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Ameren Illinois Company Transition Period Impact Evaluation Report

Volume I – Impact Evaluation Results
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1. Executive Summary

This report presents evaluation results from Ameren Illinois Company's (AIC) portfolio of commercial and industrial (C&I) and residential energy efficiency programs, implemented during the Transition Period, which ran from June 1, 2017 to December 31, 2017. The seven-month Transition Period bridged the period between AIC's Plan 3 energy efficiency programs and the 2018 Plan period established by Senate Bill 2814 (the Future Energy Jobs Act [FEJA]), which went into effect on January 1, 2018.

The overarching evaluation objective for the Transition Period was to determine gross and net energy and demand impacts associated with the AIC energy efficiency portfolio. In addition, the evaluation team conducted limited program research to inform improvements to the design and implementation of new and existing programs.

As part of the Transition Period evaluation effort, the evaluation team assessed the following programs:

- Residential[1]
  - Retail Products (formerly known as Residential Lighting)
  - Heating and Cooling (HVAC)
  - Behavioral Modification
  - Multifamily
  - Home Efficiency Income Qualified (HEIQ)
  - Public Housing Authority
  - Public Sector Central Air Conditioners (Public Sector CAC)[2]
  - School Kits
- Commercial and Industrial[3]
  - Standard
  - Custom
  - Retro-Commissioning (RCx)

In addition to establishing the 2018 Plan period, FEJA led to a number of significant changes affecting the portfolio of energy efficiency programs available to AIC customers. While some of these changes do not

[1] In addition to the programs mentioned above, we also evaluate carryover savings from legacy IPA programs that ran in PY8 and PY9, including the Residential Lighting, Rural Kits, Moderate Income Kits (MICK), and CFL Distribution programs.

[2] While this offering is not best conceived of as a separate program, we break these savings out separately for reporting purposes.

[3] As of June 1, 2017, the beginning of the Transition Period, public sector energy efficiency efforts (formerly under DCEO) are included in the C&I programs. Due to the organization of the portfolio, we do not consider the carryover DCEO efforts targeted at nonresidential customers to be separate programs. However, as part of our evaluation of the Standard and Custom programs, we assess impacts from the STEP and BOC offerings previously provided by DCEO.

formally come into effect until 2018, the following led to modifications in AIC's programs for the Transition Period:

- **Discontinuation of energy efficiency programs offered through the Illinois Power Agency (IPA):** Energy efficiency programs offered through the IPA and previously available to AIC customers ended on May 31, 2017. To maintain continuity, AIC absorbed the IPA Residential Lighting Program (now known as the Retail Products Program) and the IPA-funded electric component of the Behavioral Modification Program into its portfolio for the Transition Period. All other IPA programs were discontinued.

- **Exemption of large nonresidential customers:** At the start of the Transition Period, all nonresidential customers of 10 MW or larger became exempt from energy efficiency programs in Illinois. This change is significant for program implementation purposes, as a large portion of AIC's Business Program savings have historically been derived from these customers.

- **Discontinuation of energy efficiency programs offered through the Illinois Department of Commerce and Economic Opportunity (DCEO):** Prior to the Transition Period, public sector nonresidential customers (e.g., schools, government buildings) and public housing facilities were ineligible for AIC energy efficiency programs and instead were served by programs offered through the DCEO. As of June 1, 2017, these customers became eligible for AIC programs. The Transition Period allowed AIC to begin to integrate these customers into its programs. In addition to offering its existing programs to public sector customers, AIC absorbed a number of programs previously offered by the DCEO into its portfolio for the Transition Period. These programs include the Public Housing Authority (PHA) Program, the Savings through Efficient Products (STEP) Program, and the DCEO's Building Operator Certification (BOC) Program.

- **Shift to Cumulative Persisting Annual Savings (CPAS):** Beginning in 2018, electric savings goals for the utilities are defined based on CPAS as a percentage of sales. As such, annual evaluations of AIC's programs moving forward will track CPAS. While savings achieved in the Transition Period do not count toward the CPAS goals set for AIC, we present CPAS savings in this report as a first look at how savings will be tracked for AIC's programs in the future.[4]

- **Calculation of Weighted Average Measure Life (WAML):** FEJA replaces the existing funding mechanism for energy efficiency in Illinois by allowing AIC to create a regulatory asset and amortize and recover the total expenditures of that regulatory asset "over a period that is equal to the weighted average of the measure lives implemented for that year that are reflected in the regulatory asset."[5] This regulatory asset began in the Transition Period, and, therefore, we present WAML for AIC's energy efficiency programs in this report in accordance with the guidelines for calculation presented in the Illinois Stakeholder Advisory Group's (SAG) WAML Report.[6,7]

The subsequent sections of this report present methods and impact findings from the evaluation of the Transition Period programs. We also provide context around AIC's portfolio savings goals and resources, as well as an overview of the evaluation approaches employed. Please note that savings from public sector

[4] Please note that while we separate savings into AIC and public sector savings elsewhere in this report, for purposes of CPAS, we report combined savings.

[5] Weighted Average Measure Life Report. Illinois Energy Efficiency Stakeholder Advisory Group. February 20, 2018.

[6] Ibid.

[7] Per guidance from AIC and the Illinois Commerce Commission (ICC), the WAML presented in this report is inclusive of both private and public sector savings as well as carryover savings from legacy IPA programs.

customers and Plan 3 IPA program carryover savings do not count toward AIC's energy efficiency goals for the Transition Period,[8] and therefore we report these savings separately throughout this report.

1.1 Overall Portfolio Results

At the portfolio level, the AIC programs had ex post net savings goals for the Transition Period of 77,329 MWh and 2,634,576 therms.[9] These savings goals are inclusive of customers previously available for AIC programs and do not include savings achieved by public sector customers, but do include carryover savings realized by discontinued past IPA programs. AIC exceeded these goals, achieving total net savings of 83,806 MWh and 2,947,129 therms.[10] The gross realization rates for the entire portfolio are 96% for MWh and 95% for therms. Table 1 and Table 2 present ex ante gross, ex post gross, and ex post net savings for each program.

Table 1. AIC Transition Period Portfolio MWh Savings Results

Program	Ex Ante Gross MWh	Gross Realization Rate[a]	Ex Post Gross MWh	Net-to-Gross Ratio (NTGR)[b]	Ex Post Net MWh
Residential Portfolio					
Retail Products	44,026	93%	40,832	59%	24,092
HVAC	2,417	100%	2,418	80%	1,943
Behavioral Modification[c]	22,575	98%	22,140	N/A	22,140
Multifamily	3,107	112%	3,492	88%	3,081
HEIQ	2,097	110%	2,309	100%	2,309
School Kits	459	79%	367	95%	348
Residential Total	***74,681***	***96%***	***71,558***	***75%***	***53,913***
C&I Portfolio					
Standard	32,111	100%	32,246	78%	25,259
Custom	6,734	86%	5,759	74%	4,268
RCx	436	92%	402	91%	366
C&I Total	***39,281***	***98%***	***38,407***	***78%***	***29,893***
AIC Total	**113,962**	**96%**	**109,965**	**76%**	**83,806**

Note: Some values may appear inconsistent due to rounding.
[a] Realization rate = ex post value ÷ ex ante value.
[b] Please note that these NTGRs are program level and may differ from SAG-approved values applied at the end-use level.
[c] Please note that all savings presented for the Behavioral Modification Program are determined through a randomized controlled trial (RCT) and are therefore inclusive of net effects.

[8] No public sector-specific energy efficiency goals were set for the Transition Period.
[9] Joint Verified Petition, Exhibit B, Docket 17-0212 (Filed April 27, 2017).
[Accessed: https://www.icc.illinois.gov/downloads/public/edocket/445934.pdf]
[10] AIC's goals are at the portfolio level. The utility does not have to meet program-specific goals.

Table 2. AIC Transition Period Portfolio Therm Savings Results

Program	Ex Ante Gross Therms	Gross Realization Rate[a]	Ex Post Gross Therms	NTGR[b]	Ex Post Net Therms
Residential Portfolio					
Retail Products	101,826	91%	93,080	90%	83,772
HVAC	90,682	88%	79,543	90%	71,589
Behavioral Modification[c]	1,081,748	80%	861,531	N/A	861,531
Multifamily	30,611	136%	41,677	89%	36,962
HEIQ	380,711	102%	387,038	100%	387,038
School Kits	8,625	68%	5,885	104%	6,123
Residential Total	***1,694,203***	***87%***	***1,468,754***	***99%***	***1,447,015***
C&I Portfolio					
Standard	1,539,400	100%	1,539,402	61%	933,198
Custom	671,637	102%	683,031	83%	566,916
RCx	0	N/A	0	N/A	0
C&I Total	***2,211,037***	***101%***	***2,222,433***	***67%***	***1,500,114***
AIC Total	**3,905,240**	**95%**	**3,691,187**	**80%**	**2,947,129**

Note: Some values may appear inconsistent due to rounding.
[a] Realization rate = ex post value ÷ ex ante value.
[b] Please note that these NTGRs are program level and may differ from SAG-approved values applied at the end-use level.
[c] Please note that savings presented for Behavioral Modification are determined through a RCT and are inclusive of net effects.

While there were no savings goals were set for public sector programs during the Transition Period, public sector programs achieved total net savings of 15,109 MWh and 316,324 therms. The gross realization rates for public sector programs overall are 95% for MWh and 79% for therms. Table 3 and Table 4 present ex ante gross, ex post gross, and ex post net savings for each public sector program.

Table 3. Public Sector Transition Period Portfolio MWh Savings Results

Program	Ex Ante Gross MWh	Gross Realization Rate[a]	Ex Post Gross MWh	NTGR[b]	Ex Post Net MWh
Residential Portfolio					
PHA	583	99%	578	100%	578
Public Sector CAC	247	143%	353	100%	353
Residential Total	***830***	***112%***	***931***	***100%***	***931***
C&I Portfolio					
Standard	11,231	96%	10,749	70%	7,574
Custom	7,851	90%	7,056	85%	5,970
RCx	496	130%	646	98%	633
C&I Total	***19,578***	***94%***	***18,451***	***77%***	***14,178***
Public Sector Total	**20,408**	**95%**	**19,382**	**78%**	**15,109**

Note: Some values may appear inconsistent due to rounding.
[a] Realization rate = ex post value ÷ ex ante value.
[b] Please note that these NTGRs are program level and may differ from SAG-approved values applied at the end-use level.

Table 4. Public Sector Transition Period Portfolio Therm Savings Results

Program	Ex Ante Gross Therms	Gross Realization Rate[a]	Ex Post Gross Therms	NTGR[b]	Ex Post Net Therms
Residential Portfolio					
PHA	26,350	70%	18,544	100%	18,544
Public Sector CAC	0	N/A	0	N/A	0
Residential Total	***26,350***	***70%***	***18,544***	***100%***	***18,544***
C&I Portfolio					
Standard	104,916	98%	102,893	60%	61,367
Custom	99,096	85%	83,796	74%	62,108
RCx	266,604	70%	185,432	94%	174,306
C&I Total	***470,616***	***79%***	***372,121***	***80%***	***297,780***
Public Sector Total	**496,966**	**79%**	**390,665**	**81%**	**316,324**

Note: Some values may appear inconsistent due to rounding.
[a] The ratio of ex post gross energy savings to ex ante gross energy savings. Residential and portfolio total calculations exclude residential lighting carryover, for which ex ante savings are not available.
[b] Please note that these NTGRs are program level and may differ from SAG-approved values applied at the end-use level.

Finally, Table 5 presents MWh savings achieved by Plan 3 IPA programs during the Transition Period. Note that while no IPA programs were in operation during the Transition Period, carryover savings resulting from operation of these programs in PY8 and PY9 were achieved. These savings are not applied to AIC's Plan 3 statutory goals and are therefore reported separately.

Table 5. IPA Transition Period Portfolio MWh Savings Results

Program	Ex Ante Gross MWh[a]	Gross Realization Rate	Ex Post Gross MWh	NTGR[a]	Ex Post Net MWh
Residential Portfolio					
IPA Residential Lighting	N/A	N/A	9,595	63%	6,024
IPA Rural Kits	N/A	N/A	343	71%	243
IPA MICK	N/A	N/A	189	100%	189
IPA CFL Distribution	N/A	N/A	972	100%	972
IPA Total	**N/A**	**N/A**	**11,099**	**67%**	**7,428**

Note: Some values may appear inconsistent due to rounding.
Note: Ex ante savings were not reported for carryover from standalone IPA programs.
[a] Please note that these NTGRs are program level and may differ from SAG-approved values applied at the end-use level.

1.2 Cumulative Persisting Annual Savings and Weighted Average Measure Life

Beginning in 2018, electric savings goals for the utilities are defined based on CPAS as a percentage of sales. As such, annual evaluations of AIC's programs moving forward will track CPAS. While savings achieved in the Transition Period do not count toward the statutory CPAS goals set for AIC, we present CPAS savings in this report as a first look at how savings will be tracked for AIC's programs in the future.

In addition, FEJA replaces the existing funding mechanism for energy efficiency in Illinois by allowing AIC to create a regulatory asset and amortize and recover the total expenditures of that regulatory asset "over a

period that is equal to the weighted average of the measure lives implemented for that year that are reflected in the regulatory asset."[11] This regulatory asset began in the Transition Period, and, therefore, we present WAML for AIC's energy efficiency programs in this report in accordance with the guidelines for calculation presented in the Illinois Stakeholder Advisory Group's (SAG) WAML Report.[12,13]

[11] Weighted Average Measure Life Report. Illinois Energy Efficiency Stakeholder Advisory Group. February 20, 2018.

[12] Ibid.

[13] Per guidance from AIC and the Illinois Commerce Commission (ICC), the WAML presented in this report is inclusive of both private and public sector savings.

Table 6 summarizes electric CPAS and WAML for the Transition Period portfolio at the program level. Savings presented are inclusive of public and private sector savings achieved by the programs, as well as carryover savings from IPA programs operated in PY8 and PY9. For additional detail around CPAS and measure life, please see the individual program chapters. In addition, we present an embedded Excel spreadsheet below summarizing CPAS and WAML by program at the measure level.

AIC Transition Period CPAS

Table 6. Transition Period Portfolio CPAS and WAML

Program	WAML	First-Year Ex Post Gross Savings (MWh)	CPAS - Ex Post Net Savings (MWh)								Lifetime Savings (MWh)[b]
			Transition Period[a]	2018	2019	2020	2021	...	2030	...	
Retail Products	8.91	50,427	30,116	30,116	30,116	21,346	12,575	...	0	...	161,996
HVAC	15.82	2,419	1,943	1,943	1,943	1,943	1,943	...	766	...	25,376
Behavioral Modification[c]	1.00	22,140	22,140	0	0	0	0	...	0	...	22,140
Multifamily	14.02	3,492	3,081	3,080	3,079	2,865	2,647	...	1,501	...	39,775
HEIQ	17.82	2,309	2,309	2,309	2,286	2,259	2,256	...	1,612	...	35,897
School Kits	8.35	368	348	348	326	272	217	...	0	...	2,505
PHA	8.79	578	578	578	571	565	539	...	172	...	4,653
Public Sector CAC	18.00	353	353	353	353	353	353	...	96	...	3,268
Standard	10.96	42,995	32,832	32,693	32,527	32,526	31,767	...	7,893	...	351,953
Custom	12.42	12,816	10,238	10,238	10,238	10,238	10,238	...	0	...	126,921
RCx	5.00	1,049	999	999	999	999	999	...	0	...	4,997
IPA Rural Kits	3.50	343	243	243	243	122	0	...	0	...	851
IPA MICK	3.50	189	189	189	189	95	0	...	0	...	662
IPA CFL Distribution	3.50	972	972	972	972	486	0	...	0	...	3,402
Transition Period CPAS		**140,450**	**106,341**	**84,062**	**83,843**	**74,068**	**63,534**	**...**	**12,039**	**...**	**784,395**
Expiring Transition Period CPAS			**0**	**22,280**	**22,499**	**32,273**	**42,807**	**...**	**94,302**	**...**	
Portfolio WAML	**8.94**										

[a] For the purposes of Transition Period CPAS reporting only, we consider the Transition Period to be a full year (e.g., 2017) to avoid any issues with scaling CPAS to a 7 month period. This challenge will not be presented during the 2018-2021 cycle.
[b] Lifetime savings are inclusive of all savings for the entire life of all measures. During the Transition Period, the longest-lived measures installed were insulation measures (at 25 years). Therefore, some CPAS exist through 2041.
[c] All savings presented for the Behavioral Modification Program are inclusive of net effects. Therefore, the column titled "First-Year Ex Post Gross Savings (MWh)" presents first-year ex post net savings for this program.

2. Evaluation Approach

The Transition Period impact evaluation approach included program-specific activities with the primary goal of providing gross and net energy and demand impacts. This section outlines the impact evaluation activities for each of the Transition Period programs. The Transition Period evaluation included the calculation of gross and net impact estimates associated with each program.

For the majority of programs, the impact evaluation consisted of applying savings algorithms from the Illinois Technical Reference Manual (IL-TRM) V5.0 to final program tracking databases to estimate ex post gross savings. However, the team employed a combination of engineering desk reviews, on-site verification, and consumption analysis to select programs and/or measures (Behavioral Modification, PHA, Standard, Custom, and RCx). For programs we evaluated in Program Year 9 (PY9) (all non-public sector focused offerings), we used an evaluation approach consistent with our PY9 evaluations.

Volume II of this report, provided under a separate cover, provides detailed methodology and supplemental information for certain program evaluations.

2.1 Research Objectives

The overarching research objectives for the impact evaluation of AIC's Transition Period programs are as follows:

1. What were the estimated gross energy and demand impacts from this program?
2. What were the estimated net energy and demand impacts from this program?

The evaluation team met these objectives by conducting the impact evaluation activities outlined in Table 7. As noted previously, the evaluation approaches outlined here are consistent with the PY9 impact evaluations. In addition, we reviewed program materials and interviewed all program managers.

Table 7. Transition Period Impact Evaluation Activities

Program	Gross Impacts				Net Impacts	
	IL-TRM Application Review	Participant Interviews	Engineering Desk Reviews	On-Site Verification	Consumption Analysis	Application of SAG-Approved NTGR
Retail Products	✓					✓
HVAC	✓					✓
Behavioral Modification					✓	
Multifamily	✓					✓
HEIQ	✓					✓
PHA	✓		✓			✓
Public Sector CAC	✓					✓
School Kits	✓					✓
Standard	✓		✓			✓
Custom		✓	✓	✓		✓
RCx			✓	✓		✓

The following sections provide further detail on the gross and net impact evaluation activities.

2.2 Gross Impact Analysis Approach

2.2.1 Application of IL-TRM V5.0

To determine gross impacts associated with the majority of AIC's programs (see Table 7), we reviewed the content of program tracking databases to identify database errors and duplicate records and to ensure that the implementer correctly applied savings algorithms and assumptions stated in the IL-TRM V5.0. We applied the algorithms and assumptions provided in the IL-TRM V5.0, while using the actual data from the program tracking databases. As part of this process, we also verified measure installations through analysis of program tracking databases, as well as through the review of supporting project documentation.

We resolved any discrepancies found in the databases and provide details related to any gross savings adjustments in the program-specific sections of this report.

2.2.2 Application of Custom Impact Methods

A smaller number of AIC's Transition Period programs are not suitable for gross impact analysis using the IL-TRM. The C&I Custom and RCx offerings require custom energy savings calculations to determine all program gross impacts. In addition, for a number of measures provided through public sector programs during the Transition Period (notably the PHA Program and the STEP offering), we conducted engineering desk reviews to determine savings as the program tracking data did not appear to follow the IL-TRM. Finally, we estimated net savings for the Behavioral Modification Program using methods that are described in Section 2.3.1.

Commercial and Industrial Custom

To review and verify savings assumptions, the team conducted engineering desk reviews and/or on-site verification for all 44 projects[14] completed through the Custom Program during the Transition Period.[15] These activities included an examination of existing equipment and/or program measurement and verification (M&V) measurements. At a minimum, the review engineer performed the following actions during on-site verification:

- Verify that the installed measure(s), for which the program participants received an incentive payment, is/are still installed and functioning, and that the quantity is consistent with the number of measures the program rebated.
- Collect additional physical data to further analyze and determine the energy savings resulting from the incented measure(s). The pertinent data collected from each site are determined based on in-depth review of the site's project files and are unique to each installed measure.

We conducted a total of 11 engineering desk reviews and 33 on-site verifications. In addition, we submitted formal M&V plans and reports for five of the largest Custom Program projects. No other M&V sites have a written site-specific plan or report.

[14] Projects achieving savings.

[15] Historically, we have conducted on-site review of a sample of Custom projects. However, given the population of projects completed through the program in the Transition Period (44), the new inclusion of public sector projects, and the additional effort to develop a rigorous sample design in a short time period, we believed that attempting a census of all projects would provide AIC with the most accurate and actionable results. Because we examined all projects, there is no sampling error associated with our impact estimates.

We shared the site visit results with AIC and Illinois Commerce Commission (ICC) staff in advance of submitting the draft Transition Period report. The Excel file and Custom Program project site reports provided for review and discussion include the ex ante and ex post savings for each project, the resulting realization rate, and the reasons for the realization rate. We will also hold a meeting with AIC and Leidos (the program implementer), as well as with ICC staff, to discuss the findings and answer any questions prior to finalization of the report.

Based on the results from the engineering desk reviews and on-site verification, we calculated the gross impacts for each site and summed them to determine total program ex post gross savings estimates.

Commercial and Industrial Retro-Commissioning

Similar to the gross impact analysis approach for the Custom Program, the impact analysis for the Transition Period RCx Program employs a bottom-up approach to estimating gross savings based on engineering desk reviews and/or on-site verification for all six projects[16] completed through the RCx Program during the Transition Period. Because we examined all projects, there is no sampling error associated with our impact estimates.

We conducted a total of four engineering desk reviews (for the public sector projects completed through the Program) and two on-site verifications (for the private sector projects completed through the Program).

We shared the site visit results with AIC and ICC staff in advance of submitting the draft Transition Period report. The Excel file provided for review and discussion includes the ex ante and ex post savings for each project, the resulting realization rate, and the reasons for the realization rate. We will also hold a meeting with AIC and Leidos, as well as with ICC staff, to discuss the findings and answer any questions prior to finalization of the report.

Based on the results from the engineering desk reviews and on-site verification, we calculated the gross impacts for each site and summed them to determine total program ex post gross savings estimates.

2.3 Net Impact Analysis Approach

To determine net savings for Transition Period programs, we applied SAG-approved net-to-gross ratios (NTGRs) to ex post gross savings for savings completed by private sector customers.[17] An exception to this approach is made for the Behavioral Modification Program, which is evaluated using a consumption analysis approach, which yields net impact results. We describe our approach to the Behavioral Modification Program in Section 2.3.1.

