on a 5 hp chilled water pump motor
- (1) VSD installed on a 20 hp hot water pump motor

Methodology for Estimating Gross Savings.

ADM staff inspected project documentation pertaining to the lighting retrofit and equipment installation.

Energy savings for these measures were calculated according to the Illinois TRM 4.0, measures 4.2.2, 4.2.3, 4.2.9, 4.4.6, 4.4.7, 4.4.17, and 4.5.4. Algorithms pertaining to savings calculations are presented below.

Electric Energy Savings

$\Delta kWh\ (freezer) = (kWhbase - kWhee) * 365.25$

Where:

kWhbase = baseline maximum daily energy consumption (see TRM reference table below)

Type	kWhbase
Solid Door Refrigerator	0.10 * V + 2.04
Glass Door Refrigerator	0.12 * V + 3.34
Solid Door Freezer	0.40 * V + 1.38
Glass Door Freezer	0.75 * V + 4.10

kWhee = efficient maximum daily energy consumption (see TRM reference table below)

Type	kWhee
0 < V < 15	≤ 0.250V + 1.250
15 ≤ V < 30	≤ 0.400V – 1.000
30 ≤ V < 50	≤ 0.163V + 6.125
V ≥ 50	≤ 0.158V + 6.333

$\Delta Savings\ (steam\ cooker) = (\Delta\text{Idle Energy} + \Delta\text{Preheat Energy} + \Delta\text{Cooking Energy}) * Z$

Where:

Algorithms pertaining to these energy differentials, as well as reference tables, can be found in TRM measure section 4.2.3

Z = days/year steamer operating (365.25 default)

$$\Delta kWh\ (\text{hot food cabinet}) = \text{HFHCBaselinekWh} - \text{HFHCENERGYSTARkWh}$$

Where:

HFHCBaselinekWh = PowerBaseline*Hoursday*Days/1000

Cabinet Size	Power (W)
Full Size HFHC	2500
¾ Size HFHC	1200
½ Size HFHC	800

HFHCENERGYSTARkWh = PowerENERGYSTAR*Hoursday*Days/1000

Cabinet Size	Power (W)
Full Size HFHC	800
¾ Size HFHC	480
½ Size HFHC	320

Hoursday = average daily operation (15 default)

Days = annual days of operation (365.25 default)

$$\Delta kWh\ (VSD) = \frac{BHP}{EFFi} * Hours * ESF$$

Where:

BHP = brake horsepower, nominal motor HP * motor load factor

EFFi = motor efficiency (93% default)

ESF = energy savings factor (see TRM reference table below)

Application	ESF
Hot Water Pump	0.424
Chilled Water Pump	0.411
Air Foil/backward incline	0.354

Application	ESF
Air Foil/ backward incline inlet Guide Vanes	0.227
Forward Curved Fan, with discharge dampers	0.179
Forward Curved Inlet Guide Vanes	0.092

$$\Delta kWh\ (room\ A/C) = (FLH_{\ RoomAC} * Btu/H\ * (1/EERbase\ -\ 1/EERee))/1000$$

Where:

FLH_{RoomAC} = full load hours (see TRM reference table below)

Zone	FLH_{RoomAC}
1 (Rockford)	253
2-(Chicago)	254
3 (Springfield)	310
4-(Belleville)	391
5-(Marion)	254

Btu/hr = unit size

EERbase = baseline unit efficiency (see TRM reference table below)

EERee = efficient unit efficiency (see TRM reference table below)

Product Class (Btu/H)	Federal Standard EER, with louvered sides	Federal Standard EER, without louvered sides	ENERGY STAR EER, with louvered sides	ENERGY STAR EER, without louvered sides	CEE TIER 1 EER
< 8,000	9.7	9	10.7	9.9	11.2
8,000 to 13,999	9.8	8.5	10.8	9.4	11.3
14,000 to 19,999	9.7	8.5	10.7	9.4	11.2

>= 20,000	8.5	8.5	9.4	9.4	9.8

$$\Delta kWh\ (electric\ chiller) = TONS\ *\ (IPLVbase - PLVee)\ *\ EFLH$$

Where:

TONS	= cooling capacity
IPLVbase	= baseline equipment efficiency (kW/ton) (see TRM reference table below)
IPLVee	= installed equipment efficiency (kW/ton)
EFLH	= equivalent full load hours

TABLE C403.2.3(7)
MINIMUM EFFICIENCY REQUIREMENTS:
WATER CHILLING PACKAGES[a]

EQUIPMENT TYPE	SIZE CATEGORY	UNITS	BEFORE 1/1/2010		AS OF 1/1/2010[b]				TEST PROCEDURE[c]
					PATH A		PATH B		
			FULL LOAD	IPLV	FULL LOAD	IPLV	FULL LOAD	IPLV	
Air-cooled chillers	< 150 tons	EER	≥ 9.562	≥ 10.4 16	≥ 9.562	≥ 12.500	NA	NA	AHRI 550/590
	≥ 150 tons	EER			≥ 9.562	≥ 12.750	NA	NA	
Air cooled without condenser, electrical operated	All capacities	EER	≥ 10.586	≥ 11.782	Air-cooled chillers without condensers shall be rated with matching condensers and comply with the air-cooled chiller efficiency requirements				
Water cooled, electrically operated, reciprocating	All capacities	kW/ton	≤ 0.837	≤ 0.696	Reciprocating units shall comply with water cooled positive displacement efficiency requirements				
Water cooled, electrically operated, positive displacement	< 75 tons	kW/ton	≤ 0.790	≤ 0.676	≤ 0.780	≤ 0.630	≤ 0.800	≤ 0.600	
	≥ 75 tons and < 150 tons	kW/ton			≤ 0.775	≤ 0.615	≤ 0.790	≤ 0.586	
	≥ 150 tons and < 300 tons	kW/ton	≤ 0.717	≤ 0.627	≤ 0.680	≤ 0.580	≤ 0.718	≤ 0.540	
	≥ 300 tons	kW/ton	≤ 0.639	≤ 0.571	≤ 0.620	≤ 0.540	≤ 0.639	≤ 0.490	
Water cooled, electrically operated, centrifugal	< 150 tons	kW/ton	≤ 0.703	≤ 0.669	≤ 0.634	≤ 0.596	≤ 0.639	≤ 0.450	
	≥ 150 tons and < 300 tons	kW/ton	≤ 0.634	≤ 0.596					
	≥ 300 tons and < 600 tons	kW/ton	≤ 0.576	≤ 0.549	≤ 0.576	≤ 0.549	≤ 0.600	≤ 0.400	
	≥ 600 tons	kW/ton	≤ 0.576	≤ 0.549	≤ 0.570	≤ 0.539	≤ 0.590	≤ 0.400	
Air cooled, absorption single effect	All capacities	COP	≥ 0.600	NR	≥ 0.600	NR	NA	NA	AHRI 560
Water cooled, absorption single effect	All capacities	COP	≥ 0.700	NR	≥ 0.700	NR	NA	NA	
Absorption double effect, indirect fired	All capacities	COP	≥ 1.000	≥ 1.050	≥ 1.000	≥ 1.050	NA	NA	
Absorption double effect, direct fired	All capacities	COP	≥ 1.000	≥ 1.000	≥ 1.000	≥ 1.000	NA	NA	

For SI: 1 ton = 3517 W, 1 British thermal unit per hour = 0.2931 W, °C = [(°F) - 32]/1.8.
NA = Not applicable, not to be used for compliance; NR = No requirement.

a. The centrifugal chiller equipment requirements, after adjustment in accordance with Section C403.2.3.1 or Section C403.2.3.2, do not apply to chillers used in low-temperature applications where the design leaving fluid temperature is less than 36°F. The requirements do not apply to positive displacement chillers with leaving fluid temperatures less than or equal to 32°F. The requirements do not apply to absorption chillers with design leaving fluid temperatures less than 40°F.

b. Compliance with this standard can be obtained by meeting the minimum requirements of Path A or B. However, both the full load and IPLV shall be met to fulfill the requirements of Path A or B.

c. Chapter 6 of the referenced standard contains a complete specification of the referenced test procedure, including the referenced year version of the test procedure.

Summer Coincident Peak Demand Savings

$$\Delta kW\ (freezer) = \Delta kWh/Hours * CF$$

Where:

Hours = 8766

CF = 0.937

$$\Delta kW\ (steam\ cooker) = \left(\frac{\Delta kWh}{Hoursday * Daysyear}\right) * CF$$

Where:

Daysyear = annual days of operation (365.25 default)

CF = summer peak coincidence factor (see TRM reference table below

Location	CF
Fast Food Limited Menu	0.32
Fast Food Expanded Menu	0.41
Pizza	0.46
Full Service Limited Menu	0.51
Full Service Expanded Menu	0.36
Cafeteria	0.36

$$\Delta kW\ (hot\ food\ cabinet) = \frac{\Delta kWh}{Hoursday * Days} * CF$$

Where:

CF = summer peak coincidence factor (see TRM CF reference table for steam cooker above)

$$\Delta kW\ (VSD) = \frac{BHP}{EFFi} * DSF$$

Where:

DSF = demand savings factor (see TRM reference table below)

Application	DSF
Hot Water Pump	0
Chilled Water Pump	0.299
Air foil / backward incline	0.260
Air Foil / backward incline inlet Guide Vanes	0.130
Forward Curved Fan, with discharge dampers	0.136
Forward Curved Inlet Guide Vanes	0.029

$\Delta kW\ (room\ A/C) = Btu/H\ *\ ((1/EERbase\ -\ 1/EERee))/1000)\ *\ CF$

Where:

CF = 91.3%

$\Delta kW\ (electric\ chiller) = TONS\ *\ ((PEbase) - (PEee))\ *\ CF_{SSP}$

Where:

PEbase = peak efficiency of baseline equipment expressed as Full Load (kW/ton)

PEee = peak efficiency of efficient equipment expressed as Full Load (kW/ton)

CF_{SSP} = 91.3%

Measure-Level Gross Realized Savings

The tables below presents the realized gross energy savings of these measures, along with the numeric values of inputs to the savings calculation equation.

Annual kWh Savings for Lighting Retrofit

Measure	***Calculation Inputs***					***Annual Gross kWh Savings***			
	Quantity	***Baseline Wattage***	***Efficient Wattage***	***Hours***	***WHF_e***	***Ex Ante***	***TRM Ex Post***	***ADM Ex Post***	***Realization Rate***
LED Bulbs and Fixtures	0	-	-	-	-	10,883	-	-	0%
Total						**10,883**	**0**	**0**	

Annual kWh Savings for Equipment Installation

Measure	***Calculation Inputs***			***Annual Gross kWh Savings***			
	Quantity	***Type***	***Size***	***Ex Ante***	***TRM Ex Post***	***ADM Ex Post***	***Realization Rate***
Solid and Glass Door Refrigerators & Freezers	1	Solid Door Freezer	42.18 cu. ft.	1,411	1,918	1,918	136%

Measure	*Calculation Inputs*			*Annual Gross kWh Savings*			
	Quantity	*Type*	*Size*	*Ex Ante*	*TRM Ex Post*	*ADM Ex Post*	*Realization Rate*
Commercial Steam Cooker	2	6 pan	N/A	57,386	57,386	57,386	100%
Hot Food Holding Cabinets	2	Cafeteria	Full Size	18,628	18,628	18,628	100%
Room Air Conditioner	1	ENERGY STAR	28000 BTU/hr	207	80	80	39%
Room Air Conditioner	0	N/A	N/A	207	-	-	0%
Electric Chiller	1	Air-cooled	90 tons	13,477	13,454	13,454	100%
VSD for HVAC Pumps and Cooling Tower Fans	1	Air Foil/ backward incline inlet Guide Vanes	22.75 bhp	12,233	12,233	12,233	100%
VSD for HVAC Pumps and Cooling Tower Fans	1	Forward Curved Inlet Guide Vanes	6.5 bhp	2,833	1,417	1,417	65%
	1		1.95 bhp		425	425	
VSD for HVAC Pumps and Cooling Tower Fans	1	Hot Water Pump	3.25 bhp	6,528	3,264	3,264	98%
	1	Chilled Water Pump	3.25 bhp		3,164	3,164	
VSD for HVAC Pumps and Cooling Tower Fans	1	Hot Water Pump	33 bhp	13,057	15,971	15,971	122%
Total				**125,967**	**127,940**	**127,940**	

Summary of Project-Level Gross Realized Savings

The table shown below presents the realized gross energy savings of the lighting retrofit.

Verified Electric Savings/Realization Rates

Incentive Type	*Annual Gross Savings*			
	Ex Ante (kWh)	*Ex Post (kWh)*	*Realization Rate*	*Ex Post Peak kW Reduction*

Standard	136,850	127,940	93%	24.84
Total	**136,850**	**127,940**	**93%**	**24.84**

There were two errors in the application process that resulted in a realization rate of zero. The LED wall packs were not installed, and was intended to be removed from the database. One of the room air conditioner measures was an inadvertent duplicate entry in the application process.

Site ID: 42

Executive Summary

The program participant received Standard Program incentives for installing various equipment. The gross realization rate for these measures is 147%.

Project Description

The participant implemented the following measures:

- (1) 200 ton, air cooled, electric chiller installed
- (1) VSD installed on 40 hp HVAC fan
- (1) VSD installed on 30 hp HVAC fan
- (1) VSD installed on 40 hp HVAC pump

Methodology for Estimating Gross Savings.

ADM staff inspected project documentation pertaining to the measures.

Energy savings for the lighting retrofit were calculated according to the Illinois TRM 4.0, measures 4.4.6 and 4.4.17.

Electric Energy Savings

$$\Delta kWh\ (electric\ chiller) = TONS\ *\ (IPLVbase - PLVee)\ *\ EFLH$$

Where:

TONS	= cooling capacity
IPLVbase	= baseline equipment efficiency (kW/ton) (see TRM reference table below)
IPLVee	= installed equipment efficiency (kW/ton)
EFLH	= equivalent full load hours

TABLE C403.2.3(7)
MINIMUM EFFICIENCY REQUIREMENTS:
WATER CHILLING PACKAGES[a]

EQUIPMENT TYPE	SIZE CATEGORY	UNITS	BEFORE 1/1/2010		AS OF 1/1/2010[b]				TEST PROCEDURE[c]
					PATH A		PATH B		
			FULL LOAD	IPLV	FULL LOAD	IPLV	FULL LOAD	IPLV	
Air-cooled chillers	< 150 tons	EER	≥ 9.562	≥ 10.4 16	≥ 9.562	≥ 12.500	NA	NA	AHRI 550/590
	≥ 150 tons	EER			≥ 9.562	≥ 12.750	NA	NA	
Air cooled without condenser, electrical operated	All capacities	EER	≥ 10.586	≥ 11.782	Air-cooled chillers without condensers shall be rated with matching condensers and comply with the air-cooled chiller efficiency requirements				
Water cooled, electrically operated, reciprocating	All capacities	kW/ton	≤ 0.837	≤ 0.696	Reciprocating units shall comply with water cooled positive displacement efficiency requirements				
Water cooled, electrically operated, positive displacement	< 75 tons	kW/ton	≤ 0.790	≤ 0.676	≤ 0.780	≤ 0.630	≤ 0.800	≤ 0.600	
	≥ 75 tons and < 150 tons	kW/ton			≤ 0.775	≤ 0.615	≤ 0.790	≤ 0.586	
	≥ 150 tons and < 300 tons	kW/ton	≤ 0.717	≤ 0.627	≤ 0.680	≤ 0.580	≤ 0.718	≤ 0.540	
	≥ 300 tons	kW/ton	≤ 0.639	≤ 0.571	≤ 0.620	≤ 0.540	≤ 0.639	≤ 0.490	
Water cooled, electrically operated, centrifugal	< 150 tons	kW/ton	≤ 0.703	≤ 0.669	≤ 0.634	≤ 0.596	≤ 0.639	≤ 0.450	
	≥ 150 tons and < 300 tons	kW/ton	≤ 0.634	≤ 0.596					
	≥ 300 tons and < 600 tons	kW/ton	≤ 0.576	≤ 0.549	≤ 0.576	≤ 0.549	≤ 0.600	≤ 0.400	
	≥ 600 tons	kW/ton	≤ 0.576	≤ 0.549	≤ 0.570	≤ 0.539	≤ 0.590	≤ 0.400	
Air cooled, absorption single effect	All capacities	COP	≥ 0.600	NR	≥ 0.600	NR	NA	NA	AHRI 560
Water cooled, absorption single effect	All capacities	COP	≥ 0.700	NR	≥ 0.700	NR	NA	NA	
Absorption double effect, indirect fired	All capacities	COP	≥ 1.000	≥ 1.050	≥ 1.000	≥ 1.050	NA	NA	
Absorption double effect, direct fired	All capacities	COP	≥ 1.000	≥ 1.000	≥ 1.000	≥ 1.000	NA	NA	

For SI: 1 ton = 3517 W, 1 British thermal unit per hour = 0.2931 W, °C = [(°F) - 32]/1.8.
NA = Not applicable, not to be used for compliance; NR = No requirement.

a. The centrifugal chiller equipment requirements, after adjustment in accordance with Section C403.2.3.1 or Section C403.2.3.2, do not apply to chillers used in low-temperature applications where the design leaving fluid temperature is less than 36°F. The requirements do not apply to positive displacement chillers with leaving fluid temperatures less than or equal to 32°F. The requirements do not apply to absorption chillers with design leaving fluid temperatures less than 40°F.

b. Compliance with this standard can be obtained by meeting the minimum requirements of Path A or B. However, both the full load and IPLV shall be met to fulfill the requirements of Path A or B.

c. Chapter 6 of the referenced standard contains a complete specification of the referenced test procedure, including the referenced year version of the test procedure.

$$\Delta kWh\ (VSD) = \frac{BHP}{EFFi} * Hours * ESF$$

Where:

BHP	= brake horsepower, nominal motor HP * motor load factor
EFFi	= motor efficiency (93% default)
ESF	= energy savings factor (see TRM reference table below)

Application	ESF
Hot Water Pump	0.424
Chilled Water Pump	0.411
Air Foil/backward incline	0.354
Air Foil/ backward incline inlet Guide Vanes	0.227
Forward Curved Fan, with discharge dampers	0.179
Forward Curved Inlet Guide Vanes	0.092

Summer Coincident Peak Demand Savings

$$\Delta kW\ (electric\ chiller) = TONS * ((PEbase) - (PEee)) * CF_{SSP}$$

Where:

PEbase = peak efficiency of baseline equipment expressed as Full Load (kW/ton)

PEee = peak efficiency of efficient equipment expressed as Full Load (kW/ton)

CF_{SSP} = 91.3%

$$\Delta kW\ (VSD) = \frac{BHP}{EFFi} * DSF$$

Where:

DSF = demand savings factor (see TRM reference table below)

Application	DSF
Hot Water Pump	0
Chilled Water Pump	0.299
Air foil / backward incline	0.260
Air Foil / backward incline inlet Guide Vanes	0.130
Forward Curved Fan, with discharge dampers	0.136
Forward Curved Inlet Guide Vanes	0.029

Measure-Level Gross Realized Savings

The table below presents the realized gross energy savings of the equipment installation, along with the numeric values of inputs to the savings calculation equation.