For public sector customers, we applied different NTGRs based on directives in the Transition Period Final Order. In particular, we leverage past DCEO evaluation research to determine the most appropriate NTGRs to apply for each program.

[16] Projects achieving savings.

[17] Electric Program Year 9/Gas Program Year 6 NTG Recommendations (http://www.ilsag.info/ntg_2016.html).

Since we did not formally include most public sector programs in our AIC NTGR recommendations for this period, we outline the choices we made for public sector programs in Table 8 below. Our chosen NTGRs align with the NTGRs used by the other evaluation teams in Illinois.[18]

Table 8. NTGRs for Public Sector Programs

Program	NTGR			Source
	kWh	kW	Therms	
PHA	100%			SAG consensus for low-income programs
Public Sector CAC				
Standard (STEP offering)	96%	96%	90%	PY7 DCEO STEP Evaluation
Standard (Municipality Owned Street Lighting offering)	100%	100%	N/A	Evaluation assumption aligning with other IL evaluators
Standard (Other offerings)	65%	65%	46%	PY7 DCEO Public Sector Standard Program Evaluation
Custom (BOC offering)	100%			Savings estimates inclusive of net effects
Custom	83%	82%	74%	PY7 DCEO Public Sector Custom Program Evaluation
Retro-Commissioning	98%	103%	94%	PY7 DCEO Public Sector Retro-Commissioning Program Evaluation

2.3.1 Behavioral Modification Consumption Analysis

The team used a monthly consumption analysis approach to determine impacts from the Behavioral Modification Program. Given the experimental design, the estimated savings are considered net savings. We used treatment and control group monthly billing data to estimate net savings per household over the program period. The net savings are further adjusted using channeling analysis to ensure that savings are not double-counted between programs. We also compared Oracle's (the program implementer) estimated gas and electric savings to those we developed for this evaluation.

To strengthen the internal validity and defensibility of the research design, we conducted an equivalency analysis to ensure that the treatment and control groups were comparable. This analysis involved comparing the pre-program energy consumption for treatment and control groups for each cohort. The program added a new gas-only cohort (Expansion Cohort 8) in September 2017. For newly added cohorts, we typically compare demographic, housing, and psychographic data of the treatment and control groups. However, we did not conduct this additional analysis because Expansion Cohort 8 entered the program with only three months left in the program period. Further, the program will begin the next program year with a new vendor and a newly selected cohort of customers.

[18] Detailed in memos available at http://www.ilsag.info/ntg_2018.html

Data sources include:

- For all customer treatment and control groups, gas consumption/billing data from July 2009 to December 2017
- AIC program tracking data for all residential programs from June 2011 to December 2017
- Data from Oracle, including raw data files, any code used for data cleaning and analysis, final data files, and model outputs.

Sampling

The billing analysis includes all cohorts.[19] For the cohorts previously evaluated—Original Cohort and Expansion Cohorts 1 through 7—some attrition might have occurred. Therefore, we compared the treatment and control groups on pre-participation period[20] usage only to ensure continued equivalence. Because we found that the populations are equivalent on energy consumption, no sampling occurred for the billing analysis, and we included all available data in our analysis. If the treatment and control groups were found to be dissimilar, we would have selected two matched samples from the populations of treatment and control group members for this analysis.

Model Specifications

The evaluation team used a consumption analysis approach for the Transition Period that is similar to the method used for the PY9 evaluation. Specifically, we used an intent-to-treat (ITT) approach and estimated savings using a difference-in-differences (DID) approach. The DID refers to the model's implicit comparison of consumption before and after treatment of both treatment and control group customers. The model includes customer-specific intercepts (i.e., fixed effects) to capture unobserved differences between customers that do not change over time and that affect customers' energy use.

As part of the impact analysis, we used three different models to aid in comparisons of results from previous evaluations:

1. An overall model (Equation 1) that incorporates the post-participation period only. This is the lagged dependent variable (LDV) model, which is consistent with program implementer modeling and does a better job of modeling program impacts given Oracle's exclusion criterion of only 90 days pre-participation period data.
2. An overall model with the addition of weather adjustments (Equation 2), which allows direct year-to-year savings comparison.
3. A simple overall model (Equation 3), which is consistent with previous years' evaluations.

We provide impact estimates for the program using the LDV model in Section 3.1.3. LDV models use seasonal usage from the pre-participation period, but do not explicitly adjust for weather differences between the pre-

[19] Though Expansion Cohort 8 was added in September 2017, we estimate net energy savings for these customers over the remainder of the Transition Period (October–December) because the 2018 program year starts with a new program implementer and a new cohort.

[20] We defined the pre-participation period as the 12 months before the customer's first report. The month in which a customer receives his or her first report is neither the pre-participation period nor the post-participation period. The post-participation period is the time period after the month in which the customer received his or her first report. For the purposes of this evaluation, we focused specifically on the Transition Period post-participation period and dropped post-participation period data outside of the program year window (June 2017 to December 2017). Note that in a few cases, there are some bills that extended into January 2018.

and post-treatment periods. We provide results using the second model to allow for comparisons of savings year over year, and the third model to provide results using the most basic model specification. Results from the second and third models are presented in Volume II of this report. Our model specifications are explained below.

Model 1: Post-Participation Only Model

For reporting purposes, and to enable comparisons to program implementer-supported models (i.e., Oracle's estimates), we estimated an LDV model. An LDV model differs from the linear fixed effects regression (LFER) model in that only usage from the post-participation period is used in estimating the model. Information from the pre-participation period is used only to calculate pre-usage variables that are incorporated into the LDV model, but pre-participation period usage is not directly modeled. Following last year's evaluation, we used three levels of pre-participation period usage for each customer: overall pre-participation period average daily consumption (ADC), summer pre-participation period ADC, and winter pre-participation period ADC. The LDV model uses the control group in the same way that the LFER model does, in that the treatment effect is corrected for control group ADC so that the coefficient of the treatment variable is the average ITT effect. We employed the following estimating equation:

Equation 1. Post-Participation Period Only Model Estimating Equation

$$ADC_{it} = \alpha_i + \beta_1 Treatment_i + \beta_2 PreUsage_i + \beta_3 PreWinter_i + \beta_4 PreSummer_i + \beta_5 MonthYear_t + \beta_6 PreUsage_i \cdot MonthYear_t + \beta_7 PreWinter_i \cdot MonthYear_t + \beta_8 PreSummer_i \cdot MonthYear_t + \varepsilon_{it}$$

Where:

ADC_{it} = ADC (therms or kWh) for household *i* at time *t*

α_i = Household-specific intercept

β_1 = Coefficient for the change in consumption for the treatment group

β_2 = Coefficient for the ADC across household *i* available pretreatment meter reads

β_3 = Coefficient for the ADC over the months of December through March across household *i* available pretreatment meter reads

β_4 = Coefficient for the ADC over the months of June through September across household *i* available pretreatment meter reads

β_5 = Vector of coefficients for month-year dummies

β_6 = Vector of coefficients for month-year dummies by average daily pretreatment usage

β_7 = Vector of coefficients for month-year dummies by average daily winter pretreatment usage

β_8 = Vector of coefficients for month-year dummies by average daily summer pretreatment usage

$Treatment_i$ = Variable to represent treatment and control groups (0 = control group, 1 = treatment group)

$PreUsage_i$ = ADC for household *i* over the entire pre-participation period

$PreWinter_i$ = ADC for household *i* over the pre-participation months of December through March

$PreSummer_i$ = ADC for household *i* over the pre-participation months of June through September

$MonthYear_t$ = Vector of month-year dummies

ε_{it} = Error

Model 2: Weather-Adjusted Model

To enable better comparisons across program years, we incorporated weather terms. This process also improved the precision in the modeled results by accounting for possible differences in weather experienced by the study population. We controlled for weather by accounting for heating degree days (HDDs) and cooling degree days (CDDs), using a base of 65°F for HDD and 75°F for CDD. This model also helps account for differences between treatment and control group usages that correlate with weather.

Equation 2. Weather-Adjusted Model Estimating Equation

$$ADC_{it} = \alpha_i + \beta_1 Post_t + \beta_2 Treatment_i \cdot Post_t + \beta_3 HDD_{it} + \beta_4 CDD_{it} + \varepsilon_{it}$$

Where:

$ADC_{it}, \alpha_i, Treatment_i$ and ε_{it} are defined as above in Equation 1

β_1 = Coefficient for the change in consumption between pre- and post-participation periods

β_2 = Coefficient for the change in consumption for the treatment group in the post-participation period compared to the pre-participation period and to the control group; this is the basis for the net savings estimate

β_3 = Coefficient for HDD

β_4 = Coefficient for CDD

$Post_t$ = Variable to represent the pre- and post-participation periods (0 = pre-participation period, 1 = post-participation period)

HDD_{it} = Sum of HDD (base 65°F)

CDD_{it} = Sum of CDD (base 75°F)

Model 3: Original Model

Equation 3. Original Model Estimating Equation

$$ADC_{it} = \alpha_i + \beta_1 Post_t + \beta_2 Treatment_i \cdot Post_t + \varepsilon_{it}$$

Where:

$ADC_{it}, \alpha_i, Treatment_i$ and ε_{it} are defined as above in Equation 1

β_1, β_2, and $Post_t$ are defined as above in Equation 2

Channeling Analysis

We calculate a savings adjustment to account for the portion of net savings estimated from the billing analysis that has been claimed by other AIC programs. Savings from the Behavioral Modification Program reflect both non-purchase behavioral changes, such as turning off lights in unoccupied rooms and adjusting thermostat settings, and investments in energy-saving equipment, such as high-efficiency furnaces and compact fluorescent lamps (CFLs), or other purchase behaviors. Savings from measures that were rebated through AIC's energy efficiency programs appear in both the Behavioral Modification Program and the rebate programs, and thus would be double-counted if an adjustment were not made.

To ensure that we do not double count savings across programs, we calculate a savings adjustment that removes savings that result from this uplift. To calculate this adjustment, we first calculate the participation uplift resulting from the Behavioral Modification Program, and then apply a median savings value per uplifted participant to this uplift to calculate savings uplift. We then deduct these savings from our original estimate of program savings. We also include a "legacy uplift," deducting savings from measures installed in prior program years.

This piece of the savings is subtracted from the savings estimated by billing analysis. Customers in the treatment and control groups are assumed to receive the same treatment from the utility for the program promoting Measure A (i.e., they face the same marketing and incentives). Because customers were randomly assigned to the treatment and control groups, any difference between the groups in the installation of Measure A can be attributed to the Behavioral Modification Program. We base the savings associated with participation in other AIC programs on the deemed savings values associated with the measures other programs have claimed in the Transition Period. As such, we conduct a participation lift and channeling analysis (incorporating historical trend analysis) to assess trends in program participation over time and adjusted net savings estimates. This analysis also accounts for and removes channeling savings for current participants from prior program years (PY3 – the Transition Period).

During the Transition Period only, we apply an adjustment factor of 7/12 to the channeling adjustment. The channeling analysis estimates first-year energy savings associated with measure installations, but the consumption analysis for the Behavioral Modification Program determines savings only for the period the program was active (7 months). We therefore apply this adjustment factor to ensure an appropriate savings deduction during the Transition Period.[21]

2.4 Sources and Mitigation of Error

The evaluation team took steps to mitigate potential sources of error throughout the planning and implementation of the Transition Period evaluation. In particular, we took the following actions to address potential sources of non-survey related error.

- **Analysis Error:** For gross impact calculations, we applied IL-TRM V5.0 calculations to the participant data in the tracking database to calculate gross impacts. To minimize data analysis error, a separate team member reviewed all calculations to verify their accuracy. For net impact calculations, we applied

[21] The evaluation team notes that, because the Transition Period does not incorporate a full heating season unlike all previous program years evaluated, an inherent bias is likely to exist in the results of the channeling analysis that penalizes the program disproportionately for heating impacts achieved through measure installations from other AIC programs. Unfortunately, because measure savings for other AIC programs are annualized and the channeling analysis uses these savings in calculation of a deduction, this challenge is insurmountable for the Transition Period. However, we expect that this effect is small and does not create significant bias in overall savings results for the Program. Channeling adjustments in future years will not be affected.

SAG-approved NTGRs to estimated gross impacts to derive the program's net impacts. To minimize analytical errors, all calculations were reviewed by a separate team member to verify their accuracy.

For the Behavioral Modification Program, we also worked to address the following types of error:

- **Model Specification Error**: The most difficult type of modeling error, in terms of bias and the ability to mitigate it, is specification error. In this type of error, variables that predict model outcomes are included when they should not be or left out when they should be included, possibly producing biased estimates. The team addressed this type of error by using a fixed-effects model, which adjusts for constant differences from one household to the next using customer-specific intercepts. Over time, treatment and control groups in a randomized experiment can drift apart due to attrition, causing imbalance between the groups that must be addressed in the model specification. When there is imbalance in consumption, weather, or other factors between treatment and control groups, model specification error can become much more pronounced. For this reason, the team also included models that control for weather conditions to account for differences in temperatures experienced by treatment and control populations.

- **Measurement Errors**: Measurement error can come from variables such as weather data, which are commonly included in the billing analysis models. If an inefficient base temperature is chosen for calculating degree-days or if an incorrect climate zone weather station is chosen, the model results could be subject to measurement error. We addressed this type of error by very carefully choosing the closest weather station for each customer in the model. Specifying an incorrect time period (either pre-treatment or post-treatment) can also lead to measurement error. To the extent that the data received from the program implementer are correct, this should not be a problem; however, little can be done if there is an error in the source data.

- **Multi-collinearity**: This type of modeling error can both bias the model results and produce very large variances in the results. The team dealt with this type of error by using model diagnostics such as variance inflation factor (VIF), though the relatively simple models used in the impact analysis have essentially no chance of problems with multi-collinearity.

- **Heteroskedasticity**: This type of modeling error can result in imprecise model results due to variance changing across customers with different levels of consumption. The team addressed this type of error by using robust standard errors. Most statistical packages offer a robust standard error option and make conservative assumptions in calculating the errors, which has the effect of making significance tests conservative as well.

- **Serial Correlation**: This type of modeling error can result in imprecise model results (due to multiple observations being highly correlated within the customer). The team addressed this type of error by clustering the errors by customer and using robust error estimation.

3. Program-Level Results

3.1 Retail Products

3.1.1 Program Description

The AIC Retail Products Program builds on the Residential Lighting Program, which for nine years aimed to transform the residential lighting market in AIC territory by increasing customers' awareness and use of ENERGY STAR® (ES) lighting. As in past years, the program partners with retailers and lighting manufacturers to sell ES lighting at a discount to bring the cost closer to that of less-efficient lighting options. These discounts encourage customers who are reluctant to pay full price for ES lighting to choose energy-efficient over standard lighting. During the Transition Period, AIC added smart thermostat rebates to what is now the Retail Products Program. As the program continues over the next four years, AIC will add products to the program. Customers could purchase up to two qualifying smart thermostats at the retailer of their choice and submit a mail-in rebate application for $100 per thermostat. The program is implemented by CLEAResult.

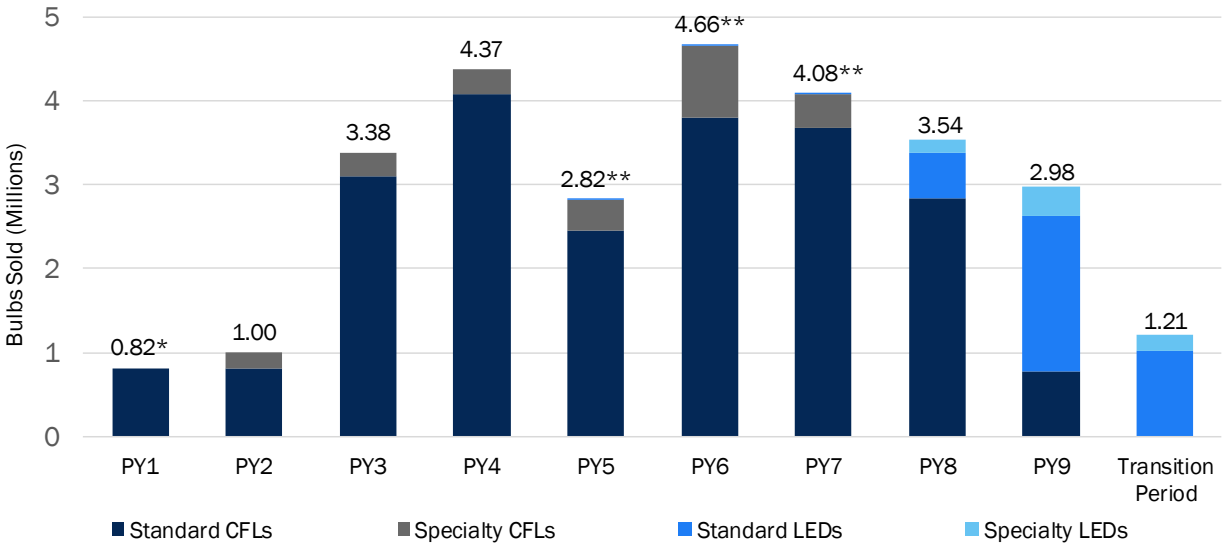
Summary of Program Design and Implementation Changes

The most significant change to program design and implementation during the Transition Period was the addition of smart thermostat rebates. Implementation of the retail lighting portion of the program was largely similar to PY9 and included discounts across a range of ES LED products at point of sale. For the first time since the start of the lighting program in 2008, CFLs were excluded from the product mix. As in previous years, the program conducted marketing and educational efforts at participating retailers and provided extensive training and retail support.

3.1.2 Program Performance

The Retail Products Program discounted 1,212,226 LED light bulbs during the Transition Period at participating retail stores. The Transition Period included 7 months, whereas each previous program year reflects a full 12 months. Monthly Transition Period sales amounted to 70% of the monthly average bulb sales in PY9. Figure 1 shows program bulb sales from PY1 through the Transition Period.

Figure 1. Total Bulbs Sold, PY1 through the Transition Period



* We do not have a record of the number of CFLs sold by type for PY1.
** Indicates that LEDs were sold but that the quantity is too small for the bar to be visible.

Smart thermostats were also incorporated into the formerly lighting-focused program. The program provided rebates for 1,916 smart thermostats during the Transition Period.

Sales by Product Type

Table 9 provides additional detail about the mix of products sold by the program during the Transition Period. Standard bulbs dominated program sales accounting for 85% of bulbs sold. Reflector products account for 9% of sales, and other specialty products make up 6% of sales. Thermostats account for a miniscule share of program sales relative to lighting, as might be expected due to their higher price tag and the simple fact that any given home uses many more light bulbs than it does thermostats.

Table 9. Bulb Sales by Bulb Type

	Bulb Type	Bulb Sales	Share of Sales
Standard LEDs	Standard/A-line	1,026,215	85%
Specialty LEDs (Reflector)	BR	83,613	7%
	PAR/MR	21,564	2%
	R20	2,630	<1%
Specialty LEDs (Other)	Decorative	59,931	5%
	Globe	15,027	1%
	3-way	3,246	<1%
Thermostats	Smart Thermostat	1,916	<1%
Total		**1,212,226**	**100%**

Sales by Store Category

Over the course of the Transition Period, the program engaged 15 retailers. Consistent with past years, Big Box retailers and do-it-yourself (DIY) stores sold the greatest share of discounted bulbs, cumulatively accounting for 73% of bulb sales. Table 10 provides a breakdown of lighting sales by retail channel.

Table 10. Bulb Sales by Retail Channel

Retail Channel	Bulb Sales	Share of Sales
Big Box	458,015	38%
DIY	427,469	35%
Club	168,711	14%
Discount	65,734	5%
Hardware	64,405	5%
Grocery	27,892	2%
Total	**1,212,226**	**100%**

3.1.3 Impact Results

Measure Verification

For the Transition Period, CLEAResult provided a goal-tracking worksheet that contained invoiced sales data for each lighting product sold at each participating retailer and included per-unit and total gross and net energy savings with summarized assumptions. The same file also included records of all thermostat rebate recipients and included ex ante energy, demand, and gas savings for each customer.

We verified program participation by examining both the lighting sales data and the thermostat participation data for product or customer eligibility and time of sale. Our review of the program tracking data found that all product sales were made during the eligible time period and for eligible products. We also cross-checked bulb specifications with product descriptions and corrected several minor discrepancies.

Gross Impacts

Because some bulbs are inevitably stored by customers for later use, an in-service rate (ISR) is required to calculate the gross savings achieved in the Transition Period. We used the method outlined in the IL-TRM V5.0 that banks savings from a portion of sales for application in future years. The IL-TRM method assumes that 98% of bulbs will be installed within three years and that 2% of bulbs will never be installed. The "actual" ex post gross savings achieved in the Transition Period could therefore include a combination of bulb sales from PY8, PY9, and the Transition Period that were installed in the Transition Period. However, because AIC did not fund the program in PY8 or PY9, bulbs sold during those program years are excluded from Transition Period savings; savings reported here reflect only savings from bulbs sold through the Transition Period program. Volume II of this report contains additional details about the savings assumptions we used to calculate program savings for the Transition Period.

Table 11 outlines the ex post gross savings for the Transition Period Retail Products Program. As can be seen in the table, the program achieved 40,832 MWh in ex post gross energy savings, 4.74 MW in ex post gross demand savings, and 93,080 therms in ex post gross gas savings. The realization rates are 93% for gross electric energy savings, 85% for gross electric demand savings, and 91% for gross therm savings.

Because some bulbs are inevitably stored by customers for later use, an in-service rate (ISR) is required to calculate the gross savings achieved in the Transition Period. We used the method outlined in the IL-TRM V5.0 that banks savings from a portion of sales for application in future years. The IL-TRM method assumes that 98% of bulbs will be installed within three years and that 2% of bulbs will never be installed. The "actual" ex post gross savings achieved in the Transition Period could therefore include a combination of bulb sales from PY8, PY9, and the Transition Period that were installed in the Transition Period. However, because AIC did not fund the program in PY8 or PY9, bulbs sold during those program years are excluded from Transition Period savings; savings reported here reflect only savings from bulbs sold through the Transition Period program. Volume II of this report contains additional details about the savings assumptions we used to calculate program savings for the Transition Period.

Table 11. Transition Period Retail Products Program Gross Impacts

Measure	Energy (MWh)		Demand (MW)		Gas (Therms)	
	Ex Ante	Ex Post	Ex Ante	Ex Post	Ex Ante	Ex Post
Lighting	43,260	40,120	5.40	4.56	N/A	N/A
Thermostats	766	712	0.19	0.17	101,826	93,080
Total Transition Period Gross Savings	**44,026**	**40,832**	**5.59**	**4.74**	**101,826**	**93,080**
Transition Period Achieved Gross Realization Rate[a]	**93%**		**85%**		**91%**	

[a] Gross realization rate = ex post value ÷ ex ante value.