Annual kWh Savings for Equipment Installation

Measure	*Calculation Inputs*			*Annual Gross kWh Savings*			
	Quantity	*Type*	*Size*	*Ex Ante*	*TRM Ex Post*	*ADM Ex Post*	*Realization Rate*
Electric Chiller	1	Air Cooled	200 tons	13,477	40,219	40,219	298%
VSD for HVAC Pumps and Cooling Tower Fans	1	Air Foil/ backward incline inlet Guide Vanes	40 hp	13,981	13,981	13,981	100%
	1	Forward Curved Inlet Guide Vanes	30 hp	4,250	4,250	4,250	100%
	1	Chilled Water Pump	40 hp	25,313	25,313	25,313	100%
Total				**57,021**	**83,762**	**83,762**	

Summary of Project-Level Gross Realized Savings

The table shown below presents the realized gross energy savings of the measures.

Verified Electric Savings/Realization Rates

Incentive Type	*Annual Gross Savings*			
	Ex Ante (kWh)	*Ex Post (kWh)*	*Realization Rate*	*Ex Post Peak kW Reduction*
Standard	57,021	83,762	147%	24.81
Total	**57,021**	**83,762**	**147%**	**24.81**

The ex ante savings estimate regarding the electric chiller refers to a capacity of 90 tons. Project personnel confirmed that an electric chiller with a capacity of 200 tons was installed, which is reflected in the ex post savings estimate.

Site ID: 43

Executive Summary

The program participant received Standard Program incentives for installing various equipment and retrofitting lighting. The gross realization rate for these measures is 104%.

Project Description

The participant implemented the following measures:

- (44) 17W LED track lights installed
- (63) 2W LED exit signs installed
- (100,037) watts controlled by occupancy sensor lighting controls
- (2) 42.18 ft^3 solid door freezers installed
- (4) full sized hot food holding cabinets installed
- (6) 500 lbs ice/day ice makers installed
- (1) VSD installed on 35hp HVAC return fan motor
- (1) VSD installed on a 10hp hot water pump and (1) VSD installed on a 10hp chilled water pump

Methodology for Estimating Gross Savings.

ADM staff inspected project documentation pertaining to the measures.

Energy savings for the lighting retrofit were calculated according to the Illinois TRM 4.0, measures 4.2.2, 4.2.9, 4.2.10, 4.4.17, 4.5.4, 4.5.5, and 4.5.10. Algorithms pertaining to savings calculations are presented below.

Electric Energy Savings

$$\Delta kWh\ (reduced\ wattage) = \left(\frac{Watts_{base} - Watts_{EE}}{1000}\right) * \ Hours * WHF_e * ISR$$

Where:

A reference table at the beginning of TRM measure 4.5 "Lighting End Use" provides values for Hours, WHFe, WHFd, and CF based on applicable building type.

$Watts_{base}$ = input wattage of the baseline system

$Watts_{EE}$ = new input wattage of EE fixture

WHF_e = waste heat factor to account for cooling energy savings

ISR = in service rate (% of units rebated that get installed) = 1

$$\Delta kWh\ (occupancy\ sensor) = kW_{controlled} *\ Hours * ESF * WHF_e$$

Where:

$kW_{controlled}$ = total lighting load connected to the control in kilowatts

ESF = energy savings factor (see TRM reference table below)

Lighting Control Type	Energy Savings Factor
Wall or Ceiling-Mounted Occupancy Sensors	41% or custom
Fixture Mounted Occupancy Sensors	30% or custom
Wall-Mounted Occupancy Sensors Configured as "Vacancy Sensors"	53% or custom

$$\Delta kWh\ (freezer) = (kWhbase - kWhee) * 365.25$$

Where:

kWhbase = baseline maximum daily energy consumption (see TRM reference table below)

Type	kWhbase
Solid Door Refrigerator	0.10 * V + 2.04
Glass Door Refrigerator	0.12 * V + 3.34
Solid Door Freezer	0.40 * V + 1.38
Glass Door Freezer	0.75 * V + 4.10

kWhee = efficient maximum daily energy consumption (see TRM reference table below)

Type	kWhee
0 < V < 15	≤ 0.250V + 1.250
15 ≤ V < 30	≤ 0.400V – 1.000
30 ≤ V < 50	≤ 0.163V + 6.125
V ≥ 50	≤ 0.158V + 6.333

$$\Delta kWh\ (VSD) = \frac{BHP}{EFFi} * Hours * ESF$$

Where:

BHP = brake horsepower, nominal motor HP * motor load factor

EFFi = motor efficiency (93% default)

ESF = energy savings factor (see TRM reference table below)

Application	ESF
Hot Water Pump	0.424
Chilled Water Pump	0.411
Air Foil/backward incline	0.354
Air Foil/ backward incline inlet Guide Vanes	0.227
Forward Curved Fan, with discharge dampers	0.179
Forward Curved Inlet Guide Vanes	0.092

$$\Delta kWh \text{ (hot food cabinet)} = HFHCBaselinekWh - HFHCENERGYSTARkWh$$

Where:

HFHCBaselinekWh = PowerBaseline*Hoursday*Days/1000

Cabinet Size	Power (W)
Full Size HFHC	2500
¾ Size HFHC	1200
½ Size HFHC	800

HFHCENERGYSTARkWh = PowerENERGYSTAR*Hoursday*Days/1000

Cabinet Size	Power (W)
Full Size HFHC	800
¾ Size HFHC	480
½ Size HFHC	320

Hoursday = average daily operation (15 default)

Days = annual days of operation (365.25 default)

$$\Delta kWh\ (ice\ maker) = [(kWh_{base} - kWh_{ee}) / 100] * (DC * H) * 365.25$$

Where:

kWh_{base} = maximum kWh consumption of the baseline system per 100 lbs of ice (see TRm reference table below)

kWh_{ee} = maximum kWh consumption of EE system per 100 lbs of ice (see TRm reference table below)

Ice Machine Type	kWhbase	kWhee
Ice Making Head (H < 450)	10.26 - 0.0086*H	9.23 - 0.0077*H
Ice Making Head (H ≥ 450)	6.89 – 0.0011*H	6.20 - 0.0010*H
Remote Condensing Unit, without remote compressor (H < 1000)	8.85 – 0.0038*H	8.05 - 0.0035*H
Remote Condensing Unit, without remote compressor (H ≥ 1000)	5.1	4.64
Remote Condensing Unit, with remote compressor (H < 934)	8.85 – 0.0038*H	8.05 - 0.0035*H
Remote Condensing Unit, with remote compressor (H ≥ 934)	5.3	4.82
Self Contained Unit (H < 175)	18 - 0.0469*H	16.7 - 0.0436*H
Self Contained Unit (H ≥ 175)	9.8	9.11

DC = duty cycle (0.57 default)

H = harvest rate (lbs ice/day)

Summer Coincident Peak Demand Savings

$$\Delta kW\ (reduced\ wattage) = \left(\frac{Watts_{base} - Watts_{EE}}{1000}\right) * WHF_d * CF * ISR$$

Where:

WHF_d = waste heat factor to account for cooling demand savings

CF = summer peak coincidence factor

$$\Delta kW\ (occupancy\ sensor) = kW_{controlled} * WHF_d * (CF_{baseline} - CF_{OS})$$

Where:

CF_{OS} = 0.15

$$\Delta kW\ (freezer) = \Delta kWh/Hours * CF$$

Where:

Hours = 8766

CF = 0.937

$$\Delta kW\ (VSD) = \frac{BHP}{EFFi} * DSF$$

Where:

DSF = demand savings factor (see TRM reference table below)

Application	DSF
Hot Water Pump	0
Chilled Water Pump	0.299
Air foil / backward incline	0.260
Air Foil / backward incline inlet Guide Vanes	0.130
Forward Curved Fan, with discharge dampers	0.136
Forward Curved Inlet Guide Vanes	0.029

$$\Delta kW\ (hot\ food\ cabinet) = \frac{\Delta kWh}{Hoursday * Days} * CF$$

Where:

CF = summer peak coincidence factor (see TRM reference table below)

Location	CF
Fast Food Limited Menu	0.32
Fast Food Expanded Menu	0.41
Pizza	0.46
Full Service Limited Menu	0.51
Full Service Expanded Menu	0.36
Cafeteria	0.36

$$\Delta kW\ (ice\ maker) = \frac{\Delta kWh}{Hours * DC} * CF$$

Where:

Hours = 8766

CF = 0.937

Measure-Level Gross Realized Savings

The table below presents the realized gross energy savings of the equipment installation and lighting retrofit along with the numeric values of inputs to the savings calculation equation.

Annual kWh Savings for Lighting Retrofit

Measure	***Calculation Inputs***						***Annual Gross kWh Savings***			
	Quantity	***Baseline Wattage***	***Efficient Wattage***	***Hours***	***WHF_e***	***ESF***	***Ex Ante***	***TRM Ex Post***	***ADM Ex Post***	***Realization Rate***
LED Bulbs and Fixtures	44	TRM = 60.4 Actual = N/A	TRM = 12.2 Actual = 17	4,311	1.25	N/A	8,287	10,290	10,290	124%
Commercial LED Exit Signs	63	TRM = 23 Actual = 23	TRM = 2 Actual = 2	8,766	1.25	N/A	14,497	14,497	14,497	100%
Occupancy Sensor Lighting Controls	N/A	100,037	N/A	4,311	1.25	0.41	221,021	221,020	221,020	100%
Total							**243,805**	**245,808**	**245,808**	

The ADM calculated ex post savings estimate will be equal to the TRM savings estimate, except in cases in which the TRM is not applied. The TRM is not be applied in cases in which it does not properly characterize the newly installed lighting system.

Annual kWh Savings for Equipment Installation

Measure	***Calculation Inputs***			***Annual Gross kWh Savings***			
	Quantity	***Type***	***Size***	***Ex Ante***	***TRM Ex Post***	***ADM Ex Post***	***Realization Rate***
Solid and Glass Door Refrigerators & Freezers	2	Solid Door Freezer	42.18 cu. ft.	2,429	3,836	3,836	158%
Hot Food Holding Cabinets	4	Cafeteria	Full Size	37,256	37,256	37,256	100%
Ice Maker	6	N/A	500 lbs ice/day	3,591	3,997	3,997	111%

Measure	*Calculation Inputs*			*Annual Gross kWh Savings*			
	Quantity	***Type***	***Size***	***Ex Ante***	***TRM Ex Post***	***ADM Ex Post***	***Realization Rate***
VSD for HVAC Pumps and Cooling Tower Fans	1	Air Foil/backward incline	22.75 bhp	19,077	19,077	19,077	100%
VSD for HVAC Pumps and Cooling Tower Fans	1 1	Hot Water Pump Chilled Water Pump	6.5 bhp 6.5 bhp	2,833	6,528 6,328	6,528 6,328	454%
Total				**65,186**	**77,023**	**77,023**	

Summary of Project-Level Gross Realized Savings

The table shown below presents the realized gross energy savings of the measures.

Verified Electric Savings/Realization Rates

Incentive Type	*Annual Gross Savings*			
	Ex Ante (kWh)	***Ex Post (kWh)***	***Realization Rate***	***Ex Post Peak kW Reduction***
Standard	308,991	322,831	104%	23.17
Total	**308,991**	**322,831**	**104%**	**23.17**

A CF value of 0.22 and a WHF_d value of 1.44 was used to determine kW reduction for lighting measures. These values were taken from the TRM 4.0 based on applicable facility type.

The ex ante savings estimate regarding the installation of an efficient ice maker refers to two 1,500 lbs ice/day units. Discussion with facility personnel revealed that three 500 lbs ice/day units were installed instead of the 1,500 lbs ice/day unit, resulting in a total of six 500 lbs ice/day units used to calculate ex post savings estimates.

Site ID: 44

Executive Summary

The program participant received Standard program incentives for installing an energy efficient steam cooker. The gross realization rate for this measure is 100%.

Project Description

The participant implemented the following measure(s):

- (1) 6-pan electric steam cooker installed

Methodology for Estimating Gross Savings.

ADM staff inspected project documentation pertaining to the equipment installation.

Energy savings for the lighting retrofit were calculated according to the Illinois TRM 4.0, measure 4.2.3.

Electric Energy Savings

$$\Delta Savings\ (steam\ cooker) = (\Delta\text{Idle Energy} + \Delta\text{Preheat Energy} + \Delta\text{Cooking Energy}) * \text{Z}$$

Where:

Algorithms pertaining to these energy differentials, as well as reference tables, can be found in TRM measure section 4.2.3

Z = days/year steamer operating (365.25 default)

Summer Coincident Peak Demand Savings

$$\Delta kW\ (steam\ cooker) = \left(\frac{\Delta kWh}{Hoursday * Daysyear}\right) * CF$$

Where:

Daysyear = annual days of operation (365.25 default)

CF = summer peak coincidence factor (see TRM reference table below

Location	CF
Fast Food Limited Menu	0.32
Fast Food Expanded Menu	0.41
Pizza	0.46
Full Service Limited Menu	0.51
Full Service Expanded Menu	0.36
Cafeteria	0.36

Measure-Level Gross Realized Savings

The table below presents the realized gross energy savings of the equipment installation, along with the numeric values of inputs to the savings calculation equation.

Annual kWh Savings for Equipment Installation

Measure	***Calculation Inputs***		***Annual Gross kWh Savings***			
	Quantity	***Type***	***Ex Ante***	***TRM Ex Post***	***ADM Ex Post***	***Realization Rate***
Commercial Steam Cooker	1	6 pan	28,693	28,693	28,693	100%
Total			**28,693**	**28,693**	**28,693**	

Summary of Project-Level Gross Realized Savings

The table shown below presents the realized gross energy savings of the lighting retrofit.

Verified Electric Savings/Realization Rates

Incentive Type	***Annual Gross Savings***			
	Ex Ante (kWh)	***Ex Post (kWh)***	***Realization Rate***	***Ex Post Peak kW Reduction***

Standard	28,693	28,693	100%	4.71
Total	**28,693**	**28,693**	**100%**	**4.71**

Site ID: 45

Executive Summary

The program participant received Standard Program incentives for installing an efficient solid door freezer. The gross realization rate for this measure is 158%.

Project Description

The participant implemented the following measure:

- (1) 42.18 ft^3 solid door freezers installed

Methodology for Estimating Gross Savings.

ADM staff inspected project documentation pertaining to the measures.

Energy savings for the equipment installation were calculated according to the Illinois TRM 4.0, measure 4.2.2.

Electric Energy Savings

$\Delta kWh\ (freezer) = (kWhbase - kWhee) * 365.25$

Where:

kWhbase = baseline maximum daily energy consumption (see TRM reference table below)

Type	kWhbase

Solid Door Refrigerator	0.10 * V + 2.04
Glass Door Refrigerator	0.12 * V + 3.34
Solid Door Freezer	0.40 * V + 1.38
Glass Door Freezer	0.75 * V + 4.10

kWhee = efficient maximum daily energy consumption (see TRM reference table below)

Type	kWhee
0 < V < 15	≤ 0.250V + 1.250
15 ≤ V < 30	≤ 0.400V – 1.000
30 ≤ V < 50	≤ 0.163V + 6.125
V ≥ 50	≤ 0.158V + 6.333

Summer Coincident Peak Demand Savings

$\Delta kW\ (freezer) = \Delta kWh/Hours * CF$

Where:

Hours = 8766

CF = coincidence factor = 0.937

Measure-Level Gross Realized Savings

The table below presents the realized gross energy savings of the equipment installation, along with the numeric values of inputs to the savings calculation equation.

Annual kWh Savings for Equipment Installation

Measure	***Calculation Inputs***			***Annual Gross kWh Savings***			
	Quantity	***Type***	***Size***	***Ex Ante***	***TRM Ex Post***	***ADM Ex Post***	***Realization Rate***
Solid and Glass Door Refrigerators & Freezers	1	Solid Door Freezer	42.18 cu. ft.	1,215	1,918	1,918	158%
Total				**1,215**	**1,918**	**1,918**	

Summary of Project-Level Gross Realized Savings

The table shown below presents the realized gross energy savings of the measures.

Verified Electric Savings/Realization Rates

Incentive Type	*Annual Gross Savings*			
	Ex Ante (kWh)	*Ex Post (kWh)*	*Realization Rate*	*Ex Post Peak kW Reduction*
Standard	1,215	1,918	158%	0.21
Total	**1,215**	**1,918**	**158%**	**0.21**

Site ID: 46

Executive Summary

The program participant received Standard program incentives for retrofitting lighting and installing occupancy controls. The gross realization rate for these measures is 82%.

Project Description

The participant implemented the following measures:

- (53) 40W Incandescent exit signs replaced by 4.5W LED exit signs
- (35) Wall-mounted occupancy sensors installed (33,302 controlled watts)
- (98) 4’ T12 lamps removed with reflectors
- (647) 4’ T12 lamps removed
- (67) 4’ 2L 82W T12 fixtures replaced with 4’ 2L 54W HPT8 fixtures
- (679) 4’ 2L 80W T12 fixture replaced with (1) 4’ 2L 49W HPT8 fixtures, (312) 4’ 2L 75W HPT8 fixtures, (196) 4’ 2L 54W HPT8 fixtures, and (170) 4’ 2L 59W HPT8 fixtures

Methodology for Estimating Gross Savings.

ADM staff inspected project documentation pertaining to the lighting retrofit.

Energy savings for the lighting retrofit were calculated according to the Illinois TRM 4.0, measures 4.5.2, 4.5.3, 4.5.5, and 4.5.10. Algorithms pertaining to savings calculations are presented below.

Electric Energy Savings

$$\Delta kWh\ (reduced\ wattage) = \left(\frac{Watts_{base} - Watts_{EE}}{1000}\right) * Hours * WHF_e * ISR$$

Where:

$Watts_{base}$	= input wattage of the baseline system
$Watts_{EE}$	= new input wattage of EE fixture
WHF_e	= waste heat factor to account for cooling energy savings
ISR	= in service rate (% of units rebated that get installed) = 1

$$\Delta kWh\ (occupancy\ sensor) = kW_{controlled} * Hours * ESF * WHF_e$$

Where:

$kW_{controlled}$	= total lighting load connected to the control in kilowatts
ESF	= energy savings factor (% reduction to the operating hours from the non-controlled baseline lighting system)

Summer Coincident Peak Demand Savings

$$\Delta kW\ (reduced\ wattage) = \left(\frac{Watts_{base} - Watts_{EE}}{1000}\right) * WHF_d * CF * ISR$$

Where:

WHF_d	= waste heat factor to account for cooling demand savings
CF	= Summer Peak Coincidence Factor

$$\Delta kW\ (occupancy\ sensor) = kW_{controlled} * WHF_d * (CF_{baseline} - CF_{OS})$$

Where:

CF_{OS}	= 0.15

Measure-Level Gross Realized Savings

The table below presents the realized gross energy savings of the lighting retrofit, along with the numeric values of inputs to the savings calculation equation.

Annual kWh Savings for Lighting Retrofit

Measure	*Calculation Inputs*					*Annual Gross kWh Savings*			
	Quantity	***Baseline Wattage***	***Efficient Wattage***	***Hours***	***WHF_e***	***Ex Ante***	***TRM Ex Post***	***ADM Ex Post***	***Realization Rate***
Commercial LED Exit Signs	53	TRM = 35 Actual = 40	TRM = 2 Actual = 4.5	2,422	1.31	12,196	5,970	5,970	49%
Occupancy Sensor Lighting Controls	35	33,302	N/A	2,422	1.31	73,860	43,321	43,321	59%
Fluorescent Delamping	98	TRM = 33.7 Actual = 40	TRM = 0 Actual = 0	2,422	1.31	16,265	10,479	10,479	64%
Fluorescent Delamping	647	TRM = 33.7 Actual = 40	TRM = 0 Actual = 0	2,422	1.31	109,045	69,180	69,180	63%
HP and RW T8 Fixtures and Lamps	67	TRM = 82 Actual = 82	TRM = 49 Actual = 54	2,422	1.31	10,109	7,015	7,015	69%
HP and RW T8 Fixtures and Lamps	1	TRM = 82 Actual = 80	TRM = 49 Actual = 49	2,422	1.31	32,315	105	105	220%
	312	TRM = 82 Actual = 80	TRM = 49 Actual = 75	2,422	1.31		32,667	32,667	
	196	TRM = 82 Actual = 80	TRM = 49 Actual = 54	2,422	1.31		20,522	20,522	
	170	TRM = 82 Actual = 80	TRM = 49 Actual = 59	2,422	1.31		17,800	17,800	
Total						**253,790**	**207,058**	**207,058**	

The ADM calculated ex post savings estimate will be equal to the TRM savings estimate, except in cases in which the TRM is not applied. The TRM is not to be applied in cases in which it does not properly characterize the newly installed lighting system.

Summary of Project-Level Gross Realized Savings

The table shown below presents the realized gross energy savings of the lighting retrofit.

Verified Electric Savings/Realization Rates

Incentive Type	*Annual Gross Savings*			
	Ex Ante (kWh)	***Ex Post (kWh)***	***Realization Rate***	***Ex Post Peak kW Reduction***

Standard	253,790	207,058	82%	12.27
Total	**253,790**	**207,058**	**82%**	**12.27**

A CF value of 0.22 and a WHF_d value of 1.40 was used to determine kW reduction. These values were taken from the TRM 4.0 based on applicable facility type.

Measures regarding fluorescent delamping, measure 4.5.2, references tables found in the TRM for baseline wattage. Measures regarding installed T8 lighting, measure 4.5.3, references tables found in the TRM for baseline and efficient wattage. Measures regarding installed LED exit signs, measure 4.5.5, references pre-existing and installed exit signs regarding baseline and efficient wattages.

These measures were applied for under the site "Back of the Yards IB High School" but were implemented at "Bass Elementary".

Site ID: 47

Executive Summary

The program participant received Standard Program incentives for installing high efficiency boilers. The gross realization rate for this measure is 100%.

Project Description

The participant implemented the following measure(s):

- (2) 2,500,000 btu/hr high efficiency, hot water, boilers installed

Methodology for Estimating Gross Savings.

ADM staff inspected project documentation pertaining to the measure.

Energy savings for the boiler installation were calculated according to the Illinois TRM 4.0, measure 4.4.10.

Natural Gas Energy Savings

$$\Delta therms = EFLH * Capacity * ((EfficiencyRating(actual) - EfficiencyRating(base)/EfficiencyRating(base)) / 100{,}000$$

Where:

EFLH = equivalent full load hours

Capacity = installed boiler capacity (Btu/hr)

EfficiencyRating(base) = baseline boiler efficiency (see TRM reference table below)

Year	Efficiency
Hot Water <300,000 Btu/hr < June 1, 2013	80% AFUE
Hot Water <300,000 Btu/hr ≥ June 1, 2013	82% AFUE
Hot Water ≥300,000 & ≤2,500,000 Btu/hr	80% TE
Hot Water >2,500,000 Btu/hr	82% Ec

EfficiencyRating(actual) = installed boiler efficiency

Measure-Level Gross Realized Savings

The table below presents the realized gross energy savings of the boiler installation, along with the numeric values of inputs to the savings calculation equation.

Annual Natural Gas Savings for High Efficiency Boiler

Measure	*Calculation Inputs*					*Annual Gross Therms Savings*			
	Quantity	***Type***	***Size***	***Baseline Efficiency***	***Installed Efficiency***	***Ex Ante***	***TRM Ex Post***	***ADM Ex Post***	***Realization Rate***
High Efficiency Boiler	2	Hot Water	2,500,000	80%	99%	20,615	20,615	20,615	100%
Total						**20,615**	**20,615**	**20,615**	

Summary of Project-Level Gross Realized Savings

The table shown below presents the realized gross energy savings of the measure.

Verified Natural Gas Savings/Realization Rates

Incentive Type	***Annual Gross Savings***		
	Ex Ante (therms)	***Ex Post (therms)***	***Realization Rate***
Standard	20,615	20,615	100%
Total	**20,615**	**20,615**	**100%**

Where applicable, the ex post savings calculations reference default baseline specifications found in the TRM. Equivalent full load hours (EFLH) is in reference to building type and location and can be found in the TRM reference table at the beginning of section 4.4 “HVAC End Use”.

Site ID: 48

Executive Summary

The program participant received Standard program incentives for installing high efficiency boilers. The gross realization rate for this measure is 100%.

Project Description

The participant implemented the following measure(s):

- (2) 2,000,000 btu/hr high efficiency, hot water, boilers installed

Methodology for Estimating Gross Savings.

ADM staff inspected project documentation pertaining to the measure.

Energy savings for the boiler installation were calculated according to the Illinois TRM 4.0, measure 4.4.10.

Natural Gas Energy Savings

$$\Delta therms = EFLH * Capacity * ((EfficiencyRating(actual) - EfficiencyRating(base)/EfficiencyRating(base)) / 100{,}000$$

Where:

EFLH = equivalent full load hours

Capacity = installed boiler capacity (Btu/hr)

EfficiencyRating(base) = baseline boiler efficiency (see TRM reference table below)

Year	Efficiency
Hot Water <300,000 Btu/hr < June 1, 2013	80% AFUE
Hot Water <300,000 Btu/hr ≥ June 1, 2013	82% AFUE
Hot Water ≥300,000 & ≤2,500,000 Btu/hr	80% TE
Hot Water >2,500,000 Btu/hr	82% Ec

EfficiencyRating(actual) = installed boiler efficiency

Measure-Level Gross Realized Savings

The table below presents the realized gross energy savings of the boiler installation, along with the numeric values of inputs to the savings calculation equation.

Annual Natural Gas Savings for High Efficiency Boiler

Measure	*Calculation Inputs*					*Annual Gross Therms Savings*			
	Quantity	*Type*	*Size*	*Baseline Efficiency*	*Installed Efficiency*	*Ex Ante*	*TRM Ex Post*	*ADM Ex Post*	*Realization Rate*

High Efficiency Boiler	2	Hot Water	2,000,000	80%	93.7%	11,892	11,892	11,892	100%
Total						**11,892**	**11,892**	**11,892**	

Summary of Project-Level Gross Realized Savings

The table shown below presents the realized gross energy savings of the measures.

Verified Natural Gas Savings/Realization Rates

Incentive Type	***Annual Gross Savings***		
	Ex Ante (therms)	***Ex Post (therms)***	***Realization Rate***
Standard	11,892	11,892	100%
Total	**11,892**	**11,892**	**100%**

Where applicable, the ex post savings calculations reference default baseline specifications found in the TRM. Equivalent full load hours (EFLH) is in reference to building type and location and can be found in the TRM reference table at the beginning of section 4.4 “HVAC End Use”.

Site ID: 49

Executive Summary

The program participant received Standard program incentives for installing various equipment. The gross realization rate for these measures is 129%.

Project Description

The participant implemented the following measure(s):

- (2) Natural gas fired, rack double-ovens installed
- (2) 1,500,000 btu/hr high efficiency boilers installed

Methodology for Estimating Gross Savings.

ADM staff inspected project documentation pertaining to these measures.

Energy savings for the equipment installation were calculated according to the Illinois TRM 4.0, measures 4.2.18 and 4.4.10.

Natural Gas Energy Savings

$$\Delta therms\ (boiler) = EFLH * Capacity * ((EfficiencyRating(actual) - EfficiencyRating(base)/EfficiencyRating(base)) / 100{,}000$$

Where:

EFLH = equivalent full load hours

Capacity = installed boiler capacity (Btu/hr)

EfficiencyRating(base) = baseline boiler efficiency (see TRM reference table below)

Year	Efficiency
Hot Water <300,000 Btu/hr < June 1, 2013	80% AFUE
Hot Water <300,000 Btu/hr ≥ June 1, 2013	82% AFUE
Hot Water ≥300,000 & ≤2,500,000 Btu/hr	80% TE
Hot Water >2,500,000 Btu/hr	82% Ec

EfficiencyRating(actual) = installed boiler efficiency

Measure-Level Gross Realized Savings

The table below presents the realized gross energy savings of the boiler installation, along with the numeric values of inputs to the savings calculation equation.

Annual Natural Gas Savings for Equipment Installation

Measure	*Calculation Inputs*					*Annual Gross Therms Savings*			
	Quantity	*Type*	*Size*	*Baseline Efficiency*	*Installed Efficiency*	*Ex Ante*	*TRM Ex Post*	*ADM Ex Post*	*Realization Rate*

Rack Oven - Double Oven	2	N/A	N/A	N/A	N/A	1,224	4,128	4,128	337%
High Efficiency Boiler	2	Hot Water	1,500,000	80%	94%	8,789	8,789	8,789	100%
Total						**10,013**	**12,917**	**12,917**	

Summary of Project-Level Gross Realized Savings

The table shown below presents the realized gross energy savings of the measures.

Verified Energy Savings/Realization Rates

Incentive Type	***Annual Gross Savings***		
	Ex Ante (therms)	***Ex Post (therms)***	***Realization Rate***
Standard	10,013	12,917	129%
Total	**10,013**	**12,917**	**129%**

Where applicable, the ex post savings calculations reference default baseline specifications found in the TRM. Equivalent full load hours (EFLH) is in reference to building type and location and can be found in the TRM reference table at the beginning of section 4.4 “HVAC End Use”.

The TRM stipulates that natural gas savings are deemed to equal 2,064 therms for each rack double oven installed.

Site ID: 50

Executive Summary

The program participant received Standard program incentives for installing high efficiency boilers. The gross realization rate for this measure is 100%.

Project Description

The participant implemented the following measure(s):

- (2) 2,500,000 btu/hr high efficiency, hot water, boilers installed

Methodology for Estimating Gross Savings.

ADM staff inspected project documentation pertaining to these measures.

Energy savings for the boiler installation were calculated according to the Illinois TRM 4.0, measure 4.4.10.

Natural Gas Energy Savings

$$\Delta therms = EFLH * Capacity * ((EfficiencyRating(actual) - EfficiencyRating(base)/EfficiencyRating(base)) / 100{,}000$$

Where:

EFLH = equivalent full load hours

Capacity = installed boiler capacity (Btu/hr)

EfficiencyRating(base) = baseline boiler efficiency (see TRM reference table below)

Year	Efficiency
Hot Water <300,000 Btu/hr < June 1, 2013	80% AFUE
Hot Water <300,000 Btu/hr ≥ June 1, 2013	82% AFUE
Hot Water ≥300,000 & ≤2,500,000 Btu/hr	80% TE
Hot Water >2,500,000 Btu/hr	82% Ec

EfficiencyRating(actual) = installed boiler efficiency

Measure-Level Gross Realized Savings

The table below presents the realized gross energy savings of the boiler installation, along with the numeric values of inputs to the savings calculation equation.

Annual Natural Gas Savings for High Efficiency Boiler

Measure	*Calculation Inputs*	*Annual Gross Therms Savings*

	Quantity	*Type*	*Size*	*Baseline Efficiency*	*Installed Efficiency*	*Ex Ante*	*TRM Ex Post*	*ADM Ex Post*	*Realization Rate*
High Efficiency Boiler	2	Hot Water	2,500,000	80%	99%	20,615	20,615	20,615	100%
Total						**20,615**	**20,615**	**20,615**	

Summary of Project-Level Gross Realized Savings

The table shown below presents the realized gross energy savings of the measures.

Verified Energy Savings/Realization Rates

Incentive Type	*Annual Gross Savings*		
	Ex Ante (therms)	*Ex Post (therms)*	*Realization Rate*
Standard	20,615	20,615	100%
Total	**20,615**	**20,615**	**100%**

Where applicable, the ex post savings calculations reference default baseline specifications found in the TRM. Equivalent full load hours (EFLH) is in reference to building type and location and can be found in the TRM reference table at the beginning of section 4.4 “HVAC End Use”.

Site ID: 51

Executive Summary

The program participant received Standard program incentives for installing a new storage water heater. The gross realization rate for this measure is 100%.

Project Description

The participant implemented the following measure(s):

- (1) High efficiency water heater installed

Methodology for Estimating Gross Savings.

ADM staff inspected project documentation pertaining to these measures.

Energy savings for the water heater installation were calculated according to the Illinois TRM 4.0, measure 4.3.1.

Natural Gas Energy Savings

The TRM stipulates that natural gas savings are deemed to equal 251 therms for each high efficiency water heater installed.