The program implementation team used assumptions from prior evaluations and the IL-TRM V5.0 to calculate ex ante savings. The differences are attributable to a combination of several ex post assumptions that differed somewhat from ex ante ones.

- **Lighting Residential/Commercial Installations:** The evaluation team used slightly higher estimates of the percentage of residential installations (97% versus 96% or 94%, depending on bulb type) and slightly lower estimates of commercial installations than the implementer (3% versus 4% or 6%, depending on bulb type). We drew our estimate from AIC PY8 in-store intercept LED results. As a result, ex post savings are lower than ex ante savings.

- **Lighting Commercial Installation Rate:** The evaluation team used a slightly lower commercial ISR than the implementer used to calculate ex ante savings (95.0% versus 95.7%). The lower value used for ex post savings is recommended by the IL-TRM V5.0 based on in-store intercepts that captured sales for both residential and commercial application. As a result, ex post first-year savings are lower than ex ante savings.

- **Multiple Thermostat Purchases:** For thermostats, the difference between ex ante and ex post gross savings is almost entirely attributable to the treatment of multiple thermostats installed at the same location. Because IL-TRM savings assumptions are based on the household and not the measure, the IL-TRM V5.0 specifies that the program can claim savings only from a single thermostat even if a customer purchases and installs more than one. The program implementer estimated savings for all thermostats discounted regardless of the number installed per household. The evaluation team did not include savings from a second thermostat installed in the same household. As a result, ex post savings are lower than ex ante savings.

- **Thermostat Leakage:** Based on the address provided by the customer on the rebate application, we identified and excluded five thermostats installed outside of AIC service territory from ex post savings. As a result, ex post savings are lower than ex ante savings.

- **Thermostat Savings from Furnace Fans:** The implementer did not include energy savings from furnace fans for all AIC electric customers with gas heating systems. As a result, ex post savings are greater than ex ante savings.

Table 12 provides the savings values from sales made in the Transition Period that are claimed in the Transition Period and those that will carry over to 2018 and 2019 due to their later installation.[22]

Table 12. Retail Products Program Gross Impacts for Transition Period through 2019

Measure	Energy (MWh)			Demand (MW)			Gas (Therms)
	Transition Period	2018	2019	Transition Period	2018	2019	Transition Period
Standard LEDs	31,041	523	457	3.48	0.06	0.05	N/A
Specialty LEDs	9,079	153	134	1.08	0.02	0.02	N/A
Thermostats	712	N/A	N/A	0.17	N/A	N/A	93,080
Total	**40,832**	**676**	**591**	**4.74**	**0.08**	**0.07**	**93,080**

Note: Savings shown are exclusively from products sold during the Transition Period.

Net Impacts

Ex post net savings claimed in the Transition Period are composed of lighting sales from Transition Period sales of lighting and other energy-efficient products installed during the Transition Period. To calculate ex post net savings, we applied NTGRs approved by the SAG for each program year to the sales made in that year. The program achieved 24,092 MWh in ex post net energy savings, 2.82 MW in ex post net demand savings, and 83,772 therms in ex post net gas savings (Table 13). The realization rates are 93% for net energy savings, 84% for net demand savings, and 82% for net therm savings. In addition to the differences between ex ante and ex post gross savings discussed above, we identified two reasons why ex ante and ex post net savings differ:

[22] For further detail on carryover savings, please see Volume II of this report.

- **Thermostat NTGR:** The implementer used a NTGR of 1.0, whereas we used the SAG-approved NTGR of 0.90. As a result, ex post net savings are lower than ex ante net savings.

Table 13. Transition Period Retail Products Program Net Energy Impacts

Measure	Energy (MWh)		Demand (MW)		Gas (Therms)	
	Ex Ante	Ex Post	Ex Ante	Ex Post	Ex Ante	Ex Post
Lighting	25,277	23,451	3.16	2.67	N/A	N/A
Thermostats	766	641	0.19	0.16	101,826	83,772
Total Transition Period Net Savings	**26,043**	**24,092**	**3.34**	**2.82**	**101,826**	**83,772**
Transition Period Achieved Net Realization Rate[a]	**93%**		**84%**		**82%**	

[a] Net realization rate = ex post value ÷ ex ante value.

Cumulative Persisting Annual Savings and Weighted Average Measure Life

Table 14 presents CPAS and WAML for the Transition Period Retail Products Program. Consistent with guidance received from AIC and ICC Staff, CPAS and WAML include savings achieved through IPA program carryover, clearly indicated below.

Table 14. Retail Products Program CPAS and WAML

Measure	Measure Life	First-Year Ex Post Gross Savings (MWh)	CPAS - Ex Post Net Savings (MWh)							Lifetime Savings (MWh)
			Transition Period	2018	2019	2020	2021	...	2030	...	
Standard LEDs (Transition Period - Year 1)[a]	10.0	31,041	18,004	18,004	18,004	12,039	6,074	...	0	...	90,347
Specialty LEDs (Transition Period - Year 1)	10.0	9,079	5,448	5,448	5,448	5,448	5,448	...	0	...	43,580
Standard LEDs (Carryover from PY9 IPA)[a,b]	10.0	520	302	302	302	201	99	...	0	...	1,503
Specialty LEDs (Carryover from PY9 IPA)[b]	10.0	415	249	249	249	249	249	...	0	...	1,990
Standard CFLs (Carryover from PY9 IPA)[a,b]	3.5	1,978	1,246	1,246	1,246	623	0	...	0	...	4,362
Standard LEDs (Carryover from PY8 IPA)[a,b]	10.0	143	105	105	105	71	37	...	0	...	530
Specialty LEDs (Carryover from PY8 IPA)[b]	10.0	38	28	28	28	28	28	...	0	...	223
Standard CFLs (Carryover from PY8 IPA)[a,b]	3.5	6,500	4,095	4,095	4,095	2,047	0	...	0	...	14,332
Smart Thermostats	10.0	712	641	641	641	641	641	...	0	...	5,128
Transition Period CPAS		**50,427**	**30,116**	**30,116**	**30,116**	**21,346**	**12,575**	**...**	**0**	**...**	**161,996**
Expiring Transition Period CPAS			**0**	**0**	**0**	**8,771**	**17,541**	**...**	**30,116**	**...**	
WAML	**8.9**										

[a] For standard bulbs, a baseline shift created by EISA 2020 occurs before the end of savings life, producing the decreasing savings seen.
[b] Carryover savings are presented in CPAS tables for the year in which they are claimed.

3.1.4 Key Findings

Based on the results of this evaluation, the evaluation team offers the following key finding and recommendation for the program moving forward:

- **Key Finding #1:** Several IL-TRM savings assumptions for smart thermostats differ for single-family versus multifamily homes. However, the rebate application did not collect information on the housing type of participants. As such, the implementer and the evaluation team assumed that 100% of thermostats were installed in single-family homes given the nature of the measure and the likelihood of its installation in single-family homes.
  - **Recommendation:** Add home type to the rebate application to increase the accuracy of savings estimates.

3.2 HVAC

3.2.1 Program Description

AIC has offered HVAC incentives to its customers since June 2009. During the Transition Period, the HVAC Program offered incentives for high-efficiency air source heat pumps (ASHPs), electronically commutated motors (ECMs), thermostats (programmable and smart), and pool pumps. Program requirements included sizing specifications, efficiency standards, and other features (e.g., a matching indoor and outdoor coil requirement for new air conditioning equipment).

Since PY4, AIC has not changed the incentive design for the HVAC Program and has passed the incentives through registered trade allies as direct discounts for residential customers. The incentive appears as a line item deduction on contractors' installation invoices. By offering these incentives, AIC sought to persuade customers to purchase higher-efficiency equipment than they might install otherwise.

Since the standard replace-on-burnout (RB) ASHP measure was dropped in August 2016, the only remaining ASHP measure offered in the Transition Period was the early replacement (ER) ASHP. To be considered ER, a unit being replaced had to be verifiably operable and had to have a seasonal energy efficiency ratio (SEER) rating of 10 or less. Through this offering, the program encouraged customers to retire existing inefficient equipment for newer, more-efficient units.

Summary of Program Design and Implementation Changes

While there will be significant changes to the program in 2018, there were very few changes to the HVAC Program for the Transition Period. Overall, program staff maintained the same offerings and processes as in PY9. The few changes that occurred during the Transition Period include:

- Thermostat measures were moved to the Retail Products Program in August 2017, along with savings from the measure.
- On-bill financing (OBF) was not available throughout the Transition Period, as funding was exhausted in early September 2017.

In addition, program staff offered to train contractors on the installation of ASHP equipment. The program also saw a transition of staff and responsibilities from CLEAResult to Leidos, as the CLEAResult contract for the program expired on December 31, 2017.

3.2.2 Program Performance

In the Transition Period, the measure mix remained limited. As described above, participation was affected by the movement of smart thermostats to the Retail Products Program in August 2017. In addition, strong winter sales of ECMs, which program staff attributed to a colder winter season compared to the previous year, helped drive participation in the program. Overall, 3,149 measures were installed in the Transition Period by 2,899 overall unique participants (see Table 15). Program staff reported that despite the limited measures offered and the transition of the smart thermostat offering, participation levels met expectations.

Table 15. Program Participation (Unique Participants) PY6 through the Transition Period

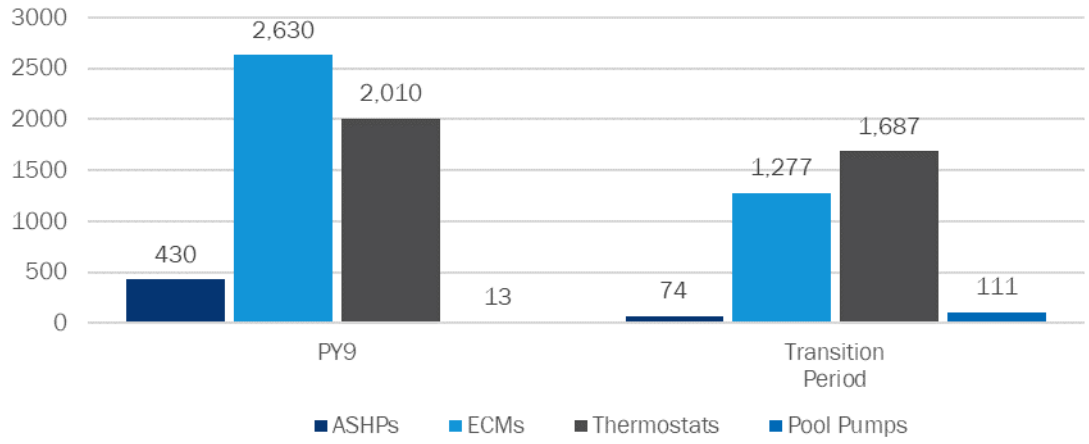
Measure Type	Program Participation (N) PY6	Program Participation (N) PY7	Program Participation (N) PY8	Program Participation (N) PY9	Program Participation (N) Transition Period
CAC	6,547	3,303	2,939	0	0
ASHPs			361	429	72
ECM Fans	4,149	2,765	3,684	2,626	1,257
Thermostats	N/A	N/A	N/A	1,821	1,532[a]
Pool Pumps	N/A	N/A	N/A	13	111

[a] Thermostat measures began transitioning to the Retail Products Program in August 2017.

Participation by Product Type

While the Transition Period only included 7 months (compared to 12 months in a typical program year), there was strong participation in ECMs, thermostats, and pool pumps, while ASHP measures lagged at 17% of PY9 levels (Figure 2).

Figure 2. Total Measures Installed in the Transition Period vs. PY9



Note: Includes only measures offered in the Transition Period, not measures discontinued in PY9.

Table 16 outlines the characteristics of the ASHP measures installed in the Transition Period. The average SEER for equipment replacing resistance heat in the Transition Period was slightly higher than PY9, where the average SEER was 16.4.

Table 16. Transition Period ASHP Equipment Characteristics

Measure Type	Count of Reported Measures	Average SEER	Average Energy Efficiency Ratio (EER)	Average Heating Seasonal Performance Factor (HSPF)
ASHP ER 16+ SEER – Replaces ASHP	24	16.8	12.6	9.3
ASHP ER 16+ SEER – Replaces Resistance	50	16.9	12.6	9.5

Note: Averages are calculated as mean values of installed measures from the program database.

3.2.3 Impact Results

Gross Impacts

Table 17 shows annual ex ante and ex post electric energy savings, electric demand savings, and therm savings for ER ASHPs, pool pumps, ECM fans, and thermostat measure categories. The table includes a line item for ductless mini-split heat pumps (DMSHPs) identified during the tracking data review, though there was only one during the Transition Period. The gross realization rates are 100% for electric energy savings, 99% for electric demand savings, and 88% for therm savings.

Table 17. HVAC Program Gross Impacts

Measure	Ex Ante Gross			Realization Rate[a]			Ex Post Gross		
	MWh	MW	Therms	MWh	MW	Therms	MWh	MW	Therms
ASHP ER	600.2	0.068	N/A	99%	88%	N/A	595.5	0.060	N/A
Pool Pump	212.9	0.141	N/A	100%	100%	N/A	213.3	0.141	N/A
ECM[b]	926.9	0.295	N/A	100%	100%	N/A	927.1	0.296	N/A
Programmable Thermostat	20.8	N/A	6,046	96%	N/A	95%	20	N/A	5,765
Smart Thermostat	649.5	0.154	84,636	101%	102%	87%	657.7	0.157	73,779
DMSHPs	6.4	0.001	N/A	72%	50%	N/A	4.6	0.000	N/A
Total	**2,417**	**0.659**	**90,682**	**100%**	**99%**	**88%**	**2,418**	**0.653**	**79,543**

[a] Realization rate = ex post gross savings ÷ ex ante gross savings. The evaluation team calculated the realization rate before rounding ex post and ex ante values.
[b] Negative gas savings from ECMs are not included in the program total or counted against the realization rate.

The evaluation team estimated savings for every reported measure by following the IL-TRM V5.0 (V6.0 for pool pumps[23]) methodology. The program implementation team used assumptions from prior evaluations and the IL-TRM V5.0 to calculate ex ante savings. The differences are attributable to a combination of several ex post assumptions that differed somewhat from ex ante ones.

- A small number of projects (0.05% of all projects) were not allocated ex ante savings. These line items received zero ex ante savings in the tracking database. We estimated ex post savings for all measures. This mainly affected thermostats.
- As established in the IL-TRM, we used efficiency levels of existing equipment to calculate ex post savings for ER measures. If the existing equipment's efficiency levels were unknown or fell below the IL-TRM's deemed value, we used the IL-TRM–provided efficiency value instead.[24] In all cases, ex ante savings used the IL-TRM deemed value.
- For thermostats, the IL-TRM calculates heating savings at the household level as a percentage of baseline heating consumption. Since this value remains the same regardless of the number of thermostats installed, no extra heating energy savings is attributed to thermostats beyond the first. In

[23] Pool pump measures were not included in IL-TRM V5.0 and therefore we used the algorithms in IL-TRM V6.0.

[24] We used the deemed efficiency value except where existing EER values were unknown. In such instances, the evaluation team used the algorithm outlined in the IL-TRM to convert SEER to EER. If the calculated EER value fell below the deemed value in the TRM, we instead used the IL-TRM deemed value.

the case of ex ante, both heating and cooling savings values were multiplied by the quantity of thermostats installed.

- Pool pumps were not included in the IL-TRM V5.0, but were added to the IL-TRM V6.0. As a result, the evaluation team used the new IL-TRM V6.0 methodology to calculate ex post impacts rather than the ENERGY STAR algorithm that was used to estimate ex ante savings. The IL-TRM V6.0 uses deemed parameters such that all pool pumps achieve the same savings. Though the measure-level realization rate is very close to 100%, individual pool pump realization rates range from 55% to 735%.

- For ECM projects, savings are higher for homes that also have a central cooling system. In some cases, ex ante savings assumed a central cooling system when the tracking database indicated that there was none, and in other cases ex ante savings assumed no central cooling system when the tracking database indicated that there was one. This affected only 0.3% of projects. Ex ante savings for thermostats assumed a new unit was installed in a single-family home. When the service address included a unit or apartment number, we assumed the home was multifamily and calculated ex post savings accordingly.

- The realization rate for DMSPHPs is low because ex ante savings estimates for DMSHPs were based on ASHP measure assumptions which have higher heating and cooling EFLH. To determine ex post savings, we calculated savings using the IL-TRM V6.0 DMSHP algorithms and inputs. Therms were calculated only for ECM and thermostat measures. For ECMs, due to decreased motor waste heat, the heating system actually uses more gas fuel than a system with a traditional motor, although the measure saves electricity. This savings penalty is not counted against the program goals and is not included in the calculation of the therms realization rate. For cost-effectiveness inputs, these negative savings values are provided in Appendix A. Demand and therms realization rates varied from 100% for many of the same reasons that energy realization rates varied (though not all were applicable to the demand savings calculations).

Net Impacts

To calculate ex post net savings, we applied SAG-approved NTGRs to ex post gross savings. The program achieved 1,943 MWh in ex post net energy savings, 0.53 MW in ex post net demand savings, and 71,589 therms in ex post gas savings (Table 18). The net realization rates are 103% for net energy savings, 125% for net demand savings, and 91% for net therm savings. Table 18 shows program net ex ante and ex post savings, determined by applying SAG-approved NTGR values.

Table 18. HVAC Program Net Impacts

	Ex Ante Net			Ex Post Net		
Program	MWh	MW	Therms	MWh	MW	Therms
HVAC	1,891	0.42	78,893	1,943	0.53	71,589
Net Realization Rate[a]				103%	105%	91%

[a] Net realization rate = ex post value ÷ ex ante value.

Cumulative Persisting Annual Savings and Weighted Average Measure Life

Table 19 presents CPAS and WAML for the Transition Period HVAC Program.

Table 19. HVAC Program CPAS and WAML

Measure	Measure Life	First-Year Ex Post Gross Savings (MWh)	CPAS - Ex Post Net Savings (MWh)							Lifetime Savings (MWh)
			Transition Period	2018	2019	2020	2021	...	2030	...	
ASHP ER[a]	18.0	595	453	453	453	453	453	...	59	...	3,431
Pool Pump	10.0	213	171	171	171	171	171	...	0	...	1,706
ECM	20.0	927	706	706	706	706	706	...	706	...	14,111
Programmable Thermostat	10.0	20	18	18	18	18	18	...	0	...	180
Smart Thermostat	10.0	658	592	592	592	592	592	...	0	...	5,920
Ductless	18.0	5	3	3	3	3	3	...	1	...	28
Transition Period CPAS		**2,419**	**1,943**	**1,943**	**1,943**	**1,943**	**1,943**	**...**	**766**	**...**	**25,376**
Expiring Transition Period CPAS			**0**	**0**	**0**	**0**	**0**	**...**	**1,177**	**...**	
WAML	**15.8**										

[a] Baseline shifts occur for early replacement measures, which is why savings may change throughout a measure's life.

3.3 Behavioral Modification

3.3.1 Program Description

The Behavioral Modification Program has been running for more than seven years. In the Transition Period, AIC administered the program to both electric and gas customers, with implementation support from Oracle and oversight from Leidos. The program's primary treatment for encouraging energy-efficient behaviors is a Home Energy Report (HER). In the Transition Period, the program offered three treatment types: a hard-copy HER mailed to participating customers twice between June and December; an electronic HER (eHER) sent once per billing cycle to participating customers with email addresses; and an online portal, where participating customers can view their HERs. Each HER includes the following information:

- A comparison of the customer's current and past energy usage
- A comparison of the customer's energy usage to that of similar households in the same geographical area
- Tips for reducing energy consumption tailored to the customer's home energy profile (e.g., type of home, square footage, and number of occupants)

Table 20 presents the number of HERs and eHERs each of the cohorts received during the Transition Period. Notably, dual-fuel customers received reports at different times than gas-only customers because gas usage generally increases in the colder months due to space heating.

Table 20. Frequency of HERs and eHERs Sent to Behavioral Modification Program Customers, by Cohort

Cohorts	Fuel Type	Number / Timing of HERs	Number / Timing of eHERs
Original and Expansion Cohorts 1, 2, 4–7	Dual	2 / Aug–Sept and Nov–Dec	7 reports / Jun–Dec
Expansion Cohorts 3 and 8	Gas-Only	3 / Sep–Oct, Nov, and Dec	3 reports / Oct–Dec
Reintroduction of 8,000 customers	Dual	2 / Oct and Dec	2 reports / Nov–Dec

Summary of Program Design and Implementation Changes

Based on interviews with AIC program staff and the program implementer, there were limited changes made to the program during the Transition Period. The most notable change was the addition of the gas-only Expansion Cohort 8, which included approximately 46,500 customers, to address program attrition resulting from opt-outs and move-outs.[25]

3.3.2 Program Performance

The Behavioral Modification Program reached just under one-third of AIC's approximately 1 million residential customers in the Transition Period. Of these customers, 329,834 participants were treated during the Transition Period (including both dual-fuel and gas-only customers).[26]

Original Cohort customers have been in the program for close to seven and a half years, and a total of eight additional cohorts have been added to the program since its inception. All cohorts are composed of dual-fuel

[25] Oracle reported adding 52,500 customers to the program as Expansion Cohort 8. The number we report does not include customers who did not receive at least one bill during the Transition Period.

[26] This number excludes customers who did not receive at least one bill during the transition period.

customers, except for Expansion Cohort 3 and Expansion Cohort 8, which are gas-only. Table 21 provides a breakdown by cohort of all treatment customers who received at least one bill in the Transition Period, as well as each cohort's approximate time in the program.

Table 21. Behavioral Modification Program Participation in Transition Period

Cohort Name	Fuel Type	Number of Customers Treated		Start Date	Approximate Time in Program
		Gas	Electric		
Original Cohort	Dual-Fuel	31,571	31,593	August 2010	7 years 5 months
Expansion Cohort 1	Dual-Fuel	47,304	47,353	April 2011	6 years 9 months
Expansion Cohort 2	Dual-Fuel	68,657	68,751	November 2011	6 years 1 month
Expansion Cohort 3	Gas-Only	11,247	N/A	November 2011	6 years 1 month
Expansion Cohort 4	Dual-Fuel	18,673	18,777	June 2013	4 years 6 months
Expansion Cohort 5	Dual-Fuel	40,065	40,106	September 2014	3 years 4 months
Expansion Cohort 6	Dual-Fuel	23,924	23,962	April 2015	2 years 8 months
Expansion Cohort 7	Dual-Fuel	36,057	36,065	September 2016	1 year 3 months
Expansion Cohort 8[a]	Gas-Only	52,336	N/A	September 2017	3 months
Total		**329,834**	**266,607**		

[a] The number of customers in the Transition Period refers to the number of customers to whom AIC intended to provide HERs and who received at least one bill.

Below, we outline additional analyses performed to assess participation in the Behavioral Modification Program.

Attrition Analysis

As expected, each cohort experienced some attrition, as customers opted out, closed accounts, or never received a report due to missing billing reads. Table 22 shows the attrition rates for the Transition Period and over time since the program began in PY3.

Table 22. Behavioral Modification Program Attrition Rates in the Transition Period

Cohort Name	PY3	PY4	PY5	PY6	PY7	PY8	PY9	Transition Period
Original Cohort	6.64%	7.30%	7.24%	6.70%	6.46%	6.23%	5.86%	3.70%
Expansion Cohort 1	2.22%	9.68%	8.26%	7.61%	7.02%	6.58%	6.23%	3.70%
Expansion Cohort 2		7.79%	9.77%	8.59%	8.02%	7.57%	7.17%	4.33%
Expansion Cohort 3		24.03%	6.59%	7.10%	6.77%	6.35%	6.24%	4.08%
Expansion Cohort 4				16.72%	12.29%	9.46%	8.31%	4.77%
Expansion Cohort 5					14.03%	15.74%	12.63%	7.17%
Expansion Cohort 6					6.69%[a]	20.96%	14.77%	7.74%
Expansion Cohort 7							20.74%	12.85%
Expansion Cohort 8								11.20%

Data Source: Oracle Program Tracking Database. A comparison of attrition rates calculated via AIC program tracking records versus Oracle monthly participant data showed that attrition rates differed on average by 0.1%.

[a] April and May only.

Overall, the table shows a higher rate of attrition in the first year that customers received reports. This is partially due to how we assign attrition to specific program years. Customers who never received a report lack a specified date for when they left the program. Because of this, we calculate the attrition rates by assuming that the customers who never received a report left the program in each cohort's inaugural program year. For example, the customers in the Original Cohort who never received a report are placed in the attrition rate calculation in PY3 (the first year of that cohort). Thus, the attrition rates for the inaugural program year of each cohort are slightly inflated because they include the total number of customers who never received a report for each cohort.

Additionally, as we found in our PY9 evaluation, later cohorts generally have higher attrition rates than earlier cohorts. This is primarily due to higher move-out rates as opposed to opt-out rates, with one potential explanation that the type of customer selected for these later cohorts (which billing data cleaning suggests often have less than nine months of pre-participation period billing history) are relatively more transient than customers selected for previous cohorts.

3.3.3 Impact Results

The evaluation team undertook a variety of efforts to develop adjusted net impact results for the Behavioral Modification Program. These include a comparison of the equivalency between treatment and control groups, impact modeling, and channeling analysis. We provide high-level results for each effort below, with additional details in Volume II of this report.

Table 23. High-Level Net Savings Results Summary

Analysis Step	Therms	MWh
Net Energy Savings Claimed by Oracle	1,081,748	22,575
Unadjusted Net Program Savings	894,696	22,676
Uplift Adjustment	33,165	536
Final Net Impacts after Accounting for Uplift	861,531	22,140
Net Realization Rate	80%	98%

Equivalency Analysis

The evaluation team performed an equivalency analysis between the treatment and control groups for the Original Cohort and Expansion Cohorts 1 through 8. For dual-fuel cohorts, we compared ADC of electricity and gas between treatment and control groups to assess whether these groups were equivalent after accounting for attrition. For the gas-only cohorts, we examined only gas ADC for the groups.

In the year before the start of the program, ADC for the Expansion Cohort 8 was 1.6 therms/day for households in both the control group and treatment group, which illustrates the equivalency of these groups in this newly added gas-only cohort. In addition, we examined equivalency of treatment and control groups of all previous cohorts based on energy usage and found that these are equivalent as well. Results showing the equivalency of the treatment and control groups for all cohorts are in Volume II of this report.

Unadjusted Program Savings

The evaluation team fit several statistical models to estimate the net impacts of the program. Results from the LDV model, presented below, show the unadjusted net savings to which we apply the channeling analysis and derive the final net impact savings.

Table 23 presents the Transition Period unadjusted net therm savings for the seven dual-fuel cohorts and two gas-only cohorts (Expansion Cohorts 3 and 8). Table 24 shows the unadjusted net electric savings for the seven dual-fuel cohorts only. The modeled therm savings for Expansion Cohorts 4 and 6 are statistically insignificant, therefore the savings from these cohorts are not included in the total. Although Expansion Cohort 6 exhibited negative savings, the statistically insignificant result indicates that the difference in gas usage between the treatment and control group for this cohort are not substantial enough to be attributed to anything beyond natural usage variation. The insignificant model results are likely due to the small amount of post period data available for the Transition Period evaluation. With a smaller sample size, it is much more difficult to distinguish between the treatment effect and natural usage variation.

Aside from Expansion Cohort 6, all cohorts show electric and gas savings for the Transition Period. The savings calculated for the electric cohorts and gas cohorts with significant savings results are comparable to the savings calculated by Oracle and differ by margins that are comparable to differences found in prior year evaluations. The unadjusted net therm savings per household and overall savings are generally higher for earlier cohorts. We see a similar trend in the unadjusted net electric savings per household, though the trend is less obvious for overall unadjusted net electric savings.

Table 24. Transition Period Unadjusted Per-Household Net Therm Savings – LDV Model

Cohort Name	Number of Customers Treated in the Transition Period[a]	Unadjusted Net Savings (% per household)	Unadjusted Net Savings (therms per household)	Unadjusted Net Program Savings (therms)[b]
Original Cohort	31,571	0.79%	3.42	107,893
Expansion Cohort 1	47,304	0.95%	4.60	217,505
Expansion Cohort 2	68,657	0.93%	3.06	209,766
Expansion Cohort 3	11,247	1.64%	6.53	73,467
Expansion Cohort 4[c]	18,673	0.25%[c]	0.92[c]	17,153[c]
Expansion Cohort 5	40,065	0.55%	2.32	92,908
Expansion Cohort 6[c]	23,924	−0.36%[c]	−0.89[c]	−21,339[c]
Expansion Cohort 7	36,057	0.43%	1.52	54,757
Expansion Cohort 8	52,336	0.36%	2.64	138,401
Overall[d]	**329,834**		**2.71**	**894,696**

[a] The number of customers in the Transition Period refers to the number of customers to whom AIC intended to provide HERs and who received at least one bill.
[b] Pro-rated for participants whose accounts closed during the Transition Period.
[c] The treatment effects on Cohorts 4 and 6 are statistically insignificant. Therefore, the unadjusted net savings from these cohorts are not included in the totals.
[d] Totals may not be exact due to rounding and do not include the unadjusted net savings from Cohort 4 or 6.

Table 25. Transition Period Unadjusted Per-Household Net Electric Savings – LDV Model

Cohort Name	Number of Customers Treated in the Transition Period[a]	Unadjusted Net Savings (% per household)	Unadjusted Net Savings (MWh per household)	Unadjusted Net Program Savings (MWh)[b]
Original Cohort	31,593	1.39%	0.106	3,347
Expansion Cohort 1	47,353	1.65%	0.140	6,616
Expansion Cohort 2	68,751	1.01%	0.059	4,067
Expansion Cohort 3	N/A	N/A	N/A	N/A
Expansion Cohort 4	18,777	0.89%	0.097	1,817

Cohort Name	Number of Customers Treated in the Transition Period[a]	Unadjusted Net Savings (% per household)	Unadjusted Net Savings (MWh per household)	Unadjusted Net Program Savings (MWh)[b]
Expansion Cohort 5	40,106	1.14%	0.086	3,439
Expansion Cohort 6	23,962	0.71%	0.047	1,123
Expansion Cohort 7	36,065	0.91%	0.063	2,267
Expansion Cohort 8	N/A	N/A	N/A	N/A
Overall[c]	**266,607**		**0.085**	**22,676**

[a] The number of customers in the Transition Period refers to the number of customers to whom AIC intended to provide HERs and who received at least one bill.
[b] Pro-rated for participants whose accounts closed during the Transition Period.
[c] Totals may not be exact due to rounding.

Uplift from Other AIC Programs

The savings analysis for the Behavioral Modification Program considers energy savings that resulted from energy-efficient actions taken through other AIC residential energy efficiency programs. While a base rate of participation in these programs would be expected in both the treatment and control groups, it is possible that the Behavioral Modification Program resulted in an increase, or "uplift," in participation in other AIC residential energy efficiency programs among the members of the treatment group by channeling treated customers to those programs.

The uplift in savings from other AIC programs is significant, particularly in terms of therm savings. Legacy uplift represents a sizable adjustment relative to the uplift from the current evaluation period. Table 26 and Table 27 present the results from our uplift analysis. We deduct approximately 3.7% of unadjusted program therm savings due to this analysis, of which the majority (3.5%) are due to legacy measures installed in prior program years. Additionally, we deduct approximately 2.4% of unadjusted program MWh savings due to this analysis, of which the majority (2.3%) are due to legacy measures installed in prior program years.

Table 26. Transition Period Behavioral Modification Program Impacts – Gas

Cohort Name	Unadjusted Program Savings (therms)	Transition Period Savings Uplift		Legacy Savings Uplift		Total Savings Uplift	
		Therms	%	Therms	%	Therms	%
Original Cohort	107,893	0	0.0%	3,547	3.3%	3,547	3.3%
Expansion Cohort 1	217,505	0	0.0%	7,430	3.4%	7,430	3.4%
Expansion Cohort 2	209,766	0	0.0%	14,599	7.0%	14,599	7.0%
Expansion Cohort 3	73,467	0	0.0%	0	0.0%	0	0.0%
Expansion Cohort 4	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Expansion Cohort 5	92,908	0	0.0%	0	0.0%	0	0.0%
Expansion Cohort 6	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Expansion Cohort 7	54,757	2,270	4.1%	5,320	9.7%	7,589	13.9%
Expansion Cohort 8	138,401	0	0.0%	N/A	N/A	0	0.0%
Total	**894,696**	**2,270**	**0.3%**	**30,896**	**3.5%**	**33,165**	**3.7%**

Table 27. Transition Period Behavioral Modification Program Impacts – Electric

Cohort Name	Unadjusted Program Savings (MWh)	Transition Period Savings Uplift		Legacy Savings Uplift		Total Savings Uplift	
		MWh	%	MWh	%	MWh	%
Original Cohort	3,347	0	0.0%	81	2.4%	81	2.4%
Expansion Cohort 1	6,616	0	0.0%	128	3.8%	128	3.8%
Expansion Cohort 2	4,067	0	0.0%	76	2.3%	76	2.3%
Expansion Cohort 3	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Expansion Cohort 4	1,817	0	0.0%	87	2.6%	87	2.6%
Expansion Cohort 5	3,439	0	0.0%	0	0.0%	0	0.0%
Expansion Cohort 6	1,123	0	0.0%	100	3.0%	100	3.0%
Expansion Cohort 7	2,267	17	0.5%	46	1.4%	63	1.9%
Expansion Cohort 8	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	**22,676**	**17**	**0.1%**	**518**	**2.3%**	**536**	**2.4%**

Final Net Impacts

The program achieved 861,531 therms and 22,140 MWh in adjusted net savings (Table 28 and Table 29). Adjusted net savings refer to modeled impacts using Equation 1, minus the savings accounted for from participation in other AIC residential programs. These findings confirm that the Behavioral Modification Program reduces energy consumption.

Table 28. Transition Period Behavioral Modification Program Total Gas Savings

Cohort Name	Program Savings Unadjusted for Uplift (therms)	Transition Period Savings Uplift (therms)	Legacy Savings Uplift (therms)	Final Adjusted Net Program Savings (therms)
Original Cohort	107,893	0	3,547	104,346
Expansion Cohort 1	217,505	0	7,430	210,075
Expansion Cohort 2	209,766	0	14,599	195,167
Expansion Cohort 3	73,467	0	0	73,467
Expansion Cohort 4	N/A	N/A	N/A	N/A
Expansion Cohort 5	92,908	0	0	92,908
Expansion Cohort 6	N/A	N/A	N/A	N/A
Expansion Cohort 7	54,757	2,270	5,320	47,168
Expansion Cohort 8	138,401	0	N/A	138,401
Total	**894,696**	**2,270**	**30,896**	**861,531**

Table 29. Transition Period Behavioral Modification Program Total Electric Savings

Cohort Name	Program Savings Unadjusted for Uplift (MWh)	Transition Period Savings Uplift (MWh)	Legacy Savings Uplift (MWh)	Final Adjusted Net Program Savings (MWh)
Original Cohort	3,347	0	81	3,266
Expansion Cohort 1	6,616	0	128	6,487
Expansion Cohort 2	4,067	0	76	3,991
Expansion Cohort 3	N/A	N/A	N/A	N/A

Cohort Name	Program Savings Unadjusted for Uplift (MWh)	Transition Period Savings Uplift (MWh)	Legacy Savings Uplift (MWh)	Final Adjusted Net Program Savings (MWh)
Expansion Cohort 4	1,817	0	87	1,730
Expansion Cohort 5	3,439	0	0	3,439
Expansion Cohort 6	1,123	0	100	1,024
Expansion Cohort 7	2,267	17	46	2,204
Expansion Cohort 8	N/A	N/A	N/A	N/A
Total	**22,676**	**17**	**518**	**22,140**

Cumulative Persisting Annual Savings and Weighted Average Measure Life

Table 32 presents CPAS and WAML for the Transition Period Behavioral Modification Program.

Table 30. Behavioral Modification Program CPAS and WAML

Measure	Measure Life	First-Year Ex Post Gross Savings (MWh)[a]	CPAS - Ex Post Net Savings (MWh)							Lifetime Savings (MWh)
			Transition Period	2018	2019	2020	2021	...	2030	...	
Behavioral Modification	1.0[b]	22,140	22,140	0	0	0	0	...	0	...	22,140
Transition Period CPAS		**22,140**	**22,140**	**0**	**0**	**0**	**0**	**...**	**0**	**...**	**22,140**
Expiring Transition Period CPAS			**0**	**22,140**	**22,140**	**22,140**	**22,140**	**...**	**22,140**	**...**	
WAML	**1.0**										

[a] No ex post gross savings exist for the Behavioral Modification Program due to the impact evaluation method. Therefore, this column presents ex post net savings, but is labeled as gross for consistency with other CPAS reporting.

[b] For the purposes of the Transition Period, we continue to use the 1-year measure life assumed for Plan 3. However, beginning in 2018, our CPAS calculations for Behavioral Modification will include persistence and savings degradation.

3.3.4 Key Findings

The Behavioral Modification Program achieved its stated goals to reduce energy consumption and educate customers about energy savings measures and behaviors. The evaluation team provides the following key findings and recommendations for the program:

- **Key Finding #1: The program reduced energy consumption.** Billing analyses results indicate a reduction of 861,531 therms and 22,140 MWh. Program participants achieved 2.6 therms and 83.0 kWh savings per household per year. We calculated these per household values by dividing the total adjusted net program savings for the evaluated period by the total number of program participants for gas and electricity, respectively.
- **Key Finding #2: Legacy uplift accounts for a large portion of the adjustments to the net therm and electric savings.** Customers who have participated in residential energy efficiency programs have installed equipment that lasts several years, leading to the need to remove the contributing savings to ensure that no double-counting of savings occurs. As the previously installed equipment reaches the end of its useful life, the legacy uplift will decline.
  - **Recommendation:** When selecting customers for future program delivery, select a cohort with lower levels of legacy uplift to help reduce the downward adjustment to energy savings.

3.4 Multifamily

3.4.1 Program Description

The AIC Multifamily Program offers incentives and services that enable energy savings and lower operating costs in market-rate multifamily housing. There are three main components offered through the AIC Multifamily Program: measures for tenant units (LEDs and CFLs for permanent light fixtures, low-flow faucet aerators and shower heads, and programmable thermostats), LEDs and CFLs for buildings' common areas, and major measures (air sealing and attic insulation) for buildings with electric and gas heat (also referred to as shell measures).

Program administrators deliver measures using a hybrid approach that leverages program implementation staff from CLEAResult, as well as program allies. Leidos provides program oversight. The program delivery differs somewhat by program component. Specifically, the program implementer conducts the outreach and recruitment for the direct-installation components (in-unit and common area). The implementer also installs most of the in-unit measures, except for programmable thermostats, which the implementer provides to participating property managers for installation by property staff. In contrast, program allies (recruited by the implementer) are responsible for all aspects of the major measures component, including generating leads, enrolling customers, performing air sealing, and installing insulation. The program implementer and program allies present all of the AIC Multifamily Program offerings as a single program to the customer. Major measures are provided at no cost to the property manager, and the discounts for common area lighting and in-unit measures historically have covered all measure costs for those aspects of the program as well.

Summary of Program Design and Implementation Changes

A number of changes were made to the Multifamily Program during the Transition Period:

- The Multifamily Program began offering LEDs during the Transition Period, with LEDs comprising most of the efficient lighting distributed to properties. This shift is part of the program's overall planned switch from a CFL-based offering to an entirely LED-based offering by the 2018 program year. This was a welcome change for the program, as program staff reported that property managers had started asking specifically for LEDs at the end of the PY9 program and were receptive to the LED offering in the Transition Period.
- In recent program years, Multifamily Program offerings in the AIC service territory have been split between the AIC Multifamily Program and the IPA Multifamily Program. Measures previously offered through the IPA Multifamily Program, including occupancy sensors and LED exit signs for common areas, were no longer available during the Transition Period. During the Transition Period, the AIC program assumed responsibility for offering major measures to customers with electric heat, but did not offer any occupancy sensors or LED exit signs. Program staff reported the program exhausted its major measures funding rapidly during the Transition Period. While the speed of major measures project completion helped the program meet its goals in October, it also left program allies without work to do for several months of the Transition Period.
- The Multifamily Program reinstated a project funding reservation system for the major measures component in an effort to better manage program spending throughout the year. This system required program allies to register for and request funding from the program before completing projects. Program staff reported the reservation system met its goals and helped them screen projects for eligibility before the projects got under way and streamline the approval process.

3.4.2 Program Performance

During the Transition Period, the AIC Multifamily Program achieved 90% of its ex ante net electric savings target of 3,429 MWh and 61% of its ex ante net gas savings target of 61,077 therms. The program also achieved 77% of its tenant unit participation goal of 4,900 individual units, serving 3,768 units (Table 31). Program staff explained that the program fell short of internal savings targets because the implementer was working with a team of two, rather than the typical three, installation contractors for a portion of the program period. When one of the three installers stopped participating during the Transition Period, a decision was made to shift Multifamily Program funding to the AIC Business Program. This resulted in a reduced budget and lower savings potential for the Multifamily Program, compared to the participation and savings internal targets.

Table 31. Multifamily Program Participation and Ex Ante Gross Savings during the Transition Period

Offering	Total Projects	Unique Residential Units[a]	Ex Ante Gross Savings		
			MWh	MW	Therms
Multifamily	292	3,768	3,081	0.39	36,962

[a] Based on Opinion Dynamics analysis of Transition Period program tracking data variable "Installed Units." The evaluation team leveraged the "Installed Units" field to arrive at the number of unique residential units that received either an in-unit or a major measure.

3.4.3 Impact Results

To estimate ex post gross savings for the Transition Period, the evaluation team applied ISRs and savings algorithms from the IL-TRM V5.0 using program tracking database inputs. The evaluation team applied the SAG-approved NTGRs to ex post gross savings to determine ex post net impacts.

Measure Verification

The program offers a variety of measures to participants, including interior in-unit and common area lighting measures, in-unit water-savings measures and programmable thermostats, and major measures (air sealing and attic insulation). To determine the verified measure quantities, the evaluation team applied ISRs provided in the IL-TRM V5.0 to ex ante measure quantities (Table 32).

Table 32. Multifamily Program Verified Measure Quantities

Measure	Unit	Ex Ante Measure Quantity	ISR	Verified Measure Quantity[a]
Air Sealing – With Electric Heat	Per Cubic Feet per Minute (CFM)	398,404	100%	398,404
Attic Insulation – With Electric Heat	Per Sq. Ft.	157,595	100%	157,595
Air Sealing – With Gas Heat	Per CFM	146,192	100%	146,192
Attic Insulation – With Gas Heat	Per Sq. Ft.	44,697	100%	44,697
9W LED – In-Unit	Per Bulb	20,973	97%	20,323
7W LED Globe – In-Unit	Per Bulb	13,067	97%	12,662
9W LED Reflector – In-Unit	Per Bulb	3,346	97%	3,242
Aerator (Electric Water Heater) – 1.5 Gallons per Minutes (gpm)	Per Aerator	1,667	95%	1,584
5W LED Candelabra – In-Unit	Per Bulb	1,607	97%	1,557
Shower Head (Electric Water Heater) – 1.75 gpm	Per Shower Head	1,347	95%	1,280

Measure	Unit	Ex Ante Measure Quantity	ISR	Verified Measure Quantity[a]
Shower Head (Gas Water Heater) – 1.75 gpm	Per Shower Head	1,040	95%	988
Aerator (Gas Water Heater) – 1.5 gpm	Per Aerator	958	95%	910
Aerator (Electric Water Heater) – 2.0 gpm	Per Aerator	928	91%	844
9W LED Interior – Common Area	Per Bulb	744	98%	729
Aerator (Gas Water Heater) – 2.0 gpm	Per Aerator	556	91%	506
9W LED Exterior – Common Area	Per Bulb	532	98%	521
5W LED Candelabra Interior – Common Area	Per Bulb	390	98%	382
Low Wattage Standard CFL – In Unit	Per Bulb	371	97%	359
9W LED Reflector Interior – Common Area	Per Bulb	255	98%	250
Programmable Thermostat (Gas Heat)	Per Thermostat	152	100%	152
5W LED Candelabra Exterior – Common Area	Per Bulb	144	98%	141
14W CFL Globe – In-Unit	Per Bulb	143	97%	139
Programmable Thermostat – Electric Resistance	Per Thermostat	116	100%	116
9W LED Reflector Exterior – Common Area	Per Bulb	40	98%	39
9W CFL Candelabra – In-Unit	Per Bulb	16	97%	16
Programmable Thermostat – Heat Pump	Per Thermostat	15	100%	15
9W CFL Candelabra – Common Area	Per Bulb	13	98%	13
7W LED Globe Interior – Common Area	Per Bulb	8	98%	8
Total[b]		**795,316**	**100%**	**793,664**

[a] Verified measure quantity = ex ante quantity * ISR.
[b] Numbers may not total due to rounding.

Gross Impacts

The total ex post gross impacts for the AIC Multifamily Program were 3,492 MWh, 0.427 MW, and 41,677 therms. As shown in Table 33, ex post gross impacts were higher than ex ante gross impacts, with gross realization rates of 112% for electric energy savings, 110% for electric demand savings, and 136% for therm savings.