Measure-Level Gross Realized Savings

The table below presents the realized gross energy savings of the water heater installation, along with the numeric values of inputs to the savings calculation equation.

Annual Natural Gas Savings for High Efficiency Water Heater

Measure	***Calculation Inputs***		***Annual Gross Therms Savings***			
	Quantity	***Type***	***Ex Ante***	***TRM Ex Post***	***ADM Ex Post***	***Realization Rate***
Storage Water Heater	1	High Efficiency	251	251	251	100%
Total			**251**	**251**	**251**	

Summary of Project-Level Gross Realized Savings

The table shown below presents the realized gross energy savings of the measure.

Verified Energy Savings/Realization Rates

Incentive Type	***Annual Gross Savings***		
	Ex Ante	***Ex Post***	***Realization Rate***
Standard	251	251	100%
Total	**251**	**251**	**100%**

Site ID: 52

Executive Summary

The program participant received Standard program incentives for installing various equipment. The gross realization rate for these measures is 128%.

Project Description

The participant implemented the following measure(s):

- (2) Natural gas fired, rack double-ovens installed
- (2) High efficiency storage water heaters installed
- (2) 1,500,000 btu/hr high efficiency, hot water, boilers installed

Methodology for Estimating Gross Savings.

ADM staff inspected project documentation pertaining to these measures.

Energy savings for the equipment installations were calculated according to the Illinois TRM 4.0, measures 4.2.18, 4.3.1, and 4.4.10.

Natural Gas Energy Savings

$$\Delta therms = EFLH * Capacity * ((EfficiencyRating(actual) - EfficiencyRating(base)) / EfficiencyRating(base)) / 100{,}000$$

Where:

EFLH = equivalent full load hours

Capacity = installed boiler capacity (Btu/hr)

EfficiencyRating(base) = baseline boiler efficiency (see TRM reference table below)

Year	Efficiency
Hot Water <300,000 Btu/hr < June 1, 2013	80% AFUE
Hot Water <300,000 Btu/hr ≥ June 1, 2013	82% AFUE
Hot Water ≥300,000 & ≤2,500,000 Btu/hr	80% TE
Hot Water >2,500,000 Btu/hr	82% Ec

EfficiencyRating(actual) = installed boiler efficiency

Measure-Level Gross Realized Savings

The table below presents the realized gross energy savings of the various installations, along with the numeric values of inputs to the savings calculation equation.

Annual Natural Gas Savings for Equipment Installation

Measure	***Calculation Inputs***					***Annual Gross Therms Savings***			
	Quantity	***Type***	***Size***	***Baseline Efficiency***	***Installed Efficiency***	***Ex Ante***	***TRM Ex Post***	***ADM Ex Post***	***Realization Rate***
Rack Oven - Double Oven	2	N/A	N/A	N/A	N/A	1,224	4,128	4,128	337%
Storage Water Heater	2	High Efficiency	N/A	N/A	N/A	502	502	502	100%
High Efficiency Boiler	2	Hot Water	1,500,000	80%	93.5%	8,789	8,789	8,789	100%
Total						**10,515**	**13,419**	**13,419**	

Summary of Project-Level Gross Realized Savings

The table shown below presents the realized gross energy savings of the measures.

Verified Energy Savings/Realization Rates

Incentive Type	***Annual Gross Savings***		
	Ex Ante (therms)	***Ex Post (therms)***	***Realization Rate***
Standard	10,515	13,419	128%
Total	**10,515**	**13,419**	**128%**

Where applicable, the ex post savings calculations reference default baseline specifications found in the TRM. Equivalent full load hours (EFLH) is in reference to building type and location and can be found in the TRM reference table at the beginning of section 4.4 “HVAC End Use”.

The TRM stipulates that natural gas savings are deemed to equal 251 therms for each high efficiency water heater installed and 2,064 therms for each double oven installed.

Site ID: 53

Executive Summary

The program participant received Standard program incentives for installing a new storage water heater. The gross realization rate for this measure is 100%.

Project Description

The participant implemented the following measure(s):

- (1) High efficiency water heater installed

Methodology for Estimating Gross Savings

ADM staff inspected project documentation pertaining to these measures.

Energy savings for the water heater installation were calculated according to the Illinois TRM 4.0, measure 4.3.1.

Natural Gas Energy Savings

The TRM stipulates that savings are deemed to equal 251 therms for each high efficiency water heater installed.

Measure-Level Gross Realized Savings

The table below presents the realized gross energy savings of the water heater installation, along with the numeric values of inputs to the savings calculation equation.

Annual Natural Gas Savings for High Efficiency Water Heater

Measure	***Calculation Inputs***			***Annual Gross Therms Savings***			
	Quantity	***Type***	***Size***	***Ex Ante***	***TRM Ex Post***	***ADM Ex Post***	***Realization Rate***
Storage Water Heater	1	High	N/A	251	251	251	100%

		Efficiency					
Total				**251**	**251**	**251**	

Summary of Project-Level Gross Realized Savings

The table shown below presents the realized gross energy savings of the measure.

Verified Energy Savings/Realization Rates

Incentive Type	***Annual Gross Savings***		
	Ex Ante	***Ex Post***	***Realization Rate***
Standard	251	251	100%
Total	**251**	**251**	**100%**

Site ID: 54

Executive Summary

The program participant received custom incentives for the installation of various equipment at a waste water treatment plant. The gross realization rate for this project is 62%.

Project Description

The applicant installed (3) new 150 HP VSD turbo blowers to take over the aeration load of the waste water treatment plant. The existing blowers ran at a fixed speed, controlled by a valve regulating the air flow rate. The new VSD blower is controlled via DO feedback, allowing for precise blower speed control to maintain a specified DO set point, which reduces power consumption and over-aeration by the blowers. In addition to the new blowers and controls, the existing aeration diffusers were replaced with fine bubble diffusers which allow for a high rate of oxygen transfer to the waste, thus reducing aeration needs and subsequent blower energy consumption.

Methodology for Estimating Gross Savings

During the M&V visit, ADM staff verified equipment installation/operation, and obtained historical effluent data from the facility's SCADA system.

In order to calculate the annual savings as a result of the project, ADM performed a multivariable linear regression using effluent flow and weather as variables. The form of the regression model with an R^2 of 0.87 is as follows:

$$kWh_{monthly} = 23{,}985 \times MGD - 864 \times Temp - 47{,}078 \times Post + 267{,}369$$

Where:

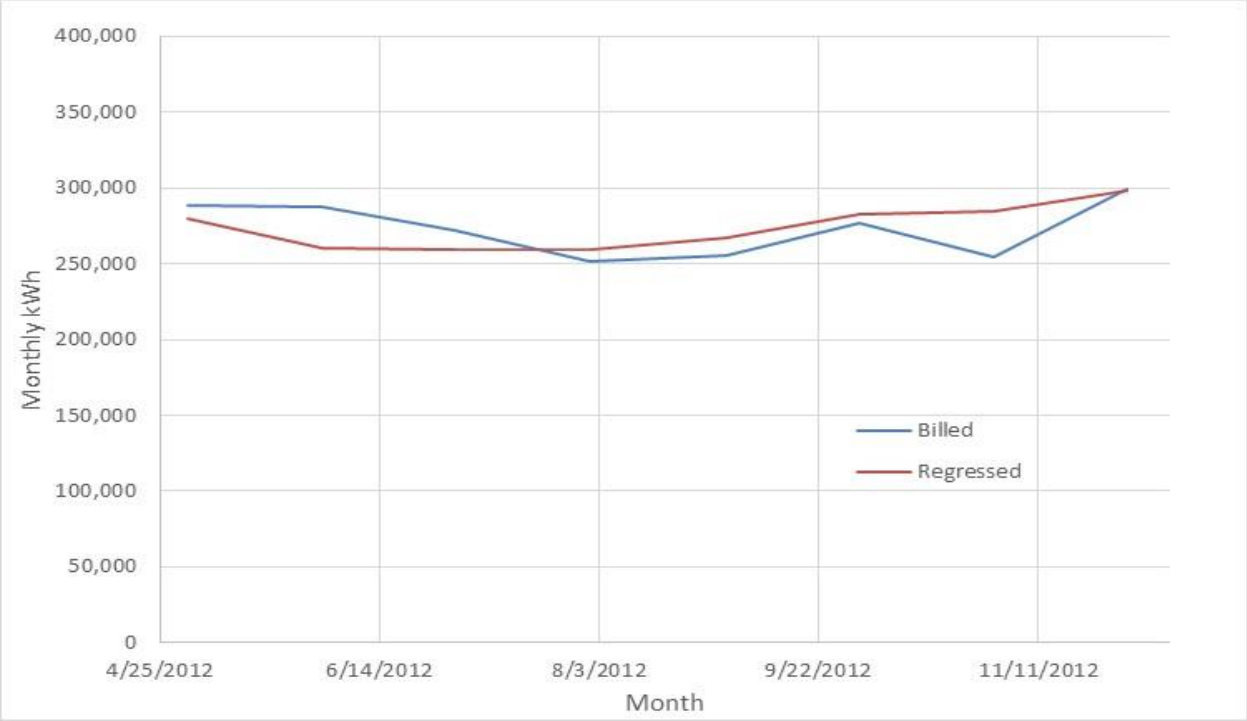
$kWh_{monthly}$	= Monthly kWh consumption of the facility
MGD	= Average effluent flow of a given month in Million Gallons per Day

Temp = Average outdoor air temperature for a given month

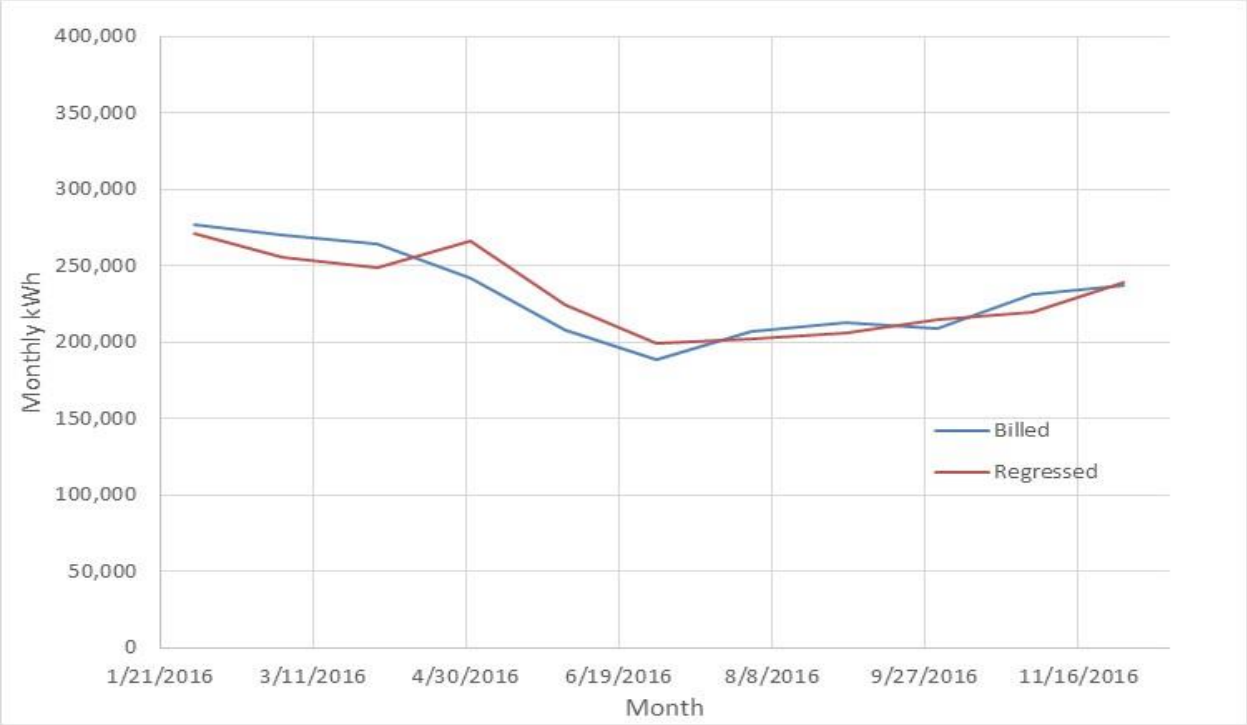
Post = Binary flag denoting a post project billing month, 1 = Post

The following graphs illustrate the monthly kWh calculated by the above equations, compared to the actual billed kWh for both the pre- and post-retrofit billing periods:

Pre-Retrofit Billed kWh vs. Regressed kWh



Post-Retrofit Billed kWh vs. Regressed kWh



Measure-level Gross Savings Results

The derived regression equations results in a typically monthly savings of 47,078 kWh which results in an annual energy savings of 564,933 kWh for the project.

The table shown below presents the verified gross savings for measures that received custom incentives.

Annual kWh Savings for WWTP Upgrades

Measure	***Annual Gross kWh Savings***	
	Ex Ante	***ADM Calculated Ex Post***
WWTP Upgrades	909,480	564,933
Total	**909,480**	**564,933**

Project-level Gross Savings Results

The tables shown below present the verified gross savings for this project.

Verified Electric Savings/Realization Rates

Incentive Type	*Measure Category*	*Annual Gross Savings*				*Lifetime Gross Savings*	
		Ex Ante kWh	*Ex Post kWh*	*Realization Rate*	*Ex Post Peak kW Reduction*	*Ex Post kWh*	*Ex Post Peak kW Reduction*
Custom	WWTP Upgrades	909,480	564,933	62%	64.49	8,473,990	64.49
Total		**909,480**	**564,933**	**62%**	**64.49**	**8,473,990**	**64.49**

The realization rate for this project is 62%. The realization is 62% due the ex ante savings being based on a straight difference between the June 2012 and June 2016 bills. The monthly difference in savings (75,790 kWh) was then multiplied by 12 months and resulted in an annual energy savings of 909,480 kWh. The difference in June bills turned out to be one of the largest billed reductions. The straight average billed reduction was about 55,000 kWh per month, which is much closer to the 47,000 kWh per month found in the ex post analysis.

The flaw in ex ante method is that there were no weather or effluent flow normalization performed which results in a skew of the estimated savings. The energy usage at the facility is dependent on flows and weather; thus, it is variable throughout the year.

Site ID: 55

Executive Summary

The program participant received Standard program incentives for retrofitting. The gross realization rate for this measure is 248%.

Project Description

The participant implemented the following measure(s):

- (159) 455W HID fixtures replaced with 89W LED pole mounted fixtures

Methodology for Estimating Gross Savings.

ADM staff inspected project documentation pertaining to the lighting retrofit.

Energy savings for the lighting retrofit were calculated according to the Illinois TRM 4.0, measure 4.5.4. Algorithms pertaining to savings calculations are presented below.

Electric Energy Savings

$$\Delta kWh = \left(\frac{Watts_{base} - Watts_{EE}}{1000}\right) * Hours * WHF_e * ISR$$

Where:

$Watts_{base}$ = input wattage of the baseline system

$Watts_{EE}$ = new input wattage of EE fixture

WHF_e = waste heat factor to account for cooling energy savings

ISR = in service rate (% of units rebated that get installed) = 1

Summer Coincident Peak Demand Savings

$$\Delta kW = \left(\frac{Watts_{base} - Watts_{EE}}{1000}\right) * WHF_d * CF * ISR$$

Where:

WHF_d = waste heat factor to account for cooling demand savings

CF = summer peak coincidence factor

Measure-Level Gross Realized Savings

The table below presents the realized gross energy savings of the lighting retrofit, along with the numeric values of inputs to the savings calculation equation.

Annual kWh Savings for Lighting Retrofit

Measure	***Calculation Inputs***					***Annual Gross kWh Savings***			
	Quantity	***Baseline Wattage***	***Efficient Wattage***	***Hours***	***WHF_e***	***Ex Ante***	***TRM Ex Post***	***ADM Ex Post***	***Realization Rate***
LED Bulbs and Fixtures	159	TRM = 361.4 Actual = 455	TRM = 116.8 Actual = 89	4,903	1.00	85,676	212,357	212,357	248%
Total						**85,676**	**212,357**	**212,357**	

The ADM calculated ex post savings estimate will be equal to the TRM savings estimate, except in cases in which the TRM is not applied. The TRM is not to be applied in cases in which it does not properly characterize the newly installed lighting system.

Summary of Project-Level Gross Realized Savings

The table shown below presents the realized gross energy savings of the lighting retrofit.

Verified Electric Savings/Realization Rates

Incentive	***Annual Gross Savings***

Type	*Ex Ante (kWh)*	*Ex Post (kWh)*	*Realization Rate*	*Ex Post Peak kW Reduction*
Standard	85,676	212,357	248%	0.00
Total	**85,676**	**212,357**	**248%**	**0.00**

No demand reduction was calculated due to only exterior lighting being implemented.

Measures regarding installed LED lighting, measure 4.5.4, references tables found in the TRM for baseline wattage, and actual installed LEDs for efficient wattage.

Site ID: 56

Executive Summary

The program participant received Standard program incentives for retrofitting. The gross realization rate for this measure is 145%.

Project Description

The participant implemented the following measure(s):

- (833) 455W HID fixtures replaced with 112W LED pole mounted fixtures

Methodology for Estimating Gross Savings.

ADM staff inspected project documentation pertaining to the lighting retrofit.

Energy savings for the lighting retrofit were calculated according to the Illinois TRM 4.0, measure 4.5.4. Algorithms pertaining to savings calculations are presented below.

Electric Energy Savings

$$\Delta kWh = \left(\frac{Watts_{base} - Watts_{EE}}{1000}\right) * Hours * WHF_e * ISR$$

Where:

$Watts_{base}$ = input wattage of the baseline system

$Watts_{EE}$ = new input wattage of EE fixture

WHF_e = waste heat factor to account for cooling energy savings

ISR = in service rate (% of units rebated that get installed) = 1

Summer Coincident Peak Demand Savings

$$\Delta kW = \left(\frac{Watts_{base} - Watts_{EE}}{1000}\right) * WHF_d * CF * ISR$$

Where:

WHF_d = waste heat factor to account for cooling demand savings

CF = summer peak coincidence factor

Measure-Level Gross Realized Savings

The table below presents the realized gross energy savings of the lighting retrofit, along with the numeric values of inputs to the savings calculation equation.

Annual kWh Savings for Lighting Retrofit

Measure	***Calculation Inputs***					***Annual Gross kWh Savings***			
	Quantity	***Baseline Wattage***	***Efficient Wattage***	***Hours***	***WHF_e***	***Ex Ante***	***TRM Ex Post***	***ADM Ex Post***	***Realization Rate***
LED Bulbs and Fixtures	833	TRM = 361.4 Actual = 455	TRM = 116.8 Actual = 112	4,903	1.00	702,891	1,018,599	1,018,599	145%
Total						**702,891**	**1,018,599**	**1,018,599**	

The ADM calculated ex post savings estimate will be equal to the TRM savings estimate, except in cases in which the TRM is not applied. The TRM is not to be applied in cases in which it does not properly characterize the newly installed lighting system.

Summary of Project-Level Gross Realized Savings

The table shown below presents the realized gross energy savings of the lighting retrofit.

Verified Electric Savings/Realization Rates

Incentive Type	*Annual Gross Savings*			
	Ex Ante (kWh)	***Ex Post (kWh)***	***Realization Rate***	***Ex Post Peak kW Reduction***
Standard	702,891	1,018,599	145%	0.00
Total	**702,891**	**1,018,599**	**145%**	**0.00**

No demand reduction was calculated due to only exterior lighting being implemented.

Measures regarding installed LED lighting, measure 4.5.4, references tables found in the TRM for baseline wattage, and actual installed LEDs for efficient wattage.

Site ID: 57

Executive Summary

The program participant received Standard program incentives for retrofitting. The gross realization rate for this measure is 148%.

Project Description

The participant implemented the following measure(s):

- (12) 455W HID fixtures replaced with 123W LED pole mounted fixtures

Methodology for Estimating Gross Savings.

ADM staff inspected project documentation pertaining to the lighting retrofit.

Energy savings for the lighting retrofit were calculated according to the Illinois TRM 4.0, measure 4.5.4. Algorithms pertaining to savings calculations are presented below.

Electric Energy Savings

$$\Delta kWh = \left(\frac{Watts_{base} - Watts_{EE}}{1000}\right) * Hours * WHF_e * ISR$$

Where:

$Watts_{base}$	= input wattage of the baseline system
$Watts_{EE}$	= new input wattage of EE fixture
WHF_e	= waste heat factor to account for cooling energy savings
ISR	= in service rate (% of units rebated that get installed) = 1

Summer Coincident Peak Demand Savings

$$\Delta kW = \left(\frac{Watts_{base} - Watts_{EE}}{1000}\right) * WHF_d * CF * ISR$$

Where:

WHF_d	= waste heat factor to account for cooling demand savings
CF	= summer peak coincidence factor

Measure-Level Gross Realized Savings

The table below presents the realized gross energy savings of the lighting retrofit, along with the numeric values of inputs to the savings calculation equation.

Annual kWh Savings for Lighting Retrofit

Measure	***Calculation Inputs***					***Annual Gross kWh Savings***			
	Quantity	***Baseline Wattage***	***Efficient Wattage***	***Hours***	***WHF_e***	***Ex Ante***	***TRM Ex Post***	***ADM Ex Post***	***Realization Rate***
LED Bulbs and Fixtures	12	TRM = 361.4 Actual = 455	TRM = 116.8 Actual = 123	4,903	1.00	9,478	14,027	14,027	148%
Total						**9,478**	**14,027**	**14,027**	

The ADM calculated ex post savings estimate will be equal to the TRM savings estimate, except in cases in which the TRM is not applied. The TRM is not to be applied in cases in which it does not properly characterize the newly installed lighting system.

Summary of Project-Level Gross Realized Savings

The table shown below presents the realized gross energy savings of the lighting retrofit.

Verified Electric Savings/Realization Rates

Incentive Type	***Annual Gross Savings***			
	Ex Ante (kWh)	***Ex Post (kWh)***	***Realization Rate***	***Ex Post Peak kW Reduction***
Standard	9,478	14,027	148%	0.00
Total	**9,478**	**14,027**	**148%**	**0.00**

No demand reduction was calculated due to only exterior lighting being implemented.

Measures regarding installed LED lighting, measure 4.5.4, references tables found in the TRM for baseline wattage, and actual installed LEDs for efficient wattage.

Site ID: 58

Executive Summary

The program participant received Standard program incentives for retrofitting. The gross realization rate for this measure is 147%.

Project Description

The participant implemented the following measure(s):

- (100) 4 lamp, 112.6W T8 fluorescent fixtures replaced with 4', 1 lamp, 44W LED fixtures

Methodology for Estimating Gross Savings.

ADM staff inspected project documentation pertaining to the lighting retrofit.

Energy savings for the lighting retrofit were calculated according to the Illinois TRM 4.0, measure 4.5.4. Algorithms pertaining to savings calculations are presented below.

Electric Energy Savings

$$\Delta kWh = \left(\frac{Watts_{base} - Watts_{EE}}{1000}\right) * Hours * WHF_e * ISR$$

Where:

$Watts_{base}$ = input wattage of the baseline system

$Watts_{EE}$ = new input wattage of EE fixture

WHF_e = waste heat factor to account for cooling energy savings

ISR = in service rate (% of units rebated that get installed) = 1

Summer Coincident Peak Demand Savings

$$\Delta kW = \left(\frac{Watts_{base} - Watts_{EE}}{1000}\right) * WHF_d * CF * ISR$$

Where:

WHF_d = waste heat factor to account for cooling demand savings

CF = summer peak coincidence factor

Measure-Level Gross Realized Savings

The table below presents the realized gross energy savings of the lighting retrofit, along with the numeric values of inputs to the savings calculation equation.

Annual kWh Savings for Lighting Retrofit

Measure	*Calculation Inputs*					*Annual Gross kWh Savings*			
	Quantity	***Baseline Wattage***	***Efficient Wattage***	***Hours***	***WHF_e***	***Ex Ante***	***TRM Ex Post***	***ADM Ex Post***	***Realization Rate***
LED Bulbs and Fixtures	100	TRM = 59 Actual = 112.6	TRM = 32.2 Actual = 44	4,683	1.31	6,261	9,202	9,202	147%

Total	**6,261**	**9,202**	**9,202**	

The ADM calculated ex post savings estimate will be equal to the TRM savings estimate, except in cases in which the TRM is not applied. The TRM is not to be applied in cases in which it does not properly characterize the newly installed lighting system.

Summary of Project-Level Gross Realized Savings

The table shown below presents the realized gross energy savings of the lighting retrofit.

Verified Electric Savings/Realization Rates

Incentive Type	***Annual Gross Savings***			
	Ex Ante (kWh)	***Ex Post (kWh)***	***Realization Rate***	***Ex Post Peak kW Reduction***
Standard	6,261	9,202	147%	1.51
Total	**6,261**	**9,202**	**147%**	**1.51**

A CF value of 0.66 and a WHF_d value of 1.53 was used to determine kW reduction. These values were taken from the TRM 4.0 based on applicable facility type.

Measures regarding installed LED lighting, measure 4.5.4, references tables found in the TRM for baseline wattage, and actual installed LEDs for efficient wattage.

Site ID: 59

Executive Summary

The program participant received Standard program incentives for retrofitting. The gross realization rate for this measure is 153%.

Project Description

The participant implemented the following measure(s):

- (112) 455W HID fixtures replaced with 138W LED pole mounted fixtures

Methodology for Estimating Gross Savings.

ADM staff inspected project documentation pertaining to the lighting retrofit.

Energy savings for the lighting retrofit were calculated according to the Illinois TRM 4.0, measure 4.5.4. Algorithms pertaining to savings calculations are presented below.

Electric Energy Savings

$$\Delta kWh = \left(\frac{Watts_{base} - Watts_{EE}}{1000}\right) * Hours * WHF_e * ISR$$

Where:

$Watts_{base}$ = input wattage of the baseline system

$Watts_{EE}$ = new input wattage of EE fixture

WHF_e = waste heat factor to account for cooling energy savings

ISR = in service rate (% of units rebated that get installed) = 1

Summer Coincident Peak Demand Savings

$$\Delta kW = \left(\frac{Watts_{base} - Watts_{EE}}{1000}\right) * WHF_d * CF * ISR$$

Where:

WHF_d = waste heat factor to account for cooling demand savings

CF = summer peak coincidence factor

Measure-Level Gross Realized Savings

The table below presents the realized gross energy savings of the lighting retrofit, along with the numeric values of inputs to the savings calculation equation.

Annual kWh Savings for Lighting Retrofit

Measure	*Calculation Inputs*					*Annual Gross kWh Savings*			
	Quantity	***Baseline Wattage***	***Efficient Wattage***	***Hours***	***WHF_e***	***Ex Ante***	***TRM Ex Post***	***ADM Ex Post***	***Realization Rate***

LED Bulbs and Fixtures	112	TRM = 361.4 Actual = 455	TRM = 116.8 Actual = 138	4,903	1.00	80,229	122,677	122,677	153%
Total						**80,229**	**122,677**	**122,677**	

The ADM calculated ex post savings estimate will be equal to the TRM savings estimate, except in cases in which the TRM is not applied. The TRM is not to be applied in cases in which it does not properly characterize the newly installed lighting system.

Summary of Project-Level Gross Realized Savings

The table shown below presents the realized gross energy savings of the lighting retrofit.

Verified Electric Savings/Realization Rates

Incentive Type	***Annual Gross Savings***			
	Ex Ante (kWh)	***Ex Post (kWh)***	***Realization Rate***	***Ex Post Peak kW Reduction***
Standard	80,229	122,677	153%	0.00
Total	**80,229**	**122,677**	**153%**	**0.00**

No demand reduction was calculated due to only exterior lighting being implemented.

Measures regarding installed LED lighting, measure 4.5.4, references tables found in the TRM for baseline wattage, and actual installed LEDs for efficient wattage.

Site ID: 60

Executive Summary

The program participant received Standard program incentives for retrofitting lighting. The gross realization rate for these measures is 265%.

Project Description

The participant implemented the following measure(s):

- (612) 199W HID fixtures replaced with 50W LED pole mounted fixtures
- (612) Bi-level occupancy controls installed on installed 50W LED pole mounted fixtures

Methodology for Estimating Gross Savings.

ADM staff inspected project documentation pertaining to the lighting retrofit.

Energy savings for the lighting retrofit were calculated according to the Illinois TRM 4.0, measures 4.5.4 and 5.4.13. Algorithms pertaining to savings calculations are presented below.

Electrical Energy Savings

$$\Delta kWh\ (reduced\ wattage) = \left(\frac{Watts_{base} - Watts_{EE}}{1000}\right) * Hours * WHF_e * ISR$$

Where:

$Watts_{base}$	= input wattage of the baseline system
$Watts_{EE/controlled}$	= new input wattage of EE/controlled system
WHF_e	= waste heat factor to account for cooling energy savings
ISR	= in service rate (% of units rebated that get installed) = 1

$$\Delta kWh\ (controls) = (kW_{base} - (kW_{controlled} * (1 - ESF))) * Hours * WHF_e$$

Where:

ESF	= energy savings factor = % Standby Mode * (1 - % Full Light at Standby Mode)

Summer Coincident Peak Demand Savings

$$\Delta kW\ (reduced\ wattage) = \left(\frac{Watts_{base} - Watts_{EE}}{1000}\right) * WHF_d * CF * ISR$$

Where:

WHF_d	= waste heat factor to account for cooling demand savings
CF	= summer peak coincidence factor

$$\Delta kW\ (controls) = (kW_{base} - (kW_{controlled} * (1 - ESF))) * (CF_{base} - CF_{OS}) * WHF_d$$

Where:

CF_{OS} = retrofit summer peak coincidence factor = 0.15

Measure-Level Gross Realized Savings

The table below presents the realized gross energy savings of the lighting retrofit, along with the numeric values of inputs to the savings calculation equation.

Annual kWh Savings for Lighting Retrofit

Measure	***Calculation Inputs***					***Annual Gross kWh Savings***			
	Quantity	***Baseline Wattage***	***Efficient Wattage***	***Hours***	***WHF_e***	***Ex Ante***	***TRM Ex Post***	***ADM Ex Post***	***Realization Rate***
Occupancy Controlled Bi-Level Fixtures	612	50	50	8,766	1.0	112,083	89,860	89,860	80%
LED Bulbs and Fixtures	612	TRM = 182.9 Actual = 198.9	TRM = 52.5 Actual = 50	8,766	1.0	190,840	712,981	712,981	374%
Total						**302,924**	**802,841**	**802,841**	

The ADM calculated ex post savings estimate will be equal to the TRM savings estimate, except in cases in which the TRM is not applied. The TRM is not to be applied in cases in which it does not properly characterize the newly installed lighting system.

Summary of Project-Level Gross Realized Savings

The table shown below presents the realized gross energy savings of the lighting retrofit.

Verified Electric Savings/Realization Rates

Incentive Type	***Annual Gross Savings***			
	Ex Ante (kWh)	***Ex Post (kWh)***	***Realization Rate***	***Ex Post Peak kW Reduction***
Standard	302,924	802,841	265%	94.64
Total	**302,924**	**802,841**	**265%**	**94.64**

A CF value of 1.0 and a WHFd value of 1.0 was used to determine kW reduction for measure 4.5.13. These values were taken from the TRM 4.0 based on applicable facility type.

Since bi-level occupancy controls were added to the newly implemented lighting fixtures, baseline and efficient fixture wattages for measure 4.5.13 is considered to be the newly

implemented lighting fixtures. A 50% standby mode value was referenced from TRM 4.0 based on applicable facility type, and 33% full light at standby mode was referenced from project documentation.

Measures regarding installed LED lighting, measure 4.5.4, references tables found in the TRM for baseline wattage, and actual installed LEDs for efficient wattage.

Site ID: 61

Executive Summary

The program participant received Standard program incentives for retrofitting lighting. The gross realization rate for these measures is 146%.

Project Description

The participant implemented the following measure(s):

- (50) Fixture mounted occupancy control sensors installed (2,800 controlled watts)
- (80) Incandescent exit signs replaced by LED exit signs
- (50) 198.9W HID fixtures replaced by 56W LED fixtures
- (392) 198.9W HID fixtures replaced by (196) 88W LED fixtures
- (1,741) 144W T12 fluorescent fixtures replaced by 44W LED fixtures
- (628) 173W T12 fluorescent fixtures replaced by 88W LED fixtures

Methodology for Estimating Gross Savings.

ADM staff inspected project documentation pertaining to the lighting retrofit.

Energy savings for the lighting retrofit were calculated according to the Illinois TRM 4.0, measures 4.5.4, 4.5.5, and 5.4.10. Algorithms pertaining to savings calculations are presented below.

Electric Energy Savings

$$\Delta kWh\ (reduced\ wattage) = \left(\frac{Watts_{base} - Watts_{EE}}{1000}\right) * Hours * WHF_e * ISR$$

Where:

$Watts_{base}$	= input wattage of the baseline system
$Watts_{EE/controlled}$	= new input wattage of EE/controlled system
WHF_e	= waste heat factor to account for cooling energy savings
ISR	= in service rate (% of units rebated that get installed) = 1

$$\Delta kWh\ (controls) = kW_{controlled} * ESF * Hours * WHF_e$$

Where:

ESF	= energy savings factor

Summer Coincident Peak Demand Savings

$$\Delta kW\ (reduced\ wattage) = \left(\frac{Watts_{base} - Watts_{EE}}{1000}\right) * WHF_d * CF * ISR$$

Where:

WHF_d = waste heat factor to account for cooling demand savings

CF = summer peak coincidence factor

$$\Delta kW\ (controls) = kW_{controlled} * (CF_{base} - CF_{OS}) * WHF_d$$

Where:

CF_{OS} = retrofit summer peak coincidence factor = 0.15

Measure-Level Gross Realized Savings

The table below presents the realized gross energy savings of the lighting retrofit, along with the numeric values of inputs to the savings calculation equation.