Table 33. Multifamily Program Gross Impacts

Program	Total Projects	Ex Ante Gross[a]			Ex Post Gross		
		MWh	MW	Therms	MWh	MW	Therms
Multifamily	292	3,107	0.387	30,611	3,492	0.427	41,677
Gross Realization Rate[b]					**112%**	**110%**	**136%**

[a] Source of ex ante savings: Transition Period program tracking database.
[b] Gross realization rate = ex post value ÷ ex ante value.

As shown in Table 34, gross electric realization rates varied by measure. Differences in ex ante and ex post gross savings stemmed from differences in input values for the savings algorithms. In particular, differences in the inputs for common area lighting, air sealing, and attic insulation measures together increased the overall program-level realization rates for electric impacts. Common area lighting measures had the highest gross energy realization rates of 723%, 554%, and 200% across common area interior LEDs, interior CFLs, and exterior LEDs, respectively. As detailed below, these high realization rates are driven by the evaluation team's

use of commercial assumptions about common area lighting usage, which better reflect the high intensity of common area lighting usage compared to the lower residential assumptions that the implementer used. Faucet aerators had the lowest realization rate for energy savings (92%).

Table 34. Multifamily Program Gross Electric Savings by Measure Category

Measure Category	Ex Ante Gross Impacts		Ex Post Gross Impacts		Gross Realization Rate	
	kWh	kW	kWh	kW	kWh	kW
In-Unit LEDs – Interior	1,053,145	110.76	1,053,145	110.76	100%	100%
Air Sealing	772,780	101.77	790,696	108.91	102%	107%
Attic Insulation	546,879	45.75	555,882	49.38	102%	108%
Shower Head	380,344	42.64	380,344	42.64	100%	100%
Common Area LED – Interior	49,145	6.42	355,566	44.28	723%	690%
Aerator	148,270	70.75	137,043	68.95	92%	97%
Common Area LED – Exterior	60,839	7.10	121,892	0.00	200%	0%
Thermostat	81,503	0.00	81,503	0.00	100%	0%
In-Unit CFL – Interior	13,725	1.43	13,725	1.43	100%	100%
Common Area CFL – Interior	483	0.05	2,679	0.33	554%	660%
Total	**3,107,114**	**386.67**	**3,492,475**	**426.68**	**112%**	**110%**

Table 35 summarizes the ex ante and ex post gross gas impacts for the measure categories with gas savings. Realization rates are 100% for all gas measures except faucet aerators (107%). The total realization rate (136%) is much higher than these individual realization rates primarily because ex ante therm savings include heating penalties for lighting measures, while ex post savings do not (per agreement between ICC staff and AIC). The ex ante method resulted in negative savings for these measures, while excluding heating penalties from ex post calculations results in zero savings. Because lighting measures accounted for 38% of the total program ex ante energy savings, ex post calculations that avoid the negative savings associated with heating penalties is the primary reason that the overall gross realization rate for gas savings is 136%.

Table 35. Multifamily Program Gross Gas Savings by Measure Category

Measure Category	Ex Ante Gross Therms	Ex Post Gross Therms	Realization Rate
Shower Head	14,633	14,633	100%
Air Sealing	11,097	11,085	100%
Attic Insulation	6,492	6,492	100%
Thermostat	5,417	5,417	100%
Aerator	3,777	4,050	107%
In-Unit LEDs – Interior	−9,711	0	N/A
Common Area LED – Interior	−808	0	N/A
In-Unit CFL – Interior	−286	0	N/A
Total	**30,611**	**41,677**	**136%**

Table 36 summarizes the sources of discrepancies between ex ante and ex post gross electric (Table 34) and gas (Table 35) savings analyses.

Table 36. Reasons for Realization Rates per Multifamily Program Measure Category

Measure Category	Gross Realization Rate		Source of Discrepancy				
	MWh	Therms	SEER	Heating Penalties	CF, Hours WHFe, WHFd[a]	Fan Run Time Savings	Other Reason[b]
Common Area LED – Interior	723%	N/A		✓	✓		
Common Area CFL – Interior	554%	N/A		✓	✓		
Common Area LED – Exterior	200%	N/A		✓	✓		
Air Sealing	102%	100%	✓			✓	
Attic Insulation	102%	100%	✓			✓	
In-Unit CFL – Interior	100%	N/A		✓			
In-Unit LEDs – Interior	100%	N/A		✓			
Aerator	92%	107%					Ex ante analysis uses single-family assumptions from the IL-TRM V5.0, whereas ex post uses multifamily assumptions.

[a] CF = Coincidence Factor; WHFe = Waste Heat Energy Factor; WHFd = Waste Heat Demand Factor.
[b] Describes incorrect ex ante assumptions and calculation methods.

Through our discussions with the implementer, we identified the sources of the differences between ex ante and ex post savings. In some cases, these differences meant that ex ante savings are higher than ex post savings, while, in other cases, they meant that ex ante savings are lower than ex post savings. The combination of all inputs brings about the overall realization rate for each measure. We describe the differences in ex ante and ex post savings calculations in detail below.

- Lighting Discrepancies
  - **Waste Heat Factors and Hours of Use (HOU) for Common Area Lighting**: The primary reason for large gross electric realization rates for common area lighting was a difference in HOU assumptions between ex ante and ex post calculations. The implementation team assumed HOU from the in-unit residential measure in the IL-TRM V5.0. Since lighting installed in common areas typically reflects commercial usage patterns, the evaluation team applied IL-TRM V5.0 commercial assumptions for LEDs and CFLs installed in multifamily buildings. On average, the commercial HOU estimates are roughly five times larger than their residential counterparts, which increased ex post savings estimates. Additionally, the implementation team calculated ex ante common area lighting savings using multifamily in-unit lighting waste heat energy factor (WHFe) assumptions. Consistent with the evaluation team's approach to common area HOU assumptions, the evaluation team applied commercial WHFe assumptions to better estimate the waste heat factor. Compared to ex ante assumptions, WHFe increased from 1.04 to 1.14. Overall, this difference also increased ex post energy savings
  - **Heating Penalties for All Interior LED Lighting**: The ex ante gross gas savings analysis included the waste heat factor heating penalty for all interior LED lighting measures. However, consistent with

past evaluations, and per agreement between ICC staff and AIC staff regarding the treatment of heating penalties, the evaluation team did not include heating penalties for lighting in the ex post gross savings calculations. This resulted in an increase in ex post gas savings.

- Air Sealing and Attic Insulation Discrepancies
  - **Fan Runtime Savings:** The implementer did not include fan runtime savings in ex ante savings calculations for air sealing and attic insulation upgrades, although these savings are relevant for projects with gas furnaces. For the ex post analysis, the evaluation team included fan runtime savings per the IL-TRM V5.0. As a result, ex post electric savings are higher than ex ante estimates.
  - **SEER Values:** Ex ante and ex post analyses are largely aligned, as both followed the IL-TRM V5.0 approach and assigned cooling efficiencies by project, based on the age of the property's cooling equipment. However, ex ante and ex post methods differed in terms of how SEER was assigned for equipment of an unknown age. Specifically, for projects with unknown cooling equipment age, the implementer applied a weighted average cooling efficiency of 11.05 SEER based on an assumed mix of cooling equipment ages, while the evaluation team applied an average of 10.06 SEER, derived from the average age of cooling equipment among PY9 participants (n=97).[27] As a result, ex post electric savings are somewhat higher than ex ante estimates.
- Faucet Aerator Discrepancies
  - **Single-Family Assumptions:** For ex ante savings inputs dependent on home type, the implementer used the single-family assumptions from the IL-TRM V5.0, rather than the multifamily assumptions that the evaluation team used. Multifamily assumptions tend to be lower than single-family assumptions (e.g., 2.1 people per home [ex post], compared to 2.56 people per home [ex ante]). Therefore, ex post savings based on multifamily assumptions are smaller than the ex ante savings derived from single-family assumptions.

Net Impacts

Overall, the program achieved 3,081 MWh, 0.39 MW, and 36,962 therms in net energy savings. Net energy and demand realization rates (104% and 103%, respectively) are slightly lower than the gross realization rates reported in Table 34 (112% and 110%, respectively) due to the NTGR assumed for LED lighting measures. The implementation team assumed a NTGR of 95% based on the NTGR for CFL measures, whereas the evaluation team assumed 77% following the SAG-approved NTGR for LED measures in PY10.

Table 37. Multifamily Program Net Impacts

Program	Ex Ante Net			Ex Post Net		
	MWh	MW	Therms	MWh	MW	Therms
Multifamily Program	2,964	0.38	36,699	3,081	0.39	36,962
Net Realization Rate[a]				**104%**	**103%**	**101%**

[a] Net realization rate = ex post value ÷ ex ante value.

[27] While the Transition Period database contained SEER data for select participants, the sample of records with SEER was not large enough to support an average SEER estimate robust enough for extrapolation to other projects. Thus, the evaluation team leveraged the average SEER developed in PY9. Note that the average SEER based on the small sample of Transition Period projects (10.00 SEER) is similar to the PY9 average used in evaluation (10.06 SEER), lending support for the PY9 data based on a larger sample size.

Note that the gross therm savings realization rate of 136% reported in Table 35 is higher than the net therm realization rate of 101% reported in Table 37. In the tracking data we received, the program implementer included heating penalties in ex ante gross therm savings, whereas the evaluation team did not report these penalties in ex post gross savings. However, the implementation team did not include these penalties in ex ante net savings, leading to a discrepancy between the gross and net therm realization rates.

Cumulative Persisting Annual Savings and Weighted Average Measure Life

Table 38 presents CPAS and WAML for the Transition Period Multifamily Program.

Table 38. Multifamily Program CPAS and WAML

Measure	Measure Life	First-Year Ex Post Gross Savings (MWh)	CPAS - Ex Post Net Savings (MWh)							Lifetime Savings (MWh)
			Transition Period	2018	2019	2020	2021	...	2030	...	
In-Unit LEDs - Interior	10.0	1,053	811	811	811	669	527	...	0		6,263
Air Sealing	15.0	791	759	759	759	759	759	...	759	...	11,386
Attic Insulation	25.0	556	489	489	489	489	489	...	489	...	12,229
Showerhead	10.0	380	380	380	380	380	380	...	0	...	3,803
Common Area LED - Interior	15.0	356	295	295	295	248	201	...	201	...	3,341
Aerator	9.0	137	145	145	145	145	145	...	0	...	1,307
Common Area LED - Exterior	15.0	122	101	101	101	77	52	...	52	...	956
Thermostat	5.0	82	85	85	85	85	85	...	0	...	424
In-Unit CFL - Interior	4.7	14	13	13	13	13	9	...	0	...	61
Common Area CFL – Interior	1.7	3	2	2	0	0	0	...	0	...	4
Transition Period CPAS		**3,492**	**3,081**	**3,080**	**3,079**	**2,865**	**2,647**	**...**	**1,501**	**...**	**39,775**
Expiring Transition Period CPAS			**0**	**1**	**2**	**216**	**434**	**...**	**1,580**	**...**	
WAML	**14.0**										

3.5 Home Efficiency Income Qualified

3.5.1 Program Description

Now on its seventh year of implementation, the HEIQ Program is a home energy diagnostic and whole-house retrofit program that began as a pilot in PY3. The program offers a variety of measures to participants, including lighting, domestic hot water (DHW), HVAC equipment and controls, and building shell measures. The HEIQ Program targets AIC customers with homes heated by electricity or natural gas provided by AIC and qualifies customers with household income between 0% and 300% of federal poverty guidelines for household size. CLEAResult implements the program with oversight from Leidos, who manages all of AIC's commercial and residential programs. Participants can join the program in one of two ways: by applying directly for a home audit through the program or by applying to the program through a program ally.

In the Transition Period, the implementation, design, and marketing of the HEIQ Program remained largely consistent with PY9. However, program staff noted that, in late PY9, they decided to install LEDs instead of CFLs in participating customer homes in response to the manufacturing and retail companies' decision to stop production and sales of CFLs. A review of program tracking data confirms this change, as 91% of lighting measures installed in the Transition Period were LEDs.

3.5.2 Program Performance

In the Transition Period, the HEIQ Program reached 1,245 participants. Consistent with PY9, the majority of participants received only retrofits (68%), while a fifth (21%) received both an audit and at least one retrofit, and a tenth (11%) received only an audit.

According to the program implementation plan, Leidos estimated that they would serve 745 participant households in the Transition Period. The program nearly doubled this estimate. Program staff noted that the increase in participation was partially due to pending applications from PY9 that had not previously been submitted for review. Program staff also reported that this unexpectedly high level of participation, driven by projects begun in previous program years, created some challenges in terms of incentive and on-bill financing availability, which ultimately may have affected the scope and/or number of customer retrofits. These challenges are detailed below:

- **Standard CAC Incentives:** The HEIQ Program reached its incentive limits for standard CACs by the end of August 2017; hence, they stopped offering this measure partway through the Transition Period. Per program staff, this may have affected furnace installations because trade allies usually sell furnaces with standard CACs.
- **On-Bill Financing:** The HEIQ Program stopped offering OBF in September 2017 after having exhausted the funds for the Transition Period. Program staff noted that this may have prevented some participants from completing retrofits during the Transition Period.

In assessing program performance, the evaluation team examined the program's conversion rate (i.e., the percentage of customers who received an audit who went on to install equipment/complete a retrofit). The evaluation team calculated the conversion rate by dividing the number of participants who received a retrofit following an audit (audit and retrofit) by the total number of participants who received an audit at all (whether or not they received a retrofit). However, to account for participants who received an audit in one year, but

received the associated retrofit in the following year, the evaluation team updated conversion rates across previous program years using cumulative results.

Table 39 compares the updated conversion rates from PY4 through PY9 to the conversion rate for the Transition Period. As shown, during this time, the HEIQ Program achieved an audit-to-retrofit conversion rate of 65%, which meets the program goal of 55%–65%. As with PY9, the conversion rate for the Transition Period decreased in comparison to prior program years (PY4–PY8). The incentive and OBF availability challenges described earlier may have contributed to the lower conversion rate. Further, the influx of incentive applications for projects begun in previous years may be a factor, as these projects would count toward previous years' conversion rates (e.g., PY9's conversion rate increased 15% during the Transition Period).

Table 39. HEIQ Program Conversion Rates

	PY4 Participants	PY5 Participants	PY6 Participants	PY7 Participants	PY8 Participants	PY9 Participants	Transition Period Participants
Audit and Retrofit (a)	198	195	245	226	632	442	257
Audit Only (b)	48	27	19	12	7	186	140
Retrofit Only (c)	15	78	52	114	380	815	848
Total Participants = a + b + c	261	300	316	352	1,019	1,443	1,245
Total Audits = a + b	246	222	264	238	639	628	397
Conversion Rate = a ÷ (a + b)	80%	88%	93%	95%	99%	70%	65%

3.5.3 Impact Results

The evaluation team applied savings algorithms and ISRs from the IL-TRM V5.0 using program tracking database inputs to estimate program gross savings. To assess net impacts, the evaluation team applied the SAG-approved PY6 NTGR of 1.0 to ex post gross impacts.

Measure Verification

The evaluation team determined verified measure quantities by applying IL-TRM V5.0 ISRs to the ex ante measure quantities. Table 40 summarizes the quantity of installed measures based on the review of the program tracking database.

Table 40. HEIQ Program Verified Measure Quantities

Measure Category	Measure	Unit	Ex Ante Measure Quantity [a]	ISR [b]	Verified Measure Quantity [a * b]
Lighting	CFL – Low (13W–15W)	Bulb	129	97%	125
	CFL – Medium (18W–20W)	Bulb	73	97%	71
	CFL – High (23W–25W)	Bulb	44	97%	43
	Specialty CFL – 9W Candelabra	Bulb	60	97%	58
	Specialty CFL – 14W Globe	Bulb	60	97%	58
	Specialty CFL – 15W Reflector	Bulb	15	97%	15
	LED – 9W	Bulb	2,079	97%	2,015
	Specialty LED – 5W Candelabra	Bulb	778	97%	754
	Specialty LED – 7W Globe	Bulb	749	97%	726
	Specialty LED – 9W Reflector	Bulb	294	97%	285
	LED – 10W (6 pack)	Packs	88	93%	82
DHW	Faucet Aerator	Aerator	176	95%	167
	Shower Head	Shower Head	121	98%	119
HVAC	Furnace	Furnace	762	100%	762
	ECM	Motor	651	100%	651
	CAC	CAC	298	100%	298
	Duct Sealing	Participant	83	100%	83
	ASHP	ASHP	77	100%	77
	Boiler	Boiler	14	100%	14
Controls	Programmable Thermostat	Thermostat	580	100%	580
	Smart Thermostat	Thermostat	214	100%	214
Envelope	Air Sealing	CFM	757,642	100%	757,642
	Attic Insulation	Sq. Ft.	650,902	100%	650,902
	Wall Insulation	Sq. Ft.	182,761	100%	182,761
	Rim Joist Insulation	Linear Feet	56,771	100%	56,771
	Crawl Space Insulation	Sq. Ft.	27,166	100%	27,166
	Basement Wall Insulation	Linear Feet	367	100%	367
Total[a]			**1,682,954**	**N/A**	**1,682,804**

[a] Numbers may not total due to rounding.

Gross Impacts

The total ex post gross savings for the HEIQ Program are 2,309 MWh, 0.71 MW, and 387,038 therms. As shown in Table 41, the gross realization rates are 110% for electric energy savings, 123% for electric demand savings, and 102% for therm savings.

Table 41. HEIQ Program Gross Impacts

Program	Number of Participants	Ex Ante Gross[a]			Ex Post Gross		
		MWh	MW	Therms	MWh	MW	Therms
HEIQ Program	1,245	2,097	0.58	380,711	2,309	0.71	387,038
Gross Realization Rate[b]					110%	123%	102%

[a] Source of ex ante savings: Transition Period program tracking database.
[b] Gross realization rate = ex post value ÷ ex ante value.

Table 42 summarizes the ex post gross electric savings by measure, ordered from largest to smallest ex ante gross energy impact.

Table 42. HEIQ Program Gross Electric Impacts by Measure

Measure	Verified Measure Quantity	Unit	Ex Ante Gross Impacts		Gross Realization Rate[a]		Ex Post Gross Impacts	
			MWh	MW	MWh	MW	MWh	MW
ASHP	77	ASHP	534.8	0.063	106%	86%	565.4	0.054
ECM	651	Motor	348.9	0.038	119%	218%	414.7	0.083
Air Sealing	747,256	CFM	253.5	0.121	114%	109%	289.5	0.132
CAC	298	CAC	230.6	0.161	162%	170%	373.1	0.272
Attic Insulation	642,301	Sq. Ft.	172.2	0.069	118%	109%	203.0	0.075
Duct Sealing	83	Participant	104.1	0.028	46%	72%	47.7	0.020
Crawl Space Insulation	26,616	Sq. Ft.	95.4	0.032	58%	41%	55.0	0.013
Programmable Thermostat	577	Thermostat	82.6	–	97%	N/A	80.4	–
LED – 9W	2,015	Bulb	55.1	0.005	100%	100%	55.1	0.005
Wall Insulation	176,859	Sq. Ft.	44.0	0.023	116%	98%	51.2	0.023
Smart Thermostat	209	Thermostat	42.8	0.012	131%	148%	56.1	0.018
Rim Joist Insulation	55,797	Linear Feet	34.3	0.016	57%	38%	19.7	0.006
Specialty LED – 5W Candelabra	754	Bulb	33.3	0.004	100%	100%	33.3	0.004
Specialty LED – 7W Globe	726	Bulb	16.2	0.002	100%	100%	16.2	0.002
Specialty LED – 9W Reflector	285	Bulb	14.6	0.002	100%	100%	14.6	0.002
LED – 10W (6 pack)	82	Packs	13.0	0.001	100%	100%	13.0	0.001
Shower Head	23	Shower Head	5.9	0.001	100%	100%	5.9	0.001
CFL – Low (13W–15W)	125	Bulb	3.2	0.000	100%	100%	3.2	0.000
Faucet Aerator	41	Aerator	3.1	0.001	100%	100%	3.1	0.001
Specialty CFL – 9W Candelabra	58	Bulb	2.3	0.000	100%	100%	2.3	0.000
CFL – Medium (18W–20W)	71	Bulb	2.0	0.000	100%	100%	2.0	0.000

Measure	Verified Measure Quantity	Unit	Ex Ante Gross Impacts		Gross Realization Rate[a]		Ex Post Gross Impacts	
			MWh	MW	MWh	MW	MWh	MW
Specialty CFL – 14W Globe	58	Bulb	1.8	0.000	100%	100%	1.8	0.000
CFL – High (23W–25W)	43	Bulb	1.8	0.000	100%	100%	1.8	0.000
Specialty CFL – 15W Reflector	15	Bulb	0.7	0.000	100%	100%	0.7	0.000
Basement Wall Insulation	367	Linear Feet	0.5	0.000	56%	40%	0.3	0.000
Total[b]	**1,655,385[c]**	**N/A**	**2,096.8**	**0.581**	**110%**	**123%**	**2,308.9**	**0.714**

[a] Gross realization rate = ex post value ÷ ex ante value.
[b] Numbers may not total due to rounding.
[c] Total verified measure quantities account for measures that affect electric consumption and therefore do not equal the total verified measure quantity shown in Table 40. Additionally, the sum of the total verified measure quantities in Table 42 and Table 43 does not equal the total verified measure quantity in Table 40 as envelope measures affect both electric and gas consumption and quantities are captured in both tables.

Table 43 summarizes the ex post gross therm savings by measure, ordered from largest to smallest ex ante gross therm impact.

Table 43. HEIQ Program Gross Gas Impacts by Measure

Measure	Verified Measure Quantity	Unit	Ex Ante Gross Impacts	Ex Post Gross Impacts	Gross Realization Rate[a]
			Therms	Therms	
Furnace	762	Furnace	176,271	221,577	126%
Air Sealing	660,874	CFM	43,701	41,311	95%
Attic Insulation	563,163	Sq. Ft.	40,320	37,546	93%
Programmable Thermostat	513	Thermostat	32,826	23,738	72%
Crawl Space Insulation	23,808	Sq. Ft.	23,087	12,273	53%
Duct Sealing	83	Participant	16,125	5,308	33%
Wall Insulation	169,512	Sq. Ft.	15,210	13,630	90%
Smart Thermostat	207	Thermostat	15,165	13,628	90%
Rim Joist Insulation	50,942	Linear Feet	8,495	4,735	56%
Boiler	14	Boiler	7,592	11,683	154%
Shower Head	96	Shower Head	1,082	1,082	100%
Basement Wall Insulation	367	Linear Feet	423	110	26%
Faucet Aerator	126	Aerator	416	416	100%
Total[b]	**1,470,468[c]**	**N/A**	**380,711**	**387,038**	**102%**

[a] Gross realization rate = ex post value ÷ ex ante value.
[b] Numbers may not total due to rounding.
[c] Total verified measure quantities account for measures that affect gas consumption and therefore do not equal the total verified measure quantity shown in Table 40. Additionally, the sum of the total verified measure quantities in and Table 43 does not equal the total verified measure quantity in Table 40 as envelope measures affect both electric and gas consumption and quantities are captured in both tables.