Annual kWh Savings for Lighting Retrofit

Measure	***Calculation Inputs***						***Annual Gross kWh Savings***			
	Baseline Quantity	***Baseline Wattage***	***Efficient Wattage***	***Hours***	***WHF_e***	***ESF***	***Ex Ante***	***TRM Ex Post***	***ADM Ex Post***	***Realization Rate***
Occupancy Sensor Lighting Controls	50	2,800	N/A	4,683	1.31	0.3	7,956	5,153	5,153	65%
Commercial LED Exit Signs	80	TRM = 35 Actual = 35	TRM = 2 Actual = 3	4,683	1.31	N/A	24,461	15,705	15,705	64%
LED Bulbs and Fixtures	50	TRM = 182.9 Actual = 198.9	TRM = 52.5 Actual = 56	4,683	1.31	N/A	26,316	38,925	38,925	148%
LED Bulbs and Fixtures	Base = 392 EE = 196	TRM = 88 Actual = 198.9	TRM = 53.6 Actual = 88	4,683	1.31	N/A	66,414	105,812	105,812	159%
LED Bulbs and Fixtures	1,741	TRM = 59 Actual = 144	TRM = 32.2 Actual = 44	4,683	1.31	N/A	109,009	160,208	160,208	147%
LED Bulbs and Fixtures	628	TRM = 88 Actual = 173	TRM = 53.6 Actual = 88	4,683	1.31	N/A	212,795	327,472	327,472	154%
Total							**446,950**	**653,275**	**653,275**	

The ADM calculated ex post savings estimate will be equal to the TRM savings estimate, except in cases in which the TRM is not applied. The TRM is not to be applied in cases in which it does not properly characterize the newly installed lighting system.

Summary of Project-Level Gross Realized Savings

The table shown below presents the realized gross energy savings of the lighting retrofit.

Verified Electric Savings/Realization Rates

Incentive Type	***Annual Gross Savings***			
	Ex Ante (kWh)	***Ex Post (kWh)***	***Realization Rate***	***Ex Post Peak kW Reduction***
Standard	446,950	653,275	146%	108.87
Total	**446,950**	**653,275**	**146%**	**108.87**

A CF value of 0.66 and a WHFd value of 1.53 was used to determine kW reduction. These values were taken from the TRM 4.0 based on applicable facility type.

Measures regarding installed LED lighting, measure 4.5.4, references tables found in the TRM for baseline wattage, and actual installed LEDs for efficient wattage.

6. Appendix B: Custom and Standard Incentives Participant Survey

SCREENING

1. Hello. May I please speak with <CONTACT>?

   Hello. My name is _____and I am calling on behalf of the Illinois Department of Commerce & Economic Opportunity.

   We are conducting a study on behalf of the Department of Commerce to help them improve their programs.

   According to our records, you participated in the Department of Commerce's Illinois Energy Now Program, through which you received a rebate or incentive for an energy efficiency project located at <ADDRESS>.

   We would like you to answer some questions about your decision making regarding your experience with the program. Do you have a few minutes to speak with me?
   [IF NEEDED: INTERVIEW SHOULD TAKE APPROXIMATELY 15 MINUTES]
   1 (Yes)
   2 (Not available at this time: SCHEDULE CALL BACK)
   3 (Not familiar with project [ASK TO BE REFERRED TO SOMEONE WHO IS FAMILIAR])

2. I was told you're the person who is most knowledgeable about this project. Is this correct?
   1 (Yes)
   2 (No) [ASK TO BE REFERRED TO SOMEONE WHO IS THE MOST KNOWLDEABLE AND CONTACT THAT PERSON]

BACKGROUND

3. To begin, can you tell me your job title or role?
   1 (Facilities Manager)
   2 (Energy Manager)
   3 (Other facilities management/maintenance position)
   4 (Chief Financial Officer)
   5 (Other financial/administrative position)
   6 (Proprietor/Owner)
   7 (President/CEO)
   8 (Manager)
   97 (Other)
   98 (Don't know)
   99 (Refused)

4. How did you first learn about the incentives for energy saving improvements provided through the <PROGRAM>?

1 (At a Department of Commerce Trade Ally Rally)
2 (The program website)
3 (Through an internet search)
4 (From a Department of Commerce Program representative)
5 (From a friend or colleague)
6 (A presentation at a conference or workshop)
7 (The Department of Commerce Illinois Energy Now Newsletter)
8 (From a professional group or association that you are a member of)
9 (From a Trade Ally/contractor/equipment vendor/energy consultant)
97 (Other)
98 (Don't know)
99 (Refused)

VENDOR/CONRACTOR INFORMATION BATTERY

5. I would like to get some information on the vendors or contractors that may have helped you <IMPLEMENT> the <ENDUSE>. Did you work with a contractor or vendor that helped you decide to <IMPLEMENT> the <END USE>?

1 Yes
2 No
98 (Don't know)
99 (Refused)

ASK Q6 IF [Q5=1]

6. Did the vendor or contractor encourage you to participate in the <PROGRAM>?

1 Yes
2 No
98 (Don't know)
99 (Refused)

ASK Q7 IF [Q5=1]

7. Did you also use a DESIGN or CONSULTING engineer?

1 Yes
2 No
98 (Don't know)
99 (Refused)

8. Did <ADMINSTAFF> assist you with the project that you implemented through the <ADMINISTRATOR>'s <PROGRAM>?

1 Yes
2 No
98 (Don't know)
99 (Refused)

ENERGY EFFICIENCY BUDGETING

9. In the last year, did your budget include specific funding for improvements to energy efficiency?

1 Yes
2 No
98 (Don't know)
99 (Refused)

PROJECT BACKGROUND
I'd now like to ask a few questions about the <ENDUSE> you <IMPLEMENTED> through the program.

10. Did you have plans to implement the <ENDUSE> that you implemented through the program before deciding to participate in the <PROGRAM>?
1 Yes
2 No
98 (Don't know)
99 (Refused)

ASK Q11 IF [Q10 = 2]
11. Using a scale from 0 to 10, where 0 is "Not at all certain" and 10 is "Extremely certain," how certain are you that you DID NOT have plans to implement the <ENDUSE>?
[RECORD 0 to 10]
98 (Don't know)
99 (Refused)

ASK Q12 IF [Q11 < 10]
12. Is there an individual within your organization that might know more about whether or not your organization had plans to implement the <ENDUSE> before deciding to participate in the <PROGRAM>?
1 Yes
2 No
98 (Don't know)
99 (Refused)

ASK Q13 IF [Q12 = 1]
13. May I have contact information for that individual? [OBTAIN CONTACT INFORMATION FOR INDIVIDUAL]
[RECORD VERBATIM]
98 (Don't know)
99 (Refused)

ASK Q14 IF [Q10 = 1]
14. Did the plans you had before deciding to participate in the program specify the specific <ENDUSE> you were going to implement?
1 Yes
2 No
98 (Don't know)
99 (Refused)

ASK Q15 IF [Q14 = 2]
15. Using a scale from 0 to 10, where 0 is "Not at all certain" and 10 is "Extremely certain," how certain are you that your plans DID NOT specify which specific <ENDUSE> you were going to implement?

[RECORD 0 to 10]
98 (Don't know)
99 (Refused)

ASK Q16 IF [Q15 < 10]
16. Is there an individual within your organization that might know more about whether or not your organization's plans specified the specific <ENDUSE> you were going to implement?

1 Yes
2 No
98 (Don't know)
99 (Refused)

ASK Q17 IF [Q16 = 1]
17. May I have contact information for that individual? [OBTAIN CONTACT INFORMATION FOR INDIVIDUAL]

[RECORD VERBATIM]
98 (Don't know)
99 (Refused)

ASK Q18 IF [Q10 = 1] AND [NTG = E]
18. In as much detail as possible, can you tell me more about the nature of the plans to implement <ENDUSE>, including efficiency levels, proposed equipment options, timelines, etc.?

[RECORD VERBATIM]
98 (Don't know)
99 (Refused)

ASK Q19 IF [Q10 = 1]
19. Without the program incentive, did your organization have the funds available to implement the same <ENDUSE> that you implemented through the program?

1 Yes
2 No
98 (Don't know)
99 (Refused)

ASK Q20 IF [Q19 =2]
20. Using a scale from 0 to 10, where 0 is "Not at all certain" and 10 is "Extremely certain," how certain are you that your organization DID NOT have the funds available to implement the same <ENDUSE> before deciding to participate in the <PROGRAM>?

[RECORD 0 to 10]

98 (Don't know)
99 (Refused)

ASK Q21 IF [Q20 < 10]
21. Is there an individual within your organization that might know more about whether or not your organization had the funds available to implement the <ENDUSE> before deciding to participate in the <PROGRAM>?
1 Yes
2 No
98 (Don't know)
99 (Refused)

ASK Q22 IF [Q21 = 1]
22. May I have contact information for that individual? [OBTAIN CONTACT INFORMATION FOR INDIVIDUAL]
[RECORD VERBATIM]
98 (Don't know)
99 (Refused)

23. Using a scale from 0 to 10, where 0 is "Not at all likely" and 10 is "Extremely likely," how likely is it that your organization could have funded this project without the program's financial assistance?
[RECORD 0 to 10]
98 (Don't know)
99 (Refused)

ASK Q11 [IF <ENER_EQUIP> = 1]
24. Did the new <ENDUSE> that you installed through the program replace existing equipment, was it added to control or work directly with existing equipment, or was it new additional standalone equipment?
1 Replaced existing equipment
2 Added to control or work directly with existing equipment
3 New additional standalone equipment
00 (Other) [RECORD VERBATIM]
98 (Don't know)
99 (Refused)

25. In deciding to do a project of this type, there are usually a number of reasons why it may be undertaken. In your own words, can you tell me why this project was implemented? IF NEEDED: Were there any other reasons? MULTIPLE RESPONSE. UP TO THREE.
1 (To replace old or outdated equipment)
2 (As part of a planned remodeling, build-out, or expansion)
3 (To gain more control over how the equipment was used)
4 (The maintenance downtime and associated expenses for the old equipment were too high)
5 (Had process problems and were seeking a solution)

6 (To improve equipment performance)
7 (To improve the product quality)
8 (To comply with codes set by regulatory agencies)
9 (To comply with organizational policies regarding regular/normal maintenance/replacement policy)
10 (To get a rebate from the program)
11 (To protect the environment)
12 (To reduce energy costs)
13 (To reduce energy use/power outages)
14)To update to the latest technology)
00 (Other) [RECORD VERBATIM]
98 (Don't know)
99 (Refused)

ASK Q26 IF [Q24=1]

26. Which of the following statements best describes the performance and operating condition of the equipment you replaced through the <PROGRAM ADMINISTRATOR>'s <PROGRAM>?

01 Existing equipment was fully functional, and without significant issues
02 Existing equipment was fully functioning, but with significant issues
03 Existing equipment had failed or did not function.
04 Existing equipment was obsolete
05 Existing equipment was fully functioning with minor issues
00 (Other) [RECORD VERBATIM]
98 (Don't know)
99 (Refused)

NET-TO-GROSS BATTERY

ASK Q27 IF [Q24 = 1 OR Q24 = 3 OR Q24 =98 OR Q24 =99]

27. When did you first learn about the < PROGRAM ADMINISTRATOR >'s <PROGRAM>? Was it BEFORE or AFTER you finalized the specifications of your <ENDUSE> project, including the efficiency level and the scope of the project.

1 Before
2 After
98 (Don't know)
99 (Refused)

ASK Q28 IF [<ENER_EQUIP>= 0 OR Q24 = 2]

28. When did you first learn about the < PROGRAM ADMINISTRATOR >'s <PROGRAM>? Was it BEFORE or AFTER you finalized the specifications of your <ENDUSE> project, including the scope of the project.

1 Before
2 After
98 (Don't know)
99 (Refused)

Now I would like you to think about the action you might have taken with regard to the <ENDUSE> if the <PROGRAM ADMINISTRATOR> program had not been available.

29. Using a scale from 0 to 10, where 0 is "Not at all likely" and 10 is "Extremely likely", if the <PROGRAM ADMINISTRATOR>'s program had not been available, what is the likelihood that you would have implemented the exact same project?

[RECORD 0 to 10]
98 (Don't know)
99 (Refused)

30. Using a scale where 0 is "Not at all likely" and 10 is "Extremely likely", if the program had not been available, what is the likelihood that you would have implemented the exact same project within 12 months of when you actually implemented it?

[RECORD 0 to 10]
98 (Don't know)
99 (Refused)

31. Without the program, when do you think you would have implemented the <ENDUSE> project? Would you say…

1 At the same time the <ENDUSE> was actually <IMPLEMENTED >
2 After the time the <ENDUSE> was actually <IMPLEMENTED>
3 Never
98 (Don't know)
99 (Refused)

ASK Q32 IF [Q30=2]

32. How much later would you have <IMPLEMENTED> the <ENDUSE> without the program? Would you say that you would have done it in…

1 0 to 6 months
2 7 months to 1 year
3 more than 1 year up to 2 years
4 more than 2 years up to 3 years
5 more than 3 years up to 4 years
6 Over 4 years
98 (Don't know)
99 (Refused)

ASK Q33 IF [[Q30=2] AND [Q32<> 98,99]]

33. Why do you think you would have <IMPLEMENTED > the <ENDUSE2> in <Q32 RESPONSE>?

00 [RECORD VERBATIM]
98 (Don't know)
99 (Refused)

34. Next, I'm going to ask you to rate the impact of various factors that might have affected your decision to <IMPLEMENT> the <ENDUSE> through the <PROGRAM>.

Please rate the impact each had on your decision using a scale where a score of "0" means that the factor had no impact on the decision to implement the <ENDUSE>, and a score of "10" means that the factor had DECISIVE impact on the decision to the implement the <ENDUSE>.
[RECORD 0 to 10]
96 Not Applicable
98 (Don't know)
99 (Refused)
[If needed: Please rate the impact of [FACTOR] in your decision to <IMPLEMENT> the <ENDUSE>.]

ASK Q35 IF [Q24=1]
35. The impact of the age or condition of the existing equipment

36. The impact of the availability of the <PROGRAM> incentive

ASK Q37 IF [Q36=8,9,10]
37. Why do you give it this rating?
[RECORD VERBATIM]
98 (Don't know);
99 (Refused)

ASK Q38 IF [<TECH_ASSIST>=1]
38. The impact of technical assistance you received from program staff

ASK Q39 IF [Q38=8,9,10] AND [NTG=E]
39. Why do you give it this rating?
[RECORD VERBATIM]
98 (Don't know)
99 (Refused)

ASK Q40 IF [Q5=1]
40. The impact of a recommendation from an equipment vendor or contractor that helped you with the choice of the <ENDUSE>

41. The impact of previous experience with implementing <ENDUSE>

42. The impact of a recommendation from <PROGRAM ADMINISTRATOR> program staff

ASK Q43 IF [NTG=E] AND [Q42=8,9,10]
43. Why do you give it this rating?
[RECORD VERBATIM]
98 (Don't know)

99 (Refused)

44. The impact of information from <PROGRAM ADMINISTRATOR> marketing materials

ASK Q45 IF [NTG=E] AND [Q44=8,9,10]
45. Why do you give it this rating?
[RECORD VERBATIM]
98 (Don't know)
99 (Refused)

ASK Q46 IF [Q7=1]
46. The impact of a recommendation from a design or consulting engineer

47. The impact of standard practice in your organization

48. The impact of an endorsement or recommendation by <ADMINSTAFF>

ASK Q49 IF [NTG=E] AND [Q48=8, 9, 10]
49. Why do you give it this rating?
[RECORD VERBATIM]
98 (Don't know)
99 (Refused)

50. The impact of organizational policy or guidelines

51. Were there any other factors we haven't discussed that that might have affected your decision to <IMPLEMENT> the <ENDUSE>?
00 [RECORD VERBATIM]
96 Nothing else influential
98 (Don't know)
99 (Refused)

ASK Q52 IF [Q51=00]
52. Using the same 0 to 10 scale, please rate the impact of this factor in your decision to <IMPLEMENT> the <ENDUSE> at this time?
[RECORD 0 to 10]
98 (Don't know)
99 (Refused)

53. [READ IF ANY OF Q35, Q40, Q41, Q46, Q47, Q50, Q51=8,9,10]
You just assigned the following factors a score of 8 or higher:
[READ ONLY ITEMS FOR WHICH RESPONDENT GAVE A RATING OF 8 OR HIGHER]
Q36 Availability of the program incentive
Q38 Technical assistance from program staff
Q40 Equipment Vendor or contractor recommendation

Q41 Previous experience with this measure
Q42 <PROGRAM ADMINISTRATOR> program staff recommendation
Q44 <PROGRAM ADMINISTRATOR> marketing materials
Q46 Recommendation from a design or consulting engineer
Q47 Standard practice in your organization
Q48 Endorsement or recommendation by <ADMINSTAFF>
Q50 Organizational policy or guidelines
Q51 Other factor

54. If you were given a TOTAL of 100 points that reflect the importance in your decision to <IMPLEMENT> the <ENDUSE> and you had to divide those 100 points between: 1) the program and 2) other factors, how many points would you give to the importance of the PROGRAM?

[RECORD 0 to 100]
98 (Don't know)
99 (Refused)
[CALCULATE VARIABLE <OTHERPTS> AS 100 MINUS Q54 RESPONSE; IF Q54=98, 99, SET OTHERPTS=BLANK]

55. And how many points would you give to the other factors?

[RECORD 0 to 100]
98 (Don't know)
99 (Refused)
[Note: The response should be <OTHERPTS> because both numbers should equal 100. If response does not equal <OTHERPTS>, ask Q56]

ASK Q56 IF [Q55<><OTHERPTS>]

56. The last question asked you to divide a TOTAL of 100 points between the program and other factors. You just noted that you would give <Q54 RESPONSE> points to the program. Does that mean you would give <OTHERPTS> points to the other factors?

1 Yes
2 No
98 (Don't know)
99 (Refused)

GO BACK TO Q54 IF [Q56=2] AND READ [OK LET ME ASK YOU THE QUESTION AGAIN]

CONSISTENCY CHECK ON PROGRAM INFLUENCE/PROGRAM COMPONENTS

ASK Q57 IF [Q54 >70] AND [Q36<3] AND [Q38<3] AND [Q42<3] AND [Q44<3] AND [Q48<3]

57. You just scored the impact of the program on your decision to implement the <ENDUSE> with <Q54 RESPONSE> out of 100 possible points. You ALSO gave relatively lower scoring to the impact of individual elements of the program experience.

ASK Q58 IF [Q54 <30] AND [[Q36>7] OR [Q38>7] OR [Q42>7] OR [Q44>7] OR [Q48>7]

58. You just scored the impact of the program on your decision to implement the <ENDUSE> with <Q54 RESPONSE> out of 100 possible points. You ALSO gave relatively higher scoring to the impact of individual elements of the program experience.

ASK Q59 IF [[Q54 >70] AND [Q36<3] AND [Q38<3] AND [Q42<3] AND [Q44<3] AND [Q48<3]] OR [[Q54 <30] AND [Q36>7]]

59. You scored the impact of THE AVAILABILITY OF THE PROGRAM INCENTIVE on your decision to implement the <ENDUSE> with <Q36 RESPONSE> out of 10 possible points, and scored the impact of the program overall with <Q54 RESPONSE> out of 100 possible points. Why is the impact of THE AVAILABILITY OF THE PROGRAM INCENTIVE different than the impact of the program overall?

00 [RECORD VERBATIM]
98 (Don't know)
99 (Refused)

ASK Q60 IF [[Q54 >70] AND [Q36<3] AND [Q38<3] AND [Q42<3] AND [Q44<3] AND [Q48<3]] OR [[Q54 <30] AND [Q38>7]]

60. You scored the impact of the program TECHNICAL ASSISTANCE on your decision to implement the <ENDUSE> with <Q38 RESPONSE> out of 10 possible points, and scored the impact of the program overall with <Q54 RESPONSE> out of 100 possible points. Why is the impact of the program TECHNICAL ASSISTANCE different than the impact of the program overall?

00 [RECORD VERBATIM]
98 (Don't know)
99 (Refused)

ASK Q61 IF [[Q54 >70] AND [Q36<3] AND [Q38<3] AND [Q42<3] AND [Q44<3] AND [Q48<3]] OR [[Q54 <30] AND [Q42>7]]

61. You scored the impact of THE RECOMMENDATION FROM <PROGRAM ADMINISTRATOR> <PROGRAM> STAFF PERSON on your decision to implement the <ENDUSE> with <Q42 RESPONSE> out of 10 possible points, and scored the impact of the program overall with <Q54 RESPONSE> out of 100 possible points. Why is the impact of the THE RECOMMENDATION FROM <PROGRAM ADMINISTRATOR> STAFF PERSON different than the impact of the program overall?

00 [RECORD VERBATIM]
98 (Don't know)
99 (Refused)

ASK Q62 [IF Q54 >70] AND [Q36<3] AND [Q38<3] AND [Q42<3] AND [Q44<3] AND [Q48<3]] OR [[Q54 <30] AND [Q44>7]]

62. You scored the impact of the THE INFORMATION from <PROGRAM ADMINISTRATOR>'s MARKETING MATERIALS on your decision to implement the <ENDUSE> with <Q44 RESPONSE> out of 10 possible points, and scored the impact of the program overall with <Q54 > out of 100 possible points. Why is the impact of the

THE INFORMATION from <PROGRAM ADMINISTRATOR>'s MARKETING MATERIALS different than the impact of the program overall?

00 [RECORD VERBATIM]
98 (Don't know)
99 (Refused)

ASK Q63 IF [[Q54 >70] AND [Q36<3] AND [Q38<3] AND [Q42<3] AND [Q44<3] AND [Q48<3] OR [[Q54 <30] AND [Q48>7]]

63. You scored the impact of the THE ENDORSEMENT or RECOMMENDATION by <ADMINSTAFF> on your decision to implement the <ENDUSE> with <Q48 RESPONSE> out of 10 possible points, and scored the impact of the program overall with <Q54 RESPONSE> out of 100 possible points. Why is the impact of the THE ENDORSEMENT or RECOMMENDATION by <ADMINSTAFF> different than the impact of the program overall?

00 [RECORD VERBATIM]
98 (Don't know)
99 (Refused)

PROGRAM COMPONENTS (INCENTIVE)/NO PROGRAM CONSISTENCY CHECK

ASK Q64 IF [[Q36=8,9,10] AND [Q29=8,9,10]] OR [[Q36=0,1,2] AND [Q29=0,1,2]]

64. You scored the impact of the program incentive on your decision to implement the <ENDUSE> with <Q36 RESPONSE> out of 10 possible points. You ALSO scored the likelihood of <IMPLEMENTING> exact same project without the incentive with <Q29 RESPONSE> out of 10 possible points. Can you please explain the role the incentive played in your decision to <IMPLEMENT> this <ENDUSE>?

00 Record VERBATIM
98 (Don't know)
99 (Refused)

ASK Q65 IF [[Q36=8,9,10] AND [Q29=8,9,10]] OR [[Q36=0,1,2] AND [Q29=0,1,2]]

65. Would you like to change your score of <Q36 RESPONSE> out of 10 possible points on the impact of the program incentive or change your score of <Q29 RESPONSE> out of 10 possible points on the likelihood of <IMPLEMENTING> the exact same project without the incentive? You may change one score, both scores, or neither score. How would you like to proceed?

1 Change impact of incentive score
2 Change likelihood of <IMPLEMENTING> the exact same project without the program score
3 Change both
4 Change neither
98 (Don't know)
99 (Refused)

ASK Q66 IF [Q65=1,3]

66. Please rate the impact of the PROGRAM incentive using a scale where a score of "0" means that the PROGRAM incentive had no impact on the decision to implement the energy efficiency project, and a score of "10" means that the PROGRAM incentive had DECISIVE impact on the decision to the implement the energy efficiency project.

[RECORD 0 to 10]
98 (Don't know)
99 (Refused)

ASK Q67 IF [Q65=2,3]

67. Using a scale from 0 to 10, where 0 is "Not at all likely" and 10 is "Extremely likely", if the <PROGRAM ADMINISTRATOR>'s efficiency program had not been available, what is the likelihood that you would have <IMPLEMENTED> the exact same project?

[RECORD 0 to 10]
98 (Don't know)
99 (Refused)

TIMING OF PROJECT DECISION / LEVEL OF PROGRAM ATTRIBUTION CONSISTENCY CHECK

ASK Q68 IF [[Q54 > 70 OR Q36 > 7 OR Q38 > 7 OR Q42 > 7 OR Q48> 7 OR Q44> 7]] AND [Q27 = 2 OR Q28 = 2]]

68. In response to an earlier question, you noted that you learned about the program AFTER you finalized the specifications of your <ENDUSE> project. Based on some of your other responses, it sounded like the program was important in your decision to install the high efficiency equipment. I want to check to see if I am misunderstanding your answers or if the questions may have been unclear. Will you explain the role the incentive program played in either your selection of the efficiency level of the installed equipment or the scope of the project?

00 [RECORD VERBATIM]
98 (Don't know)
99 (Refused)

ASK Q69 IF [Q40 > 7 AND [Q27= 2 OR Q28 = 2]]

69. Earlier you stated that a recommendation from an equipment vendor or contractor was important to your decision to implement the <ENDUSE>. You also stated that you learned about the program after you decided to complete the project. Can you please explain the role the vendor or contractor played in your decision to implement the <ENDUSE>?

00 [RECORD VERBATIM]
98 (Don't know)
99 (Refused)

PAYBACK BATTERY

70. Please rate the impact of PAYBACK ON THE INVESTMENT using a scale where a score of "0" means that the PAYBACK ON THE INVESTMENT had no impact on the

decision to implement the energy efficiency project, and a score of "10" means that the PAYBACK ON THE INVESTMENT had DECISIVE impact on the decision to the implement the energy efficiency project.

[RECORD 0 to 10]
98 (Don't know)
99 (Refused)

ASK Q71 IF [Q70=7,8,9,10]

71. I'd like to find out more about the payback criteria <ORGANIZATION> uses for its investments and how it might have applied to the decision to <IMPLEMENT> the <ENDUSE>.

What is the payback cut-off point <ORGANIZATION> uses before deciding to complete a project like this one?

[DO NOT READ. Prompt if necessary: in years and months.]
1 0 to 6 months
2 7 months to 1 year
3 more than 1 year up to 2 years
4 more than 2 years up to 3 years
5 more than 3 years up to 5 years
6 Over 5 years
98 (Don't know)
99 (Refused)

ASK Q72 IF [Q70=7,8,9,10]

72. Does your organization always implement projects that meet the required payback cut-off point?
1 Yes
2 No
98 (Don't know)
99 (Refused)

ASK Q73 IF [Q70=7,8,9,10] AND [Q72=2] AND [NTG=E]

73. Why doesn't your organization always implement projects that meet the required financial cut-off point?
00 [RECORD VERBATIM]
98 (Don't know)
99 (Refused)

ASK Q74 IF [Q70=7,8,9,10]

74. Did you review payback calculations for the <ENDUSE> project with and without the <PROGRAM> incentive?
1 Yes
2 No
98 (Don't know)

99 (Refused)

ASK Q75 IF [Q70=7,8,9,10]

75. Did the program incentive play an important role in moving your project within the acceptable payback cutoff point?

1 Yes
2 No
98 (Don't know)
99 (Refused)

ORGANIZATIONAL/CORPORATE POLICY BATTERY

ASK Q76 IF [Q50=7,8,9,10]

76. Does your organization have an environmental policy or sustainability plan to reduce environmental emissions or energy use? Some examples would be to "buy green" or use sustainable approaches to business investments.

1 Yes
2 No
98 (Don't know)
99 (Refused)

ASK Q77 IF [Q50=7,8,9,10] AND [Q76=1] AND [NTG = E]

77. What specific policy affected your decision to <IMPLEMENT> the <ENDUSE> through the <PROGRAM>?

00 [RECORD VERBATIM]
98 (Don't know)
99 (Refused)

ASK Q78 IF [Q50=7,8,9,10] AND [Q76=1]

78. Prior to participating in the <PROGRAM ADMINISTRATOR>'s <PROGRAM>, had that policy caused you to <IMPLEMENT> <ENDUSE> at this or another facility without a program incentive?

1 Yes
2 No
98 (Don't know)
99 (Refused)

ASK Q79 IF [Q50=7,8,9,10]

79. Does <ORGANIZATION> have the financial ability to implement its policy?

1 Yes
2 No
98 (Don't know)
99 (Refused)

ASK Q80 IF [[Q50=7,8,9,10] AND [Q78=1] AND [Q76=1] AND [NTG = E]]

80. Regarding the decision to <IMPLEMENT> the <ENDUSE> through the <PROGRAM>, I want to make sure I fully understand the impact of this policy as compared with the impact of the program. Can you please elaborate on that?

00 [RECORD VERBATIM]
98 (Don't know)
99 (Refused)

STANDARD PRACTICE BATTERY

ASK Q81 IF [Q47>6]

81. In an earlier question, you rated the importance of STANDARD PRACTICE in your organization very highly in your decision making. Could you please rate the importance of the PROGRAM, relative to this standard practice, in affecting your decision to <IMPLEMENT> the <ENDUSE>? Would you say the program was much more important, somewhat more important, equally important, somewhat less important, or much less important than your organization's standard practice?

1 Much more important
2 Somewhat more important
3 Equally important
4 Somewhat less important
5 Much less important
98 (Don't know)
99 (Refused)

ASK Q82 IF [[Q47=7,8,9,10] AND [NTG = E]]

82. Approximately, how long has use of <ENDUSE> been standard practice in your organization?

M [00 Record Number of Months; 98 (Don't know), 99 (Refused)]
Y [00 Record Number of Years; 98 (Don't know), 99 (Refused)]

ASK Q83 IF [Q47=7,8,9,10]

83. Does <ORGANIZATION> ever deviate from the standard practice?

1 Yes
2 No
98 (Don't know)
99 (Refused)

ASK Q84 IF [Q47=7,8,9,10] AND [Q83=1] AND [NTG = E]

84. Please describe the conditions under which <ORGANIZATION> deviates from this standard

00 [RECORD VERBATIM]
98 (Don't know)
99 (Refused)

ASK Q85 IF [Q47=7,8,9,10] AND [NTG = E]

85. How did this standard practice affect your decision to <IMPLEMENT> the <ENDUSE> through the <PROGRAM>?
00 [RECORD VERBATIM]
98 (Don't know)
99 (Refused)

ASK Q86 IF [Q47=7,8,9,10]
86. Could you please rate the importance of the <PROGRAM> as compared with this standard organization practice in affecting your decision to <IMPLEMENT> the <ENDUSE>. Would you say the <PROGRAM> was…
1 Much more important
2 Somewhat more important
3 Equally important
4 Somewhat less important
5 Much less important
98 (Don't know)
99 (Refused)

ASK Q87 IF [Q47=7,8,9,10] AND [NTG = E]
87. What group or trade organization, if any, do you look to establish standard practice for your organization?
00 [RECORD VERBATIM]
98 (Don't know)
99 (Refused)

ASK Q88 IF [Q47=7,8,9,10] AND [NTG = E]
88. How do you and other public sector organizations receive information on updates to standard practice?
00 [RECORD VERBATIM]
98 (Don't know)
99 (Refused)

ADDITIONAL PROJECTS

ASK Q89 IF [MSAME=1]
89. Our records show that <ORGANIZATION> also received an incentive from <PROGRAM ADMINISTRATOR>'s <PROGRAM> for <NSAME> other <ENDUSE> projects. Was it a single decision to complete all of those <ENDUSE> projects for which you received an incentive from the program or did each project go through its own decision process?

1 Single Decision
2 Each project went through its own decision process
00 (Other) [RECORD VERBATIM]
98 (Don't know)
99 (Refused)

ASK Q90 IF [FSAME=1]

90. Our records show that <ORGANIZATION> also received an incentive from<PROGRAM ADMINISTRATOR>'s <PROGRAM> for a <FDESC> project at <ADDRESS>. Was the decision making process for that project the same as for the <ENDUSE> project we have been talking about?

1 Same decision making process
2 Different decision making process
00 (Other) [RECORD VERBATIM]
98 (Don't know)
99 (Refused)

SPILLOVER MODULE

Thank you for discussing the new <ENDUSE> that you <IMPLEMENTED> through the <PROGRAM>. Next, I would like to discuss any energy efficiency equipment you might have installed or other energy efficiency measures you might have undertaken OUTSIDE of the program.

91. Since your participation in the <PROGRAM>, did you implement any ADDITIONAL energy efficiency measures at this facility or at your other facilities within <UTILITIES>'s service territory that did NOT receive incentives through <PROGRAM ADMINISTRATOR>?

1 Yes
2 No
98 (Don't know)
99 (Refused)

ASK Q92 IF [Q91=1]

92. What was the first measure that you implemented? IF RESPONSE IS GENERAL, E.G., "LIGHTING EQUIPMENT", PROBE FOR SPECIFIC MEASURE. PROBE FROM LIST, IF NECESSARY.

1 Lighting: T8 lamps
2 Lighting: T5 lamps
3 Lighting: Highbay Fixture Replacement
4 Lighting: CFLs
5 Lighting: Controls / Occupancy sensors
6 Lighting: LED lamps
7 Cooling: Unitary/Split Air Conditioning System
8 Cooling: Room air conditioners
9 Cooling: Variable Frequency Drives VFD/VSD on HVAC Motors
10 Motors: Efficient motors
11 Refrigeration: Strip curtains
12 Refrigeration: Anti-sweat controls
13 Refrigeration: EC motor for WALK-IN cooler/freezer
14 Refrigeration: EC motor for REACH-IN cooler/freezer

00 (Other) [RECORD VERBATIM]
96 (Didn't implement any measures)
98 (Don't know)
99 (Refused)

ASK Q93 IF [Q92<>96,98,99] AND [Q91=1]

93. What was the second measure? IF RESPONSE IS GENERAL, E.G., "LIGHTING EQUIPMENT", PROBE FOR SPECIFIC MEASURE. PROBE FROM LIST, IF NECESSARY.