Overall, the evaluation team found that the differences between ex ante and ex post savings are similar to those detailed in the PY9 HEIQ report. The evaluation team carefully reviewed the differences between ex ante and ex post variable assumptions for all program measures. For reporting purposes, we include details explaining differences for measures[28] that account for more than 5% of the total program ex ante energy savings. Table 44 identifies the reasons for discrepancies between ex ante and ex post gross savings for these measures.

Table 44. Reasons for Differences in Realization Rates

Measure	Gross Realization Rate			Source of Discrepancy			
	MWh	MW	Therms	CDD/HDD	HVAC Efficiency	Existing HVAC Type	Other Discrepancies
ASHP	106%	86%	N/A		✓	✓	Cooling and heating load reduction
CAC	162%	170%	N/A		✓	✓	Cooling load reduction
Air Sealing	114%	109%	95%			✓	Differences in actual data inputs for pre_{cfm}, $post_{cfm}$, cooling present, n_{cool}, n_{heat}, number of stories per home
Attic Insulation	118%	109%	93%			✓	Differences in actual data inputs for R-pre, R-post, cooling present, n_{cool}, n_{heat}
Crawl Space Insulation	58%	41%	53%	✓		✓	
Furnace	N/A	N/A	126%		✓	✓	Heating load reduction
Programmable Thermostat	97%	N/A	72%			✓	

We describe the differences between ex ante and ex post savings for measures identified in Table 44 in detail below. Note that while certain inputs increase savings, others decrease savings. The combination of all inputs brings about the overall realization rate for a specific measure.

- **Heating and Cooling Load Reduction:** The implementer applied algorithms for ASHPs, CACs, furnaces, and boilers from the IL-TRM V5.0. However, we learned that HVAC equipment was right-sized for homes with improved envelope measures, thus reducing heating and cooling loads. Ex post calculations included the savings from right-sizing based on the reduced heating and cooling loads, due to a better insulated and sealed home. As a result, ex post savings for all HVAC measures (e.g., ASHPs, CACs, furnaces, and boilers) are greater than ex ante savings.

- **HVAC Efficiency Discrepancies:** The implementer applied the HVAC efficiencies (SEER, EER, HSPF, annual fuel utilization efficiency [AFUE])[29] using the values provided in the IL-TRM V5.0. The evaluation team applied the actual efficiencies provided in the database. When the actual efficiency was unknown, the evaluation team applied the IL-TRM V5.0 value based on the actual equipment age. In cases where both the actual efficiency and age are unknown, the evaluation team applied the average efficiencies for all participants in the program tracking database. As a result, ex post savings for ASHPs

[28] This includes ASHPs, CACs, air sealing, ECM, attic insulation, and crawl space insulation for electric savings and furnaces, air sealing, attic insulation, programmable thermostats, and crawl space insulation for gas savings.

[29] Cooling efficiencies include SEER and EER. Heating efficiencies include HSPF and AFUE.

and furnaces are smaller than ex ante savings and ex post savings are greater than ex ante savings for CACs.

- **CDD and HDD Discrepancies:** For crawl space measures, the implementer applied IL-TRM V5.0 CDD and HDD values for conditioned spaces to calculate ex ante savings. However, based on discussions with the implementer and our understanding of the baseline conditions, the evaluation team applied unconditioned CDD and HDD values consistent with how we handled these measures in previous program years. As a result, ex post estimates are smaller than ex ante savings.

- **Differences in Actual Data Inputs for Air Sealing and Attic Insulation:** The evaluation team calculated ex post savings for air sealing and attic insulation using actual data from the database for such variables as pre- and post-participation R-values, pre- and post-participation air flow conditions (measured in CFM), cooling and heating efficiencies, number of stories per home, and whether central air conditioning is present. The evaluation team is unable to pinpoint exact reasons for differences in ex post and ex ante savings. It appears that the implementer incorporated actual data for these variables, but the evaluation team does not have the ex ante custom inputs to compare to ex post to verify what is causing these differences.

- **Existing HVAC Type:** Differences in ex ante and ex post savings are due to calculations based on HVAC type. The implementer advised us to use the primary heating type from the database when calculating savings for program measures. However, the evaluation team discovered inconsistencies between the HVAC type specified in the measure label and the primary heating and cooling specified in the database. The implementer provided a revised database that corrected the discrepancy for 65 projects across 11 different program measure types,[30] which were then incorporated into the ex post savings calculations. The implementer recognizes that the reported ex ante savings are incorrect because they are calculated using the erroneous HVAC types. Without investing a significant amount of time, we are unable to report exact implications on energy savings due to these differences. We do know that the HVAC discrepancies play a role in the variances in ex ante and ex post savings for these 11 measure types.

Net Impacts

In determining the overall net savings, we applied the SAG-approved NTGR of 1.0. Thus, the ex post net savings are equal to the ex post gross savings of 2,309 MWh, 0.71 MW, and 387,038 therms with overall realization rates of 110%, 123%, and 102% for energy, demand, and therms, respectively.

Table 45. HEIQ Program Net Impacts

Program Component	Ex Ante Net[a]			Ex Post Net		
	MWh	MW	Therms	MWh	MW	Therms
HEIQ Program	2,097	0.58	380,711	2,309	0.71	387,038
Net Realization Rate[b]				**110%**	**123%**	**102%**

[a] Source of ex ante savings: Transition Period program tracking database.
[b] Net realization rate = ex post value ÷ ex ante value.

[30] The revised database corrected the existing primary heating and cooling equipment for air sealing, ASHPs, CACs, furnaces, ECMs, programmable thermostats, smart thermostats, attic insulation, wall insulation, rim joist insulation, and crawl space insulation.

Cumulative Persisting Annual Savings and Weighted Average Measure Life

Table 47 presents CPAS and WAML for the Transition Period HEIQ Program.

Table 46. HEIQ Program CPAS and WAML

Measure	Measure Life	First-Year Ex Post Gross Savings (MWh)	CPAS - Ex Post Net Savings (MWh)								Lifetime Savings (MWh)
			Transition Period	2018	2019	2020	2021	...	2030	...	
CFL - Low (13W–15W)	3.5	3	3	3	3	2	0	...	0		11
CFL - Medium (18W–20W)	3.5	2	2	2	2	1	0	...	0	...	7
CFL - High (23W–25W)	3.5	2	2	2	2	1	0	...	0	...	6
Specialty CFL - 9W Candelabra	6.8	2	2	2	2	2	2	...	0	...	16
Specialty CFL - 14W Globe	6.8	2	2	2	2	2	2	...	0	...	13
Specialty CFL - 15W Reflector	6.8	1	1	1	1	1	1	...	0	...	5
LED - 10W (6 pack)	10.0	13	13	13	8	4	4	...	0	...	62
LED - 9W	10.0	55	55	55	36	18	18	...	0	...	271
Specialty LED - 5W Candelabra	10.0	33	33	33	33	33	33	...	0	...	333
Specialty LED - 7W Globe	10.0	16	16	16	16	16	16	...	0	...	162
Specialty LED - 9W Reflector	10.0	15	15	15	15	15	15	...	0	...	146
Faucet Aerator	9.0	3	3	3	3	3	3	...	0	...	28
Shower Head	10.0	6	6	6	6	6	6	...	0	...	59
Central Air Conditioner (TOS)	18.0	0	0	0	0	0	0	...	0	...	5
Central Air Conditioner (ER)	18.0	373	373	373	373	373	373	...	102	...	3,458
Air Source Heat Pump (TOS)	18.0	43	43	43	43	43	43	...	43	...	776
Air Source Heat Pump (ER)	18.0	522	522	522	522	522	522	...	385	...	7,757
ECM	20.0	415	415	415	415	415	415	...	415	...	8,294
Duct Sealing	20.0	48	48	48	48	48	48	...	48	...	953
Programmable Thermostat	5.0	80	80	80	80	80	80	...	0	...	402
Smart Thermostat	10.0	56	56	56	56	56	56	...	0	...	561
Air Sealing	15.0	290	290	290	290	290	290	...	290	...	4,343
Attic Insulation	25.0	203	203	203	203	203	203	...	203	...	5,074
Wall Insulation	25.0	51	51	51	51	51	51	...	51	...	1,279
Rim Joist Insulation	25.0	20	20	20	20	20	20	...	20	...	492

Measure	Measure Life	First-Year Ex Post Gross Savings (MWh)	CPAS - Ex Post Net Savings (MWh)							Lifetime Savings (MWh)
			Transition Period	2018	2019	2020	2021	...	2030	...	
Crawl Space Insulation	25.0	55	55	55	55	55	55	...	55	...	1,375
Basement Wall Insulation	25.0	0	0	0	0	0	0	...	0	...	7
Transition Period CPAS		**2,309**	**2,309**	**2,309**	**2,286**	**2,259**	**2,256**	**...**	**1,612**	**...**	**35,897**
Expiring Transition Period CPAS			**0**	**0**	**23**	**50**	**53**	**...**	**697**	**...**	
WAML	**17.8**										

3.6 Public Housing Authority

During the Transition Period, AIC met Illinois DCEO obligations to public sector customers participating in the Department's PHA Program. AIC took responsibility for these projects as a result of changes mandated by the FEJA, specifically the responsibility for administration of all energy efficiency programs in 2018.

3.6.1 Program Description

The PHA Program's objective is to improve energy efficiency of public housing in Illinois. The program targets government-owned public sector housing customers, mostly comprised of low income households, receiving federal assistance that have active AIC accounts. The PHA Program incentivizes energy efficient lighting measures, such as light bulbs, lighting controls, exit signs, and exterior and interior lighting, as well as motors, variable frequency drives, HVAC equipment, and ENERGY STAR® rated appliances. The PHA Program also incentivizes insulation and duct sealing.

3.6.2 Program Performance

In the Transition Period, the PHA Program served a total of four participants[31] that received lighting measures, new HVAC equipment and controls, duct insulation, duct sealing, and ENERGY STAR appliances. While there are no set goals for the PHA Program in terms of participation or energy or gas savings, AIC staff notes that the program met its minimum spend goal of $655,000. AIC staff also noted that participants and their residents were highly engaged with the program. However, AIC staff also report that there were delays in completing projects, which may have prevented some of the four participants from taking advantage of incentives that will no longer be offered in 2018.

3.6.3 Impact Results

The evaluation team applied savings algorithms and ISRs from the IL-TRM V5.0. The implementer provided the evaluation team with project documentation consisting of a blend of applications and calculation workbooks for the four PHA participants. The evaluation team carefully reviewed each document and applied project specific information,[32] when available, to derive ex post savings estimates. When this information was not available, the evaluation team applied default assumptions from the IL-TRM V5.0. To assess net impacts, the evaluation team applied the Illinois SAG-approved PY6 NTGR of 1.0 to ex post gross impacts.

Measure Verification

The program offers a variety of measures to participants, including lighting, HVAC equipment and controls, duct insulation and sealing, and ENERGY STAR appliances. The evaluation team determined verified measure quantities by applying IL-TRM V5.0 ISRs to the ex ante measure quantities. Table 47 summarizes the quantity of installed measures based on the review of the program tracking database.

[31] Participants in the PHA Program are public housing authorities rather than individuals.
[32] In some cases, the application specified model numbers for existing and newly installed equipment. The evaluation team applied actual equipment specifications per manufacturer data sheets.

Table 47. PHA Program Verified Measure Quantities

Measure Category	Measure	Unit	Ex Ante Measure Quantity [a]	ISR [b]	Verified Measure Quantity [a * b]
Lighting	Interior LED	Lamp	414	100%	414
	Exterior LED	Lamp	20	98%	20
HVAC Controls	Programmable Thermostats	Thermostat	10	100%	10
HVAC	Furnaces with ECMs	Furnace	204	100%	204
	Packaged Terminal Heat Pump (PTHP)	PTHP	92	100%	92
	Through-the-Wall Air Conditioner (AC) Unit	Room AC	18	100%	18
	Central Air Conditioner (CAC)	CAC	10	100%	10
Envelope	Duct Insulation and Sealing	Apartment	10	100%	10
Appliances	ENERGY STAR Refrigerator	Refrigerator	30	100%	30
Total[a]			**808**	**N/A**	**808**

[a] Numbers may not total due to rounding.

Gross Impacts

The total ex post gross savings for the PHA Program are 578 MWh, 0.08 MW, and 18,544 therms. As shown in Table 48, the gross realization rates are 99% for electric savings and 70% for therm savings.

Table 48. PHA Program Gross Impacts

Program	Number of Participants	Ex Ante Gross[a]			Ex Post Gross		
		MWh	MW	Therms	MWh	MW	Therms
PHA Program	5	583	N/A[b]	26,350	578	0.08	18,544
Gross Realization Rate[c]					**99%**	**N/A[b]**	**70%**

[a] Source of ex ante savings: Transition Period PHA program tracking database.
[b] Implementer confirmed that it did not report demand savings to AIC for the PHA Program. Thus, we are unable to calculate a demand realization rate.
[c] Gross realization rate = ex post value ÷ ex ante value.

Table 49 summarizes the ex post gross electric savings by measure, ordered from largest to smallest ex ante gross energy impact.

Table 49. PHA Program Gross Electric Impacts by Measure

Measure	Verified Measure Quantity	Unit	Ex Ante Gross Impacts		Ex Post Gross Impacts		Gross Realization Rate[a]	
			MWh	MW	MWh	MW	MWh	MW
PTHP	92	PTHP	360.5	–	360.5	0.061	100%	–
Furnace with ECMs	204	Furnace	149.3	–	149.3	0.005	100%	–
ENERGY STAR Refrigerator	30	Refrigerator	25.5	–	24.4	0.004	96%	–
Exterior LED	20	Lamp	22.6	–	16.4	–	73%	–
Interior LED	414	Lamp	15.7	–	16.0	0.002	102%	–
CAC	10	CAC	5.4	–	6.4	0.005	118%	–

Measure	Verified Measure Quantity	Unit	Ex Ante Gross Impacts		Ex Post Gross Impacts		Gross Realization Rate[a]	
			MWh	MW	MWh	MW	MWh	MW
Through-the-Wall AC Unit	18	Room AC	2.5	–	2.7	0.002	105%	–
Duct Insulation and Sealing	10	Apartment	1.0	–	1.8	0.001	172%	–
Programmable Thermostat	10	Thermostat	0.3	–	0.3	–	100%	–
Total[b]	**808[c]**	**N/A**	**582.9**	**N/A[d]**	**577.7**	**0.078**	**99%**	**N/A[d]**

[a] Gross realization rate = ex post value ÷ ex ante value.
[b] Numbers may not total due to rounding;
[c] The sum of the total verified measure quantities in Table 49 and Table 50 does not equal the total verified measure quantity in Table 47 as envelope measures affect both electric and gas consumption and quantities are captured in both tables.
[d] Implementer confirmed that it did not report demand savings to AIC for the PHA Program. Thus, we are unable to calculate a demand realization rate.

Table 50 summarizes the ex post gross therm savings by measure, ordered from largest to smallest ex ante gross gas impact.

Table 50. PHA Program Gross Therm Impacts by Measure

Measure	Verified Measure Quantity	Unit	Ex Ante Gross Impacts	Ex Post Gross Impacts	Gross Realization Rate[a]
			Therms	Therms	
Furnace with ECMs	204	Furnace	24,566	17,448	71%
Duct Insulation and Sealing	10	Apartment	1,437	749	52%
Programmable Thermostat	10	Thermostat	347	347	100%
Total[b]	**224[c]**	**N/A**	**26,350**	**18,544**	**70%**

[a] Gross realization rate = ex post value ÷ ex ante value.
[b] Numbers may not total due to rounding.
[c] Total verified measure quantities account only for measures that affect gas consumption and therefore do not equal the total verified measure quantity shown in Table 47. Additionally, the sum of the total verified measure quantities in Table 49 and Table 50 does not equal the total verified measure quantity in Table 47 as envelope measures affect both electric and gas consumption and quantities are captured in both tables.

The evaluation team carefully reviewed the differences between ex ante and ex post variable assumptions for all program measures. Table 51 identifies the reasons for discrepancies between ex ante and ex post gross savings for gas furnaces with ECMs, the only measure accounting for more than 5% of gross gas savings. We provide more detail following the table.

Table 51. Reasons for Differences in Realization Rates

Measure	Gross Realization Rate			Discrepancy
	MWh	MW[a]	Therms	
Furnace with ECMs	100%	N/A	70%	• New furnace efficiency • Baseline efficiency

[a] Implementer confirmed that it did not report demand savings to AIC for the PHA Program. Thus, we are unable to calculate a demand realization rate.

We describe the differences between ex ante and ex post savings for furnaces with ECMs in detail below. Note that while certain inputs increase savings, others decrease savings. The combination of all inputs brings about the overall realization rate for a specific measure.

- **New Furnace Efficiency:** The evaluation team applied the furnace efficiencies found in manufacturers' data specifications per the model number specified in the applications. The newly installed furnace efficiency for one of the two projects (194 of the 204 installed furnaces) had an efficiency of 80%. Ex ante calculations were not provided for this specific project, and the evaluation team was unable to recreate the ex ante savings. Therefore, we are unable to pinpoint exact reasons for differences in savings estimates for furnaces. However, methodologies for all other variables are consistent with the IL-TRM, and therefore, by process of elimination, we assume the discrepancy is the differences in the newly installed furnace efficiency. As a result, ex post furnace savings are smaller than ex ante.
- **Baseline Efficiency for Furnaces:** The application for one of the two furnace projects (10 of the 204 installed furnaces) indicated that the existing heating equipment was electric. The evaluation team treated this project as a time-of-sale (TOS) instead of ER as this participant intended on switching to gas heating equipment. Therefore, the evaluation team applied the federal minimum standard of 80% AFUE as the baseline efficiency instead of the existing equipment efficiency. As a result, ex post furnace savings are smaller than ex ante.

Net Impacts

In determining the overall net savings, we applied the SAG-approved NTGR of 1.0. Thus, the ex post net savings are equal to the ex post gross savings of 578 MWh, 0.08 MW, and 18,544 therms with overall realization rates of 99% and 70% for energy and therms, respectively.

Table 52. PHA Program Net Impacts

Program	Ex Ante Net[a]			Ex Post Net		
	MWh	MW	Therms	MWh	MW	Therms
PHA Program	583	N/A[b]	26,350	578	0.08	18,544
Net Realization Rate[c]				**99%**	**N/A[b]**	**70%**

[a] Source of ex ante savings: PHA program tracking database.
[b] Implementer confirmed that it did not report demand savings to AIC for the PHA Program. Thus, we are unable to calculate a demand realization rate.
[c] Net realization rate = ex post value ÷ ex ante value.

Cumulative Persisting Annual Savings and Weighted Average Measure Life

Table 55 presents CPAS and WAML for the Transition Period PHA Program.

Table 53. PHA Program CPAS and WAML

Measure	Measure Life	First-Year Ex Post Gross Savings (MWh)	CPAS - Ex Post Net Savings (MWh)							Lifetime Savings (MWh)
			Transition Period	2018	2019	2020	2021	...	2030	...	
Duct Insulation & Sealing	20.0	2	2	2	2	2	2	...	2	...	36
ENERGY STAR Refrigerator	12.0	24	24	24	24	24	1	...	0	...	106
HE Furnaces with ECMs (TOS)	15.5	7	7	7	7	7	7	...	7	...	113
HE Furnaces with ECMs (ER)	15.5	142	142	142	142	142	142	...	142	...	2,201
HE Central AC	18.0	6	6	6	6	6	6	...	2	...	59
Interior LED	15.0	16	16	16	9	3	3	...	3	...	77
Programmable Thermostats	5.0	0	0	0	0	0	0	...	0	...	2
PTHP	5.0	361	361	361	361	361	361		0		1,803
Through-the-wall AC Unit	12.0	3	3	3	3	3	0	...	0	...	11
Exterior LED	15.0	16	16	16	16	16	16	...	16	...	245
Transition Period CPAS		**578**	**578**	**578**	**571**	**565**	**539**	**...**	**172**	**...**	**4,653**
Expiring Transition Period CPAS			**0**	**0**	**7**	**13**	**39**	**...**	**406**	**...**	
WAML	**8.8**										

3.7 Public Sector Central Air Conditioners

3.7.1 Program Description

In addition to HEIQ and PHA data, the program implementation team provided data detailing CACs that were installed in low-income participant homes and buildings and funded using public sector funds. As such, we conducted a review of these measures and the savings claimed for them, but present these savings separately from HEIQ (reported earlier in Section 3.5) and PHA.

3.7.2 Impact Results

The evaluation team applied savings algorithms from the IL-TRM V5.0 using program tracking database inputs and ISRs specified per the IL-TRM V5.0 to estimate program gross savings. To assess net impacts, the evaluation team applied the Illinois SAG-approved NTGR of 1.0 for low-income participants to ex post gross impacts.

Measure Verification

The evaluation team determined verified measure quantities by applying IL-TRM V5.0 ISRs to the ex ante measure quantities. Table 54 summarizes the quantity of installed CACs based on the review of the program tracking database.

Table 54. Public Sector CAC Verified Measure Quantities

Measure Category	Measure	Unit	Ex Ante Measure Quantity [a]	In-Service Rate [b]	Verified Measure Quantity [a * b]
HVAC	Central AC (ER)	CAC	316	100%	316
		Total	**316**	**N/A**	**316**

Gross Impacts

The total ex post gross savings for the Public Sector CAC component are 353 MWh and 0.24 MW. As shown in Table 55, the gross realization rates are 143% for electric saving and 148% for demand savings.

Table 55. Public Sector CAC Gross Impacts

Measure	Number of Participants	Verified Measure Quantity	Ex Ante Gross[a]			Ex Post Gross		
			MWh	MW	Therms	MWh	MW	Therms
Central AC (ER)	308	316	247	0.16	N/A	353	0.24	N/A
			Gross Realization Rate[b]			**143%**	**148%**	**N/A**

[a] Source of ex ante savings: Transition Period Public CAC program tracking database.
[b] Gross realization rate = ex post value ÷ ex ante value.

As documented in the PY9 HEIQ evaluation, the implementer is right-sizing HVAC equipment, thus reducing cooling loads. Because of this, ex post calculations not only accounted for savings from installing a more efficient unit, but also incorporated the additional savings one would expect from properly sizing the unit without compromising comfort. As a result, ex post savings are greater than ex ante savings.

Net Impacts

In determining the overall net savings, we applied the SAG approved NTGR of 1.0. Thus, the ex post net savings are equal to the ex post gross savings of 353 MWh and 0.24 MW with overall realization rates of 143% and 148% for energy and demand, respectively.

Table 56. Public Sector CAC Program Net Impacts

Program Component	Ex Ante Net[a]			Ex Post Net		
	MWh	MW	Therms	MWh	MW	Therms
Public Sector CAC Program	247	0.16	N/A	353	0.24	N/A
Net Realization Rate[b]				**143%**	**148%**	**N/A**

[a] Source of ex ante savings: Public Sector CAC Program tracking database.
[b] Net realization rate = ex post value ÷ ex ante value.

Cumulative Persisting Annual Savings and Weighted Average Measure Life

Table 60 presents CPAS and WAML for the Transition Period Public Sector CAC Program.

Table 57. Public Sector CAC Program CPAS and WAML

Measure	Measure Life	First-Year Ex Post Gross Savings (MWh)	CPAS - Ex Post Net Savings (MWh)							Lifetime Savings (MWh)
			Transition Period	2018	2019	2020	2021	...	2030	...	
Central Air Conditioner (ER)	18.0	353	353	353	353	353	353	...	96	...	3,268
Transition Period CPAS		**353**	**353**	**353**	**353**	**353**	**353**	**...**	**96**	**...**	**3,268**
Expiring Transition Period CPAS			**0**	**0**	**0**	**0**	**0**	**...**	**258**	**...**	
WAML	**18.0**										

3.8 School Kits

3.8.1 Program Description

The School Kits Program presents in-class energy education to fifth-grade through eighth-grade students. Energy Federation, Incorporated (EFI) assembles and sends energy efficiency kits to these students' schools, and CLEAResult (the program implementer) distributes the kits at the start of each presentation. As shown in Table 58, each kit contained two 9W LEDs, two faucet aerators, one high-efficiency shower head, and one hot water temperature card thermometer, along with instructions for properly setting water heater temperatures.

Table 58. School Kits Products

Product	Quantity Per Kit
9W LED	2
1.0 gpm Bath Faucet Aerator	1
2.0 gpm Kitchen Faucet Aerator	1
1.75 gpm High-Efficiency Shower Head	1
Hot Water Temperature Card Thermometer	1
Instructional Materials	N/A

CLEAResult recruited schools primarily through past participation, direct-mail outreach, and conference presentations. The program was designed to be easy to schedule and receive and to provide a positive experience for participating school administrators and teachers. The presentation was designed to be informative and enjoyable for the students. The presentation and kit materials also provided opportunities to increase customer awareness of other AIC energy efficiency programs.

Program presenters and participating teachers encouraged students to install the kit's contents and to complete the activity sheet with a parent after taking their kits home. Using information collected from the activity sheet, students completed the implementer-administered, web-based student participant survey in the classroom. In total, 640 of 3,105 (21%) reported participants returned surveys. The two schools with the highest response rates to the implementer's online student survey received $250 gift cards from the program for their efforts.

Summary of Program Design and Implementation Changes

At the beginning of the Transition Period, the program implementer revised its kit packaging and contents. Instead of providing households with two 13W CFLs, each kit contained two 9W LEDs. AIC and the program implementer revised the kit marketing materials to reflect this change and replaced the packaging so that all products would fit inside the kit.

3.8.2 Program Performance

During the Transition Period, the School Kits Program distributed 3,105 kits to students, which exceeded the 3,000-kit goal. We attributed this to having experienced program staff and operations consistent with previous years. According to the program implementer's tracking database, program staff delivered 97 presentations in 29 schools, and the number of kits distributed to each of the participating schools ranged from 11 to 500. The program implementer reported challenges meeting the goal in the time and budget allotted for the

Transition Period given that the program implementer typically spends a few months scheduling the school visits and coordinating kit deliveries and presentations.

3.8.3 Impact Results

Measure Verification

To estimate gross electric savings values for program measures, the evaluation team used the program tracking database to verify the reported distribution of kits and to apply the IL-TRM V5.0 deemed per-unit gross savings inputs, in combination with the implementer-administered, web-based student participant survey results for installation rates and water heater fuel saturation. Because this information is not collected through the surveys, we used home-type information from the 2013 AIC Energy Efficiency Market Potential Assessment[33] to estimate single- and multifamily weighted averages for ex post gross per-unit savings parameters, in conjunction with parameter values prescribed for single- and multifamily participants in the IL-TRM V5.0.[34] To estimate electric energy savings associated with the program, the evaluation team applied a 60% electric water heater saturation rate (based on the implementer-administered, web-based student participant survey data) to verified installations of energy kit measures.[35]

The evaluation team used results from the implementer-administered, web-based student participant survey to estimate installation rates for kit items, except for the LED measures, for which the evaluation team used the prescribed value in the IL-TRM V5.0. Table 59 lists reported ex ante and evaluated ex post installation rates[36] for each kit measure used in the electric and gas savings calculations. The ex ante savings calculations produced by the implementer used installation rates derived from the PY7 participant survey and reported in the PY7 School Kits report.

Table 59. School Kits Program Installation Rates

Measure	Reported Ex Ante Installation Rate	Evaluated Ex Post Installation Rate
9W LED	61%	61%
1.0 gpm Bath Faucet Aerator	41%	30%
2.0 gpm Kitchen Faucet Aerator	43%	31%
1.75 gpm High-Efficiency Shower Head	46%	28%
Hot Water Temperature Card Thermometer	23%	14%

[33] Ameren Illinois Company. *Energy Efficiency Market Potential Assessment*. Report Number 1404. Volume 2: Market Research. June 10, 2013. Available online: http://ilsagfiles.org/SAG_files/Potential_Studies/Ameren/Appendix%204_AIC%20DSM%20Potential%20Study%202013%20Volume%202%20Market%20Research.docx.

[34] Note that 79% of customers live in single-family homes and 21% live in multifamily homes. The IL-TRM V5.0 reports the average number of people per household in single-family homes as 2.56 and the average number of people in multifamily homes as 2.10. The evaluation team used this information to create a weighted average of 2.46 people per household. Mathematically, this is expressed as ((79% * 2.56) + (21% * 2.10)) = 2.46.

[35] The Ameren Illinois Energy Efficiency Market Potential Assessment found 19% of single-family homes and 49% of multifamily units use electric water heating. Available online: https://www.illinois.gov/sites/ipa/Documents/AppendixB-4vol1-5AmerenPotentialStudy.pdf.

[36] Rates developed from the implementer-administered, web-based student participant survey, collected as part of the PY9 School Kits Program evaluation.

To determine gross savings and net realization rates, the evaluation team applied deemed per-unit gross savings inputs set forth in the IL-TRM V5.0, in combination with the following:

- Transition Period School Kits Program non-CFL measure installation rates and water heater fuel saturations derived from the implementer-administered, web-based student participant survey results for program measures
- Application of the SAG-approved NTGR for this program
- Net savings for delayed CFL installations attributed to the PY8 and PY9 School Kits Programs[37]

Realization rates less than 100% are mainly due to ex ante installation rates being higher than ex post installation rates for all measures other than LEDs.

Gross Impacts

Table 60 outlines the ex ante and ex post gross savings for the Transition Period School Kits Program. As can be seen in the table, the program achieved total ex post gross electric savings of 367 MWh, demand savings of 0.061 MW, and gas savings of 5,885 therms.

Table 60. School Kits Program Ex Ante and Ex Post Gross Impacts

Measure		Sales Year / Install Year	Energy (MWh)		Demand (MW)		Gas (Therms)	
			Ex Ante	Ex Post	Ex Ante	Ex Post	Ex Ante	Ex Post
Lighting (9W LED / 13W CFL)		PY8 / Year 3	24	23	0.003	0.002	N/A	N/A
		PY9 / Year 2	29	31	0.003	0.003	N/A	N/A
		Transition Period / Year 1	101	115	0.010	0.011	N/A	N/A
Bath Faucet Aerator		Transition Period / Year 1	13	10	0.006	0.014	435	300
Kitchen Faucet Aerator		Transition Period / Year 1	110	76	0.047	0.019	2,993	2,260
High-Efficiency Shower Head		Transition Period / Year 1	147	91	0.015	0.010	4,198	2,699
Hot Water Temperature Card Thermometer		Transition Period / Year 1	35	21	0.004	0.002	999	627
Overall	**Total Transition Period Gross Savings[a]**		**459**	**367**	**0.088**	**0.061**	**8,625**	**5,885**
	Transition Period Gross Realization Rate[b]		**79%**		**69%**		**68%**	

[a] Totals may not sum due to rounding.
[b] Based on the implementer-administered, web-based student participant survey data, the evaluation team assumed that 60% of total, verified water-saving measures were installed in homes with electric water heating. Reported percentages are rounded from their true values. Differences between reported measures and verified measures resulted from the application of installation rates derived from the implementer-administered, web-based student participant survey effort and the IL-TRM V5.0. Realization rates differing from 100% resulted from differences between ex ante and ex post installation rates and per-unit savings. Gross realization rate = ex post value ÷ ex ante value.

The evaluation team received ex ante gross savings estimates and assumptions from the implementer and compared them to the ex post savings. The differences between total ex ante and ex post savings estimates resulted from differences in ex ante and ex post gross per-unit savings assumptions and installation rates. The discrepancies for each program measure are addressed in the following descriptions:

[37] Seven-twelfths of delayed 13W CFL installations by PY8 and PY9 School Kits Program participants, estimated as installed during the Transition Period (in accordance with IL-TRM V4.0 [PY8] and IL-TRM V5.0 [PY9]), were credited to the final Transition Period School Kits Program net impacts.

- **LEDs:** The ex ante 9W LED per-unit savings estimate of 26.5 kWh is lower than the ex post per-unit savings estimate of 30.4 kWh. The lower ex ante per-unit savings estimate results from the implementer using the "residential interior and in-unit multifamily" location HOU value of 759 from the IL-TRM V5.0, while the evaluation team used "unknown" location HOU value of 847 from the IL-TRM V5.0, which accounts for the likelihood of some exterior installations. Ex ante per-unit kWh savings is also lower because the implementer calculated savings for a 10W LED, while the evaluation team calculated per-unit savings for a 9W LED, in accordance with the specification sheet of the distributed LED.

- **Bath Faucet Aerators (electric):** The ex ante bath faucet aerator per-unit savings estimate of 17.0 kWh is lower than the ex post per-unit savings estimate of 18.2 kWh. The lower ex ante per unit savings estimate results from the implementer using the single-family assumption of the average number of bathroom faucets per household of 2.83 from the IL-TRM V5.0. The evaluation team used an estimate of the percentage of single-family versus multifamily homes (79% and 21%, respectively) from the 2013 *Market Potential Assessment* to calculate a weighted average of the number of bathroom faucets per household of 2.55.

  The ex ante bath faucet aerator per-unit demand savings estimate of 0.0072 kW is lower than the ex post per-unit savings estimate of 0.0255 kW, calculated in accordance with the IL-TRM V5.0. The lower ex ante per-unit savings estimate results from the implementer using the average recovery hours per faucet value of 52 based on the IL-TRM V5.0 assumption for an "unknown" location in single-family homes. The evaluation team used the average recovery hours per unit based on the percentage of single-family versus multifamily homes (79% and 21%, respectively)[38] to calculate a weighted average value of 16. The TRM recovery rate value for the unknown location in single-family homes is 325% more than the weighted average single-family/multifamily value, which is the main factor contributing to the 259% realization rate for demand savings.

  In addition to differences in per-unit savings, the lower total ex post gross savings is a result of differences in installation rates applied for ex post and ex ante gross savings. The implementer assumed an ISR of 41% to estimate ex ante savings based on a PY7 survey,[39] while the evaluation team applied the bath faucet aerator-specific ISR of 30%, calculated from the implementer-administered, web-based student participant survey.

- **Bath Faucet Aerators (gas):** The ex ante bath faucet aerator per-unit savings estimate of 0.9 therms is slightly higher than the ex post per-unit savings estimate of 0.8 therms. Similar to the electricity differences, the implementer applied IL-TRM V5.0 assumptions based on single-family homes (2.83 faucets per household), while the evaluation team used an assumption of 2.55 faucets per home based on a weighted value of the 79% single-family/21% multifamily customer population distribution assumptions.[40]

[38] EnerNOC Utility Solutions Consulting. *Ameren Illinois Energy Efficiency Market Potential Assessment. Report Number 1404. Volume 2: Market Research.* June 10, 2013. Available online: http://ilsagfiles.org/SAG_files/Potential_Studies/Ameren/Appendix%204_AIC%20DSM%20Potential%20Study%202013%20Volume%202%20Market%20Research.docx.

[39] PY7 School Kits Participant Survey results.

[40] EnerNOC Utility Solutions Consulting. *Ameren Illinois Energy Efficiency Market Potential Assessment. Report Number 1404. Volume 2: Market Research.* June 10, 2013. Available online: http://ilsagfiles.org/SAG_files/Potential_Studies/Ameren/Appendix%204_AIC%20DSM%20Potential%20Study%202013%20Volume%202%20Market%20Research.docx.

The higher ex ante per-unit savings estimate also results from the implementer using an "unknown" aerator-specific energy per gallon of hot water supplied by gas value of 0.00394, while the evaluation calculated a weighted 79% single-family/21% multifamily value of 0.00357 energy per gallon.

The lower overall ex post gross savings is a result of differences in installation rates applied for ex post and ex ante gross savings. Ex ante savings assumed an ISR of 41%,[41] while the evaluation team applied the bath faucet aerator-specific ISR of 30%, calculated from the implementer-administered, web-based student participant survey.

- **Kitchen Faucet Aerators (electric):** The ex ante kitchen faucet aerator per-unit savings estimate of 137.6 kWh is higher than the ex post per-unit savings estimate of 132.4 kWh, calculated in accordance with the IL-TRM V5.0. The higher ex ante per-unit savings estimate results from the implementer using an assumption of 2.56 people per household based on assuming all homes were single-family homes, while the evaluation team applied a people-per-household assumption of 2.46 assuming the percentage of single-family versus multifamily homes (79% and 21%, respectively) from the 2013 *Market Potential Assessment.*

  The ex ante kitchen faucet aerator per-unit demand savings estimate of 0.0582 kW is higher than the ex post per-unit savings estimate of 0.0322 kW. The higher ex ante per-unit demand savings estimate results from the implementer's assumption of an "unknown" location in a single-family home for the average recovery hours per faucet value of 52 from the IL-TRM V5.0. The evaluation team applied the assumption of 90 average recovery hours per faucet for kitchens using a weighted average of assumed 79% single-family and 21% multifamily customer population distribution.

  The lower total ex post gross savings is also the result of differences in installation rates applied for ex post and ex ante gross savings. Ex ante savings assumed an ISR of 43%,[42] while the evaluation team applied the kitchen faucet aerator-specific ISR of 31%, calculated from the implementer-administered, web-based student participant survey.

- **Kitchen Faucet Aerators (gas):** The ex ante kitchen faucet aerator per-unit savings estimate of 5.6 therms is lower than the ex post per-unit savings estimate of 5.9 therms. The implementer applied the assumption of 0.00394 energy per gallon of hot water based on the "unknown" home type, while the evaluation team applied a value of 0.00429 based on a weighted average of single-family and multifamily home types.

  The lower overall ex post gross savings is a result of differences in installation rates applied for ex post and ex ante gross savings. Ex ante savings assumed an ISR of 43%,[43] while the evaluation team applied the kitchen faucet aerator-specific ISR of 31%, calculated from the implementer-administered, web-based student participant survey.

- **Shower Heads (electric):** The ex ante shower head per-unit savings estimate of 171.6 kWh is lower than the ex post per-unit savings estimate of 175.2 kWh. The implementer assumed a showers-per-household value of 1.79 for single-family homes, while the evaluation team applied an assumption of 1.69 using IL-TRM 5.0 values weighted for 79% single-family and 21% multifamily customer population

[41] PY7 School Kits Participant Survey results.

[42] Ibid.

[43] Ibid.

distribution from the 2013 *Market Potential Assessment*[44] to calculate a weighted average showers per household value of 1.69.

The ex ante shower head per-unit demand savings estimate of 0.0179 kW is lower than the ex post per-unit savings estimate of 0.0190 kW. The implementer used the average recovery hours per faucet use value of 266 based on single-family homes, while the evaluation team applied the assumption of 256 based on the weighted average of assumptions for 79% single-family/21% multifamily customer population distribution.

The lower total ex post gross savings is a result of differences in installation rates applied for ex post and ex ante gross savings. Ex ante savings assumed an ISR of 46%,[45] while the evaluation team applied the bath faucet aerator-specific ISR of 28%, calculated from the implementer-administered, web-based student participant survey.

- **Shower Heads (gas):** The ex ante shower head per-unit savings estimate of 7.3 therms is lower than the ex post per-unit savings estimate of 7.8 therms. The implementer assumed the 1.79 showers per household based on the IL-TRM V5.0 value for single-family homes, while the evaluation team applied a weighted average assumption of 1.69 based on 79% single-family/21% multifamily customer population distribution.[46]

  The lower overall ex post gross savings is a result of differences in installation rates applied for ex post and ex ante gross savings. Ex ante savings assumed an ISR of 46% from a PY7 survey,[47] while the evaluation team applied the shower head-specific ISR of 28%, calculated from the implementer-administered, web-based student participant survey.

- **Hot Water Temperature Card Thermometers (electric):** Since the evaluation team used the same savings assumptions as the implementer for the water heater temperature card thermometer per-unit savings calculations, the ex post gross per-unit savings match the ex ante per-unit savings.

  The lower overall ex post gross savings is a result of differences in installation rates applied for ex post and ex ante gross savings. Ex ante savings assumed an ISR of 23%,[48] while the evaluation team applied the hot water temperature card thermometer-specific ISR of 14%, calculated from the implementer-administered, web-based student participant survey.

- **Hot Water Temperature Card Thermometers (gas):** The ex ante hot water temperature card thermometer per-unit savings estimate of 3.5 therms is lower than the ex post per-unit savings estimate of 3.6 therms. The implementer applied a 0.78 efficiency assumption for gas hot water heaters based on single-family homes in the IL-TRM V5.0, while the evaluation team applied 0.76 based on a weighted average of 79% single-family/21% multifamily customer population distribution.

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[44] EnerNOC Utility Solutions Consulting. *Ameren Illinois Energy Efficiency Market Potential Assessment. Report Number 1404. Volume 2: Market Research.* June 10, 2013. Available online: http://ilsagfiles.org/SAG_files/Potential_Studies/Ameren/Appendix%204_AIC%20DSM%20Potential%20Study%202013%20Volume%202%20Market%20Research.docx.

[45] PY7 School Kits Participant Survey results.

[46] EnerNOC Utility Solutions Consulting. *Ameren Illinois Energy Efficiency Market Potential Assessment. Report Number 1404. Volume 2: Market Research.* June 10, 2013. Available online: http://ilsagfiles.org/SAG_files/Potential_Studies/Ameren/Appendix%204_AIC%20DSM%20Potential%20Study%202013%20Volume%202%20Market%20Research.docx.

[47] PY7 School Kits Participant Survey results.

[48] Ibid.

The lower overall ex post gross savings is a result of differences in installation rates applied for ex post and ex ante gross savings. Ex ante savings assumed an ISR of 23% from a PY7 survey,[49] while the evaluation team applied the hot water temperature card thermometer-specific ISR of 14%, calculated from the implementer-administered, web-based student participant survey.

The IL-TRM V5.0 assumes that students install 61% of the LEDs during the year that they are distributed. Up to 86% of all remaining LEDs are eventually installed during the following two years. Therefore, in addition to gross savings achieved from measure installations during the Transition Period, the evaluation team calculated gross savings for future LED installations, per the IL-TRM V5.0. Table 61 shows savings from bulbs provided to participants and installed in the Transition Period, as well as bulbs that will be installed and claimed in future program years.

Table 61. Yearly Ex Post Gross Impact of Residential Lighting Measures by Assumed Installation Year

Measure	Energy (MWh)			Demand (MW)		
	Transition Period	Future Year 1	Future Year 2	Transition Period	Future Year 1	Future Year 2
9W LED	115	25	21	0.011	0.002	0.002

The evaluation team credited the School Kits Program with savings from bulbs distributed during PY8 and PY9 installed during the Transition Period. Because the Transition Period accounts for only 7 of the 12 months of a year, we claim 7/12 of Future Year 2 installations from PY8 (23 MWh and 0.002 MW in ex post gross savings) and Future Year 1 installations from PY9 (31 MWh and 0.003 MW in ex post gross savings). The remaining 5/12 of sales from these installation years will be claimed in 2018.[50]

Net Impacts

Based on Transition Period-distributed measures, the program achieved total net electric and demand savings of 303 MWh and 0.057 MW, respectively, and total net gas savings of 6,123 therms. Additionally, the evaluation team included 7/12 of net savings from CFLs distributed in the PY8 and PY9 School Kits Programs but not installed until the Transition Period, which brought the totals to 348 MWh and 0.061 MW.[51] Table 62 shows net electric savings results by measure.

[49] Ibid.

[50] Seven-twelfths of the delayed 13W CFL installations by PY8 School Kits Program participants, estimated as installed during the Transition Period (in accordance with IL-TRM V4.0), were credited to the final Transition Period School Kits Program net impacts.

[51] Seven-twelfths of the delayed 13W CFL installations by PY8 and PY9 School Kits Program participants, estimated to have been installed during the Transition Period, have been credited to final Transition Period School Kits Program net impacts for the 9W LED measure.

Table 62. School Kits Program Total Net Savings by Measure

Measure		Sales Year / Install Year	Energy (MWh)		Demand (MW)		Gas (Therms)	
			Ex Ante	Ex Post	Ex Ante	Ex Post	Ex Ante	Ex Post
Lighting (9W LED / 13W CFL)		PY8 / Year 3	20	19	0.002	0.002	N/A	N/A
		PY9 / Year 2	24	25	0.003	0.003	N/A	N/A
		Transition Period / Year 1	83	96	0.008	0.010	N/A	N/A
Bath Faucet Aerator		Transition Period / Year 1	14	11	0.006	0.015	452	312
Kitchen Faucet Aerator		Transition Period / Year 1	115	80	0.049	0.019	3,113	2,350
High-Efficiency Shower Head		Transition Period / Year 1	154	96	0.016	0.010	4,408	2,834
Hot Water Temperature Card Thermometer		Transition Period / Year 1	35	21	0.004	0.002	999	627
Overall	**Total Transition Period / Year 1 Net Savings[a]**		**445**	**348**	**0.088**	**0.061**	**8,972**	**6,123**
	Transition Period Achieved Net Realization Rate[b]		**79%**		**69%**		**68%**	

Note: SAG-approved NTGR used for ex ante net savings and ex post net savings.
[a] Totals may not sum due to rounding.
[b] Net realization rate = ex post value ÷ ex ante value.