1 Lighting: T8 lamps
2 Lighting: T5 lamps
3 Lighting: Highbay Fixture Replacement
4 Lighting: CFLs
5 Lighting: Controls / Occupancy sensors
6 Lighting: LED lamps
7 Cooling: Unitary/Split Air Conditioning System
8 Cooling: Room air conditioners
9 Cooling: Variable Frequency Drives VFD/VSD on HVAC Motors
10 Motors: Efficient motors
11 Refrigeration: Strip curtains
12 Refrigeration: Anti-sweat controls
13 Refrigeration: EC motor for WALK-IN cooler/freezer
14 Refrigeration: EC motor for REACH-IN cooler/freezer
00 (Other) [RECORD VERBATIM]
96 (Didn't implement any measures)
98 (Don't know)
99 (Refused

ASK Q94 IF [Q93<>96,98,99] AND [Q92<>96,98,99] AND [Q91=1]

94. What was the third measure? IF RESPONSE IS GENERAL, E.G., "LIGHTING EQUIPMENT", PROBE FOR SPECIFIC MEASURE. PROBE FROM LIST, IF NECESSARY.

1 Lighting: T8 lamps
2 Lighting: T5 lamps
3 Lighting: Highbay Fixture Replacement
4 Lighting: CFLs
5 Lighting: Controls / Occupancy sensors
6 Lighting: LED lamps
7 Cooling: Unitary/Split Air Conditioning System
8 Cooling: Room air conditioners
9 Cooling: Variable Frequency Drives VFD/VSD on HVAC Motors
10 Motors: Efficient motors
11 Refrigeration: Strip curtains
12 Refrigeration: Anti-sweat controls
13 Refrigeration: EC motor for WALK-IN cooler/freezer
14 Refrigeration: EC motor for REACH-IN cooler/freezer

00 (Other) [RECORD VERBATIM]
96 (Didn't implement any measures)
98 (Don't know)
99 (Refused

ASK Q95 IF [Q92<>96,98,99] AND [Q91=1]

95. I have a few questions about the FIRST measure that you implemented. If needed, read back measure: <Q92 RESPONSE> [OPEN END]

a. Please describe the SIZE, TYPE, and OTHER ATTRIBUTES of this measure.
b. Please describe the EFFICIENCY of this measure.
c. How many of this measure did you implement?

ASK Q96 IF [Q92<>96,98,99] AND [Q91=1]

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

1 Yes
2 No
98 (Don't know)
99 (Refused)

ASK Q97 IF [Q92<>96,98,99] AND [Q91=1]

97. How important was your experience in 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?

[RECORD 0 TO 10]
98 (Don't know)
99 (Refused)

ASK Q98 IF [Q97<>98, 99] AND [Q92<>96,98,99] AND [Q91=1]

98. Can you explain how your experience with the <PROGRAM> influenced your decision to install this additional high efficiency measure?

00 [RECORD VERBATIM]
98 (Don't know)
99 (Refused)

ASK Q99 IF [Q92<>96,98,99] AND [Q91=1]

99. If you had not participated in the <PROGRAM>, how likely is it that your organization would still have implemented this measure, using a 0 to 10, scale where 0 means you definitely WOULD NOT have implemented this measure and 10 means you definitely WOULD have implemented this measure?

[RECORD 0 TO 10]
98 (Don't know)
99 (Refused)

CONSISTENCY CHECK ON PROGRAM IMPORTANCE RATING VS. NO PROGRAM RATING MEASURE 1

ASK Q100 IF [[Q97=0,1,2,3] AND [Q99=0,1,2,3] AND [Q92<>96,98,99] AND [Q91=1]]
OR [[IF [Q97=8,9,10] AND [Q99=8,9,10] AND [Q92<>96,98,99] AND [Q91=1]]

100. You scored the importance of your program experience to your decision to implement this measure with <Q1) RESPONSE > out of 10 possible points. You ALSO scored the likelihood of implementing this measure if your organization had not participated in the program with <Q2) RESPONSE> out of 10 possible points. Can you please explain the role the program made in your decision to implement this measure?

00 [RECORD VERBATIM]
98 (Don't know)
99 (Refused)

ASK Q101 IF [Q92<>96,98,99] AND [Q91=1]

101. Can you briefly explain why you decided to install this energy efficiency measure on your own, rather than going through the <PROGRAM>?

00 [RECORD VERBATIM]
98 (Don't know)
99 (Refused)

ASK Q102 IF [Q93<>96,98,99] AND [Q91=1]

102. I have a few questions about the SECOND measure that you implemented. If needed, read back measure: <Q93 RESPONSE> [OPEN END]

a. Please describe the SIZE, TYPE, and OTHER ATTRIBUTES of this measure.
b. Please describe the EFFICIENCY of this measure.
c. How many of this measure did you implement?

ASK Q103 IF [Q93<>96,98,99] AND [Q91=1]

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

1 Yes
2 No
98 (Don't know)
99 (Refused)

ASK Q104 IF [Q93<>96,98,99] AND [Q91=1]

104. How important was your experience in 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?

[RECORD 0 TO 10]
98 (Don't know)
99 (Refused)

ASK Q105 IF [Q104<>98, 99] AND [Q93<>96,98,99] AND [Q91=1]

105. Can you explain how your experience with the <PROGRAM> influenced your decision to install this additional high efficiency measure?

00 [RECORD VERBATIM]
98 (Don't know)
99 (Refused)

ASK Q106 IF [Q93<>96,98,99] AND [Q91=1]

106. If you had not participated in the <PROGRAM>, how likely is it that your organization would still have implemented this measure, using a 0 to 10, scale where 0 means you definitely WOULD NOT have implemented this measure and 10 means you definitely WOULD have implemented this measure?

[RECORD 0 TO 10]
98 (Don't know)
99 (Refused)

CONSISTENCY CHECK ON PROGRAM IMPORTANCE RATING VS. NO PROGRAM RATING MEASURE 2

ASK Q107 IF [[Q104=0,1,2,3] AND [Q106=0,1,2,3] AND [Q93<>96,98,99] AND [Q91=1]] OR [[IF [Q104=8,9,10] AND [Q106=8,9,10] AND [Q93<>96,98,99] AND [Q91=1]]

107. You scored the importance of your program experience to your decision to implement this measure with <Q104 RESPONSE > out of 10 possible points. You ALSO scored the likelihood of implementing this measure if your organization had not participated in the program with <Q106 RESPONSE> out of 10 possible points. Can you please explain the role the program made in your decision to implement this measure?

00 [RECORD VERBATIM]
98 (Don't know)
99 (Refused)

ASK Q108 IF [Q92<>96,98,99] AND [Q91=1]

108. Can you briefly explain why you decided to install this energy efficiency measure on your own, rather than going through the <PROGRAM>?

00 [RECORD VERBATIM]
98 (Don't know)
99 (Refused)

ASK Q109 IF [Q94<>96,98,99] AND [Q91=1]

109. I have a few questions about the THIRD measure that you implemented. If needed, read back measure: <SP3 RESPONSE> [OPEN END]

a. Please describe the SIZE, TYPE, and OTHER ATTRIBUTES of this measure.
b. Please describe the EFFICIENCY of this measure.
c. How many of this measure did you implement?

ASK Q110 IF [Q94<>96,98,99] AND [Q91=1]

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

1 Yes
2 No

98 (Don't know)
99 (Refused)

ASK Q111 IF [Q94<>96,98,99] AND [Q91=1]

111. How important was your experience in 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?

[RECORD 0 TO 10]
98 (Don't know)
99 (Refused)

ASK Q112 IF [Q111<>98, 99] AND [Q94<>96,98,99] AND [Q91=1]

112. Can you explain how your experience with the <PROGRAM> influenced your decision to install this additional high efficiency measure?

00 [RECORD VERBATIM]
98 (Don't know)
99 (Refused)

ASK Q113 IF [Q94<>96,98,99] AND [Q91=1]

113. If you had not participated in the <PROGRAM>, how likely is it that your organization would still have implemented this measure, using a 0 to 10, scale where 0 means you definitely WOULD NOT have implemented this measure and 10 means you definitely WOULD have implemented this measure?

[RECORD 0 TO 10]
98 (Don't know)
99 (Refused)

CONSISTENCY CHECK ON PROGRAM IMPORTANCE RATING VS. NO PROGRAM RATING MEASURE 3

ASK Q114 IF [[Q111=0,1,2,3] AND [Q113=0,1,2,3] AND [Q94<>96,98,99] AND [Q91=1]] OR [[IF [Q111=8,9,10] AND [Q113=8,9,10] AND [Q94<>96,98,99] AND [Q91=1]]

114. You scored the importance of your program experience to your decision to implement this measure with <Q111 RESPONSE > out of 10 possible points. You ALSO scored the likelihood of implementing this measure if your organization had not participated in the program with <Q113 RESPONSE> out of 10 possible points. Can you please explain the role the program made in your decision to implement this measure?

ASK Q109 IF [Q115 <>96,98,99] AND [Q91=1]

115. Can you briefly explain why you decided to install this energy efficiency measure on your own, rather than going through the <PROGRAM>?

00 [RECORD VERBATIM]
98 (Don't know)
99 (Refused)

PROCESS BATTERY

DISPLAY IF [NTG=B] Now I have just a few more questions about your experience with the program participation process.

ASK Q116 IF [NTG=B]

116. Did you work on completing the application for the program including gathering required documentation?

1 Yes
2 No
98 (Don't know)
99 (Refused)

ASK Q117 IF [NTG=B]

117. Did anyone else help complete the application? MULTIPLE RESPONSE UP TO TWO

1 Another member of your company
2 A contractor
3 An equipment vendor
4 A designer or architect
5 Someone else (Please specify)
98 (Don't know)
99 (Refused)

ASK Q118 IF [Q116=1]

118. Thinking back to the application process, please rate the clarity of information on how to complete the application using a scale where 0 means "not at all clear" and 10 means "completely clear".

[RECORD 0 TO 10]
98 (Don’t know)
99 (Refused)

ASK Q119 IF [Q118 < 8]

119. What information needs to be clarified?

ASK Q120 IF [Q116=1]

120. Did you have a clear sense of who you could go to for assistance with the application process?

1 Yes
2 No
98 (Don’t know)
99 Refused

ASK Q121 IF [NTG=B]

121. The next questions are about program staff that you may have contacted during the completion of your project. Program staff are anyone that reviewed your application, conducted site visits, determined your incentive amount, or processed your incentive check. Program staff are not anyone hired by you

In the course of completing this project, did you contact any program staff with questions or concerns about your project?

1 Yes
2 No
98 Don't know
99 Refused

ASK Q122 IF [NTG=B]

122. Using a scale of 0 to 10 where 0 means "very dissatisfied" and 10 means "very satisfied", please rate your satisfaction with the following: how dissatisfied or satisfied you are with how long it took program staff to address your questions or concerns. [Record 0-10]
98 Don't know
99 Refused

a. [ASK IF Q121=1] how long it took program staff to address your questions or concerns
b. [ASK IF Q121=1] how thoroughly program staff addressed your question or concern
c. the steps you had to take to get through the program
d. the amount of time it took to get your rebate or incentive
e. the range of equipment that qualifies for incentives
f. the program overall

ASK Q123 [IF ANY Q122 < 4]

123. Please describe the ways in which you were dissatisfied with the aspects of the program you mentioned.

ASK Q124 IF [NTG=B]

124. Do you have any suggestions for how <PROGRAM ADMINISTRATOR> could improve its Energy Efficiency programs?

ASK Q124 IF [NTG=B]

125. What do you think are the best ways to communicate information about the <PROGRAM ADMINISTRATOR> programs to organizations like yours? [MULTISELECT UP TO 3 RESPONSES]

1 (E-mail)
2 (Telephone)
3 (Presentations at events or contractors)
4 (Trade allies/Vendors/Contractors)
5 (Direct mailings)
6 (Website updates)

7 (Other (Please specify))
98 (Don't know)
99 (Refused)

126. What type facility is the facility located at [Facility]?
1 (Airport)
2 (Community College)
3 (Correctional Facility)
4 (K-12 School)
5 (Public Library)
6 (Medical Facility)
7 (Municipal Facility)
8 (Park District Facility)
9 (Police or Fire Station)
10 (Public Works Facility)
11 (State University)
12 (Wastewater Treatment Facility)
13 (Other (Please specify))
98 (Don't know)
99 (Refused)

127. Does [Organization] rent, own and occupy, or own and rent to someone else the facility at this location?
1 Rent
2 Own and occupy
3 Own and rent to someone else
98 (Don’t know)
99 (Refused)

128. Does your organization pay the full cost of the natural gas bill for the facility located at [Location]?
1 Yes
2 No
98 (Don’t know)
99 (Refused)

129. Does your organization pay the full cost of the electric bill for the facility located at [Location]?
1 Yes
2 No
98 (Don’t know)
99 (Refused)

7. Appendix C: Free Ridership Analysis

This appendix presents additional analysis of the data collected on free ridership that pertains to the free ridership methodology employed in the calculation of net savings for the Custom and Standard Incentives Programs. ADM estimated free ridership for the Custom Incentives and Standard Incentive Programs using the Core Non-Residential Free Ridership Protocol presented in the Illinois Statewide Technical Reference Manual (TRM) Version 6.0, Vol. 4 (p.29). This protocol presents two scoring options that differ in terms of how the program impact on project timing is accounted for.

Additionally, guided by Illinois Commerce Commission direction that, with respect to a determination regarding free ridership, the person or entity in question should have actual energy efficiency plans before they are to be considered to be free riders, ADM developed an Energy Efficiency Plans Score and incorporated it into the algorithm for calculation of participant free ridership.[6]

Accounting for the two scoring options and the inclusion/exclusion of the Energy Efficiency Plans Score, there are a total of four free ridership scores presented below for the Custom Incentives and Standard Incentive Programs.

Alternative Timing Options

The two *timing options* that may account for the deferment of free ridership in the overall free ridership score are as follows:

(1) For Timing Option 1, a timing adjustment factor is equal to:

$$1 - (\textit{Number of Months Expedited} - 6)/42$$

Under Timing Option 1, the timing adjustment factor is multiplied with the No-Program Score, which is then averaged with the Program Influence Score and the Program Components Score.

(2) For Timing Option 2, a timing adjustment factor is equal to:

$$1 - ((\textit{Number of Months Expedited} - 6)/42)*((10 - \textit{Likelihood of Implementing within One Year})/10)$$

Under Timing Option 2, the average of the No-Program Score, Program Influence Score, and the Program Components Score are multiplied by the timing adjustment factor.

[6] See docket 11-0593 Final Order: https://www.icc.illinois.gov/downloads/public/edocket/371251.pdf.

Energy Efficiency Plans Score

The construction of the Energy Efficiency Plans Score is described in Chapter 4. Table C-1 summarizes the share of respondents who met the criteria indicating that they had prior plans. As shown, 43% of respondents met the two criteria that indicated that they did not have plans to complete the project prior to participation.

Table C-1 Summary of Responses to Plans Module

Prior Plans Indicator	*Percent of Respondents*
Did not have plans prior to deciding to participate	29%
Plans did not specify measure	14%
Did not have funds to implement measures	0%
Met any of the plans criteria	43%

All scores are reported in terms of free ridership, meaning that higher scores are indicative of higher levels of free ridership.

Table C-2 through

Table C-6 present the free ridership scores for each program weighted by kWh savings, kW reductions, and therm savings, respectively.

Table C-2 Summary of Free Ridership Scoring Options and Free Ridership for the Custom Incentives Program (Weighted by kWh Savings)

Free Ridership Algorithm Timing Option	*Included Component Scores*			*FR With Plans Score*	*FR Without Plans Score*
	Program Influence	*Adjusted No Program Score*	*No Program Score*		
1	Yes	Yes	No	0.06	0.20
2	Yes	No	Yes	0.03	0.17

Table C-3 Summary of Free Ridership Scoring Options and Free Ridership for the Standard Incentives Program (Weighted by kWh Savings)

Free Ridership Algorithm Timing Option	*Included Component Scores*			*FR With Plans Score*	*FR Without Plans Score*
	Program Influence	*Adjusted No Program Score*	*No Program Score*		
1	Yes	Yes	No	0.27	0.37
2	Yes	No	Yes	0.27	0.35

Table C-4 Summary of Free Ridership Scoring Options and Free Ridership for the Custom Incentives Program (Weighted by kW Reductions)

Free Ridership Algorithm Timing Option	*Included Component Scores*			*FR With Plans Score*	*FR Without Plans Score*
	Program Influence	*Adjusted No Program Score*	*No Program Score*		
1	Yes	Yes	No	0.06	0.21
2	Yes	No	Yes	0.03	0.18

Table C-5 Summary of Free Ridership Scoring Options and Free Ridership for the Standard Incentives Program (Weighted by kW Reductions)

Free Ridership Algorithm Timing Option	*Included Component Scores*			*FR With Plans Score*	*FR Without Plans Score*
	Program Influence	*Adjusted No Program Score*	*No Program Score*		
1	Yes	Yes	No	0.30	0.37
2	Yes	No	Yes	0.28	0.35

Table C-6 Summary of Free Ridership Scoring Options and Free Ridership for the Custom Incentives Program (Weighted by Therm Savings)

Free Ridership Algorithm Timing Option	*Included Component Scores*			*FR With Plans Score*	*FR Without Plans Score*
	Program Influence	*Adjusted No Program Score*	*No Program Score*		
1	Yes	Yes	No	0.12	0.12
2	Yes	No	Yes	0.06	0.06

None of the survey respondents completed standard projects with therm savings.