Cumulative Persisting Annual Savings and Weighted Average Measure Life

Table 67 presents CPAS and WAML for the Transition Period School Kits Program.

Table 63. School Kits Program CPAS and WAML

Measure	Measure Life	First-Year Ex Post Gross Savings (MWh)	CPAS - Ex Post Net Savings (MWh)							Lifetime Savings (MWh)
			Transition Period	2018	2019	2020	2021	...	2030	...	
9W LED (Transition Period - Year 1)	10.0	115	96	96	96	63	31	...	0	...	536
13W CFL (PY9 - Year 2)	3.5	31	25	25	25	13	0	...	0	...	89
13W CFL (PY8 - Year 3)	3.5	23	19	19	19	10	0	...	0	...	67
1.0 GPM Bath Faucet Aerator	9.0	10	11	11	11	11	11	...	0	...	95
2.0 GPM Kitchen Faucet Aerator	9.0	76	80	80	80	80	80	...	0	...	716
1.75 GPM High Efficiency Showerhead	10.0	91	96	96	96	96	96	...	0	...	960
Hot Water Temperature Card Thermometer	2.0	21	21	21	0	0	0	...	0	...	43
Transition Period CPAS		**368**	**348**	**348**	**326**	**272**	**217**	**...**	**0**	**...**	**2,505**
Expiring Transition Period CPAS			**0**	**0**	**21**	**76**	**131**	**...**	**348**	**...**	
WAML	**8.4**										

3.8.4 Key Findings

- **Key Finding #1:** Realization rates less than 100% for non-CFL measures are due to ex ante installation rates being higher than ex post installation rates. The implementer used installation rates from the PY7 participant survey and reported in the PY7 School Kits report to estimate savings. The evaluation team used results from the Transition Period implementer-administered, web-based student participant survey to estimate installation rates for non-CFL measures.
  - **Recommendation:** Calculate future ex ante savings using the Transition Period ex post installation rates presented in this report.
- **Key Finding #2:** The implementer-administered, web-based survey did not collect single-family and multifamily home type information or data related to whether the LED light bulbs were installed in interior or exterior locations.
  - **Recommendation:** Collect information on home type and location of LED light bulbs installations in future survey efforts to inform gross program savings calculations.

3.9 Commercial and Industrial Standard

3.9.1 Program Description

Implemented by Leidos, the C&I Standard Program offers AIC business customers fixed incentives for the installation of specific energy efficiency measures. Incentives are delivered through several distinct offerings described below:

- **Core Program:** The Core Program covers lighting, variable frequency drives (VFDs), HVAC equipment, refrigeration/grocery equipment, commercial kitchen equipment, steam traps, and other measures.
- **Instant Incentives:** The Instant Incentives offering is a midstream lighting program that offers discounts at the point of sale covering a variety of standard, specialty, and linear LEDs.
- **Online Store:** Through the Standard Program, AIC operates an online store offering that serves to provide all electric business customers a variety of energy-saving products, including LEDs, occupancy sensors, and LED exit signs.
- **Green Nozzles:** The Standard Program also includes the Green Nozzles offering, which offers free low-flow pre-rinse nozzles to all AIC all-gas customers, as well as customers in the food service sector who use electric water heating.
- **Laminar Flow Restrictors (LFRs):** In PY9, the Standard Program introduced the LFR offering as a pilot. The LFRs are offered as an option for healthcare and other facilities that must comply with strict Occupational Safety and Health Administration (OSHA) requirements when limiting hot water consumption.

In addition, the Standard Program included two new offerings during the Transition Period: the STEP offering and the Municipality-Owned Street Lighting (MOSL) offering. These offerings are described below in more detail.

- **STEP:** The STEP offering is a self-install program that targets public sector customers. It was previously implemented by the MEEA on behalf of the DCEO. The program offers energy assessments and free energy-saving equipment, such as LED exit signs, low-flow faucet aerators, pre-rinse spray valves, and high-efficiency shower heads, and lighting measures, such as LEDs and occupancy sensors. AIC continued operation of this program throughout the Transition Period to maintain continuity for public sector customers but does not expect to continue offering it moving forward.
- **MOSL:** The MOSL offering incentivizes municipal customers to upgrade street lighting fixtures with LED technology. The offering upgrades municipality-owned lighting fixtures (i.e., protective lighting, street lighting, area lighting, and decorative lighting) with high-intensity discharge (HID) lighting to LED lighting. AIC plans to continue offering efficient street lighting upgrades to its customers in the future, but these savings will be organized under a different initiative and not considered a part of the Standard Program.

Summary of Program Design and Implementation Changes

During the Transition Period, the Standard Program remained consistent with PY9 in terms of program design and implementation, with some notable changes including the following:

- Exemption of large electric customers with energy use of 10 MW or more

- Significant increase of gas savings goals, particularly for HVAC offerings
- Increased incentives and bonus offerings for trade allies to help encourage participation and meet the increased gas savings goals

In addition to these changes, the Standard Program also began including public ratepayers or public sector customers as a new customer segment. Public sector customers were previously served by the DCEO; however, AIC began serving them through both commercial and residential energy efficiency programs beginning in the Transition Period.

To help drive participation, the program implementation team increased marketing activities targeting public sector customers. They also worked with the DCEO to provide customer support and training to help public sector customers adapt to AIC program offerings. In addition, trade allies serving public sector customers started conducting boiler tune-ups to maximize the efficiency of their customers' heating systems. Finally, a 15% bonus was offered to public sector customers to help encourage participation.

3.9.2 Program Performance

According to the Transition Period implementation plan, AIC expected savings from the Standard Program for the Transition Period to account for 31% and 38% of AIC's overall electric and gas savings goals, respectively.[52] As shown in Table 64, the program claimed a total of 32,111 MWh, 4.29 MW, and 1,539,400 therms in ex ante gross savings through private sector projects. In addition, the program completed 272 public sector projects and claimed 11,231 MWh, 1.56 MW, and 104,916 therms in ex ante gross savings from public sector participants as shown in Table 65.

Table 64. Summary of Private Sector Standard Program Offerings

Offering	Total Projects	Ex Ante Gross Savings		
		MWh	MW	Therms
Core Offering	393	23,565	2.49	1,538,319
Instant Incentives[a,b]	416	8,039	1.68	0
Online Store	139	479	0.11	0
Green Nozzles	4	27	0	757
LFRs	1	0	0	324
Total	**953**	**32,111**	**4.29**	**1,539,400**

[a] Savings totals for the Instant Incentives offering includes carryover from PY8 and PY9.
[b] The count of projects for Instant Incentives is the number of unique participants.

[52] Source: Transition Period Implementation Plan Sec. 8-103/8-104. Report. Ameren Illinois, April 17, 2017.

Table 65. Summary of Public Sector Standard Program Offerings

Offering	Total Projects	Ex Ante Gross Savings		
		MWh	MW	Therms
Core Offering	100	7,195	1.09	72,258
Instant Incentives[a,b]	107	2,145	0.46	0
Online Store	16	77	0.01	0
Green Nozzles	2	0	0	757
MOSL	19	591	0	0
STEP	28	1,224	0	31,901
Total	**272**	**11,231**	**1.56**	**104,916**

[a] No carryover savings are included for public sector Instant Incentives as public sector customers were not eligible for this program until the Transition Period.
[b] The count of projects for Instant Incentives is the number of unique participants.

Core Offering

Table 66 summarizes the Core Program projects completed in the Transition Period by end use. The distribution of projects and savings is similar to recent program years. During the Transition Period, 80% of private sector projects completed through the Core Program had associated electric savings only, 3% had gas savings only, and 15% had both electric and gas savings. Lighting projects accounted for 52% of the electric savings, and 77% of Transition Period projects included lighting measures. Similar to past program years, steam traps contributed nearly all (98%) of the achieved gas savings.

Table 66. Summary of Core Program Private Sector Participation by End Use

End Use	Projects		Ex Ante Gross Electric Savings		Ex Ante Gross Gas Savings	
	Quantity	%	MWh	%	Therms	%
Lighting	302	77%	12,288	52%	–	0%
VFDs	20	5%	9,220	39%	–	0%
Leak Survey and Repair	1	>1%	486	2%	–	0%
HVAC	41	10%	1,446	6%	28,975	2%
Specialty Equipment	19	5%	125	1%	4,618	0%
Steam Traps	10	3%	–	0%	1,504,726	98%
Total[a]	**393**	**100%**	**23,565**	**100%**	**1,538,319**	**100%**

[a] Columns may not sum to totals due to rounding.

As shown in Table 67, a total of 100 public sector projects were completed during the Transition Period, contributing 7,195 MWh and 72,258 therms in ex ante gross savings. The majority of projects completed by public sector participants included lighting (61%) and HVAC (19%) measures. However, VFDs contributed the most to electric ex ante gross savings (44%), while HVAC measures contributed the majority of ex ante gross gas savings (91%).

Table 67. Summary of Core Program Public Sector Participation by End Use

End Use	Projects		Ex Ante Gross Electric Savings		Ex Ante Gross Gas Savings	
	Quantity	%	MWh	%	Therms	%
Lighting	61	61%	2,588	36%	–	0%
VFDs	10	10%	3,151	44%	–	0%
Leak Survey and Repair	–	–	–	0%	–	0%
HVAC	19	19%	1,418	20%	65,706	91%
Specialty Equipment	5	5%	38	1%	–	0%
Steam Traps	5	5%	–	0%	6,552	9%
Total[a]	**100**	**100%**	**7,195**	**100%**	**72,258**	**100%**

[a] Columns may not sum to totals due to rounding.

Instant Incentives

Table 68 summarizes the Instant Incentives lighting sold to private sector customers in the Transition Period by lighting product type. A total of 105,995 LED measures were sold to 416 private sector customers through this offering. Consistent with PY9, the vast majority (92%) of purchases were linear LEDs, followed by specialty LEDs (6%), and standard LEDs (2%).

Table 68. Summary of Instant Incentives Private Sector Participation by Measure Type

Lighting Product	Participants[a]		Measures		Ex Ante Gross Electric Savings	
	Quantity	%	Quantity	%	MWh	%
Linear LED	263	83%	97,307	92%	3,570	66%
Specialty LED	169	53%	6,065	6%	1,515	28%
Standard LED	66	24%	2,623	2%	296	5%
Total[b]	**416**	**100%**	**105,995**	**100%**	**5,381**	**100%**

[a] Participants who purchased more than one lighting product are counted in multiple categories and therefore counts and percentages do not sum to the total unique participant count.
[b] Columns may not sum to 100% due to rounding.

In the Transition Period, Instant Incentives lighting was also sold to public sector customers. They purchased 51,671 incentivized lighting measures overall. Similar to private sector lighting purchases, the majority of purchases were linear LEDs (98%), followed by specialty LEDs (2%), and standard LEDs (1%).

Table 69. Summary of Instant Incentives Public Sector Participation by Measure Type

Lighting Product	Participants[a]		Measures		Ex Ante Gross Electric Savings	
	Quantity	%	Quantity	%	MWh	%
Linear LED	79	75%	50,474	98%	1,880	88%
Specialty LED	28	40%	925	2%	237	11%
Standard LED	12	15%	272	1%	28	1%
Total[b]	**107**	**100%**	**51,671**	**100%**	**2,145**	**100%**

[a] Participants who purchased more than one lighting product are counted in multiple categories and therefore counts and percentages do not sum to the total unique participant count.
[b] Columns may not sum to 100% due to rounding.

Online Store

Table 70 summarizes the Online Store lighting equipment sold to private sector customers during the Transition Period. Consistent with PY9, most (85%) of the discounted lighting measures sold through the Online Store during the Transition Period were LED bulbs, followed by LED exit signs (10%), and occupancy sensors (6%). LED bulbs also accounted for the majority (78%) of the Online Store's savings during the Transition Period. In PY9, a larger share of the Online Store sales and energy savings came from sales of LED bulbs (95% of measures sold and 92% of PY9 savings).

Table 70. Summary of Online Store Private Sector Participation by End Use

Lighting Product	Participants[a]		Measures		Ex Ante Gross Electric Savings	
	Quantity	%	Quantity	%	MWh	%
LED Bulb	97	70%	2,382	85%	374	78%
LED Exit Sign	45	32%	271	10%	53	11%
Occupancy Sensor	27	19%	155	6%	52	11%
Total[b]	**139**	**100%**	**2,808**	**100%**	**479**	**100%**

[a] Participants who purchased more than one lighting product are counted in multiple categories and therefore counts and percentages do not sum to the total unique participant count. The number of participants by measure are based on application number.
[b] Columns may not sum to 100% due to rounding

In the Transition Period, a total of 16 public sector customers purchased 404 units of discounted lighting equipment through the Online Store. Similar to private sector Online Store purchases, most of the discounted lighting sold to public sector customers through the Online Store were LED bulbs (68%), followed by LED exit signs (28%), and occupancy sensors (4%).

Table 71. Summary of Online Store Public Sector Participation by End Use

Lighting Product	Participants [a]		Measures		Ex Ante Gross Electric Savings	
	Quantity	%	Quantity	%	MWh	%
LED Bulb	5	31%	273	68%	46	60%
LED Exit Sign	12	75%	115	28%	24	31%
Occupancy Sensor	2	13%	16	4%	7	9%
Total	**16**	**100%**	**404**	**100%**	**77**	**100%**

[a] Participants who purchased more than one lighting product are counted in multiple categories and therefore counts and percentages do not sum to the total unique participant count. The number of participants by measure are based on application number.
[b] Columns may not sum to 100% due to rounding

Remaining Offerings

In this section, we present the number of projects and savings from the remaining offerings available to customers through the Standard Program, namely, the Green Nozzles, LFR, STEP, and MSOL initiatives.

- **Green Nozzles:** As in previous program years, savings from the Green Nozzles offering were minimal compared to other Standard Program offerings. The ex ante gross electric savings in the Transition Period for private sector customers remained consistent with PY9 (27 MWh in the Transition Period compared to 29 MWh in PY9), while private sector gas savings decreased by 83% in the Transition Period (757 therms) compared to PY9 (4,510 therms).

- **LFRs:** The energy savings from the LFR offering accounted for 0.2% of the overall ex ante gas program savings in the Transition Period. Only one (private sector) project was completed during the Transition Period, saving 324 therms.
- **STEP:** This offering reached 28 public sector participants who installed 4,265 energy efficiency measures in the Transition Period. It achieved 1,224 MWh ex ante gross electric savings and 31,901 therm ex ante gross gas savings.
- **MOSL:** This offering accounts for 1% of the overall ex ante electric savings (591 MWh). It reached 19 public sector participants and distributed 436 LED lighting measures in the Transition Period. As this program offering was newly introduced as part of the Standard Program, these results are not surprising.

3.9.3 Impact Results

Private Sector Impacts

Gross Impacts

Table 72 presents the private sector ex ante gross savings, ex post gross savings, and gross realization rates for electric and gas energy and electric demand for private sector participants in the Transition Period Standard Program.

Table 72. Standard Program Private Sector Gross Impact Summary

Savings Category	Ex Ante Gross	Realization Rate	Ex Post Gross
Energy Savings (MWh)			
Core Offering	23,565	99.8%	23,528
Instant Incentives[a]	8,039	102.2%	8,212
Online Store	479	99.8%	479
Green Nozzles	27	100.0%	27
LFR	–	N/A	–
Total MWh Savings	**32,111**	**100.4%**	**32,246**
Demand Savings (MW)			
Core Offering	2.49	100.2%	2.50
Instant Incentives[a]	1.68	102.1%	1.72
Online Store	0.11	99.9%	0.11
Green Nozzles	–	N/A	–
LFR	–	N/A	–
Total MW Savings	**4.29**	**100.9%**	**4.33**
Gas Savings (Therms)			
Core Offering	1 ,538,319	100.0%	1,538,321
Instant Incentives	–	N/A	–
Online Store	–	N/A	–
Green Nozzles	757	N/A	757
LFR	324	99.9%	324
Total Therm Savings	**1,539,400**	**100.0%**	**1,539,402**

[a] Includes carryover savings for CFLs and LEDs purchased in PY8 and PY9.

Core Program

AIC private customers installed more than 20,000 individual measures through the Core Program in the Transition Period as part of 393 unique projects (Table 73). As in previous years, the majority of measures consisted of lighting installations, followed by steam trap and specialty equipment[53] measures.

Table 73. Transition Period Core Program Verification Results

Measure Type	Program Tracking Measure Count	Verified Measure Count	Verification Rate
Lighting	18,533	18,533	100%
VFDs	124	124	100%
HVAC	120	120	100%
Leak Survey and Repair	1	1	100%
Specialty Equipment	322	322	100%
Steam Traps	1,772	1,772	100%
Total	**20,872**	**20,872**	**100%**

[53] Specialty equipment includes commercial refrigeration and controls (e.g., glass door freezers, solid door freezers, strip curtains, anti-sweat heater controls) and food service equipment (e.g., fryers, dishwashers, steam cookers, hot holding cabinets).

Our impact analysis activities for the Core Program yielded ex post gross electric savings, gas savings, and peak demand savings that are approximately equal to their respective ex ante estimates (Table 74), except for specialty equipment. The realization rates for peak demand and electric savings for specialty equipment differ significantly from 100% due to implemented ENERGY STAR Desktop Computer upgrades that are not included in the IL-TRM V5.0 evaluation protocols. We describe this discrepancy in more detail below.

Table 74. Transition Period Core Program Private Sector Gross Impacts

Measure Type	Verified Measures	Ex Ante Gross Savings			Realization Rate			Ex Post Gross Savings		
		MWh	MW	Therms	MWh	MW	Therms	MWh	MW	Therms
Lighting	18,533	12,288	1.07	–	100%	100%	N/A	12,283	1.07	–
VFDs	124	9,220	1.23	–	100%	100%	N/A	9,218	1.23	–
HVAC	120	1,446	0.13	28,975	100%	101%	100%	1,450	0.13	28,975
Leak Survey and Repair	1	486	0.06	–	100%	100%	N/A	486	0.06	–
Specialty Equipment	322	125	0.01	4,618	73%	120%	100%	91	0.02	4,620
Steam Traps	1,772	–	–	1,504,726	N/A	N/A	100%	–	–	1,504,726
Total	**20,872**	**23,565**	**2.49**	**1,538,319**	**100%**	**100%**	**100%**	**23,528**	**2.50**	**1,538,321**

Note: Realization rates may not equal reported ex post ÷ reported ex ante due to rounding.

The evaluation team identified slight differences between ex ante and ex post savings for several program measures, but for reporting purposes we outline discrepancies for measures with notable differences in realization rates (e.g., HVAC). Note that while certain inputs may increase savings, others decrease savings. The combination of all inputs brings about the overall realization rate for a specific measure.

- **Lighting Discrepancies:**
  - **Office Building Inputs Discrepancy:** For Core Program lighting measures where the building type was listed as office, i.e., not in alignment with the IL-TRM V5.0 taxonomy, the implementer used two methods to calculate electricity peak load reductions and electricity savings and heating penalties. The first method created a generalized office building category by assembling the most conservative input variables across the entire office building classification from the IL-TRM V5.0. The generalized office building characterization was then used to calculate peak load demand reductions. However, the implementer used the input variables associated with the IL-TRM V5.0 building type defined as a high-rise office building with constant air volume and an economizer (Office - High Rise - CAV econ) to calculate electricity savings and heating penalties. This occurred in 16 projects within the Core lighting offering and an additional 6 projects that implemented occupancy sensors from the Online Store program. For ex post calculations, we assembled the most conservative values from the six office building types into a single generalized office building type for these office projects.

- HVAC Discrepancies
  - **High-Efficiency Furnace Building Type Discrepancy:** The implementer assumed operation hours are equal to 2,718 and a coincidence factor (CF) of 0.424, per the IL-TRM V5.0 (when building type is unknown). To arrive at ex post savings, we applied the building type provided in the program tracking database to determine hours and CFs specific to each project.
  - **High-Efficiency Furnace Peak Load Algorithm Discrepancy:** The implementer applied total electricity savings to the high-efficiency furnace peak load savings algorithm. To arrive at ex post savings, we applied only the cooling savings to the peak load savings algorithm, per the IL-TRM V5.0.
- Specialty Equipment Discrepancies
  - **ENERGY STAR Desktop Computer Discrepancy:** The implementer applied a deemed annual electricity savings of 124 kWh, as defined by the 2014 version of the ENERGY STAR *Office Equipment Calculator*.[54] For ex post electricity savings, we calculated savings using the IL-TRM V6.0 as an alternative to IL-TRM V5.0, which does not include protocols for evaluating ENERGY STAR desktop computer upgrades. The discrepancy in annual electricity savings is a result of power and operational hour assumptions made in both approaches. Because the IL-TRM V6.0 approach has been approved and will be implemented in the 2018 program year, we determined this approach to be the most appropriate for evaluation of ENERGY STAR computers.

Online Store

LED bulbs continued to provide the majority of savings for the Online Store measures in the Transition Period, with LED exit signs and occupancy sensors accounting for a smaller share of savings (see Table 76).

Table 75. Transition Period Online Store Private Sector Verification Results

Measure Type	Program Tracking Measures	Verified Measures	Verification Rate
LED Bulb	2,382	2,382	100%
LED Exit Sign	271	271	100%
Occupancy Sensor	155	155	100%
Total	**2,808**	**2,808**	**100%**

Our impact analysis activities for the Online Store offering yielded ex post gross electric and peak demand savings. Ex post savings are consistent with ex ante savings, resulting in a realization rate of 100% (Table 76).

Table 76. Transition Period Online Store Private Sector Gross Impacts

Measure Type	Verified Measures	Ex Ante Gross Savings		Realization Rate		Ex Post Gross Savings	
		MWh	MW	MWh	MW	MWh	MW
LED Bulb	2,382	374	0.08	100%	100%	374	0.08
LED Exit Sign	271	53	0.01	100%	100%	53	0.01
Occupancy Sensor	155	52	0.03	99%	100%	52	0.03
Total[a]	**2,808**	**479**	**0.11**	**100%**	**100%**	**479**	**0.11**

[54] U.S. Environmental Protection Agency, (2014). "ENERGY STAR Qualified Office Equipment Calculator." Retrieved from: https://www.energystar.gov/products/office_equipment/computers.

[a] Columns may not sum to the totals listed due to rounding.

The evaluation team observed a discrepancy in occupancy sensor electricity savings associated with office buildings. As previously discussed, projects with a building type listed as "Office" used two methods to calculate electricity and peak load demand savings. In six projects, the building type was listed as "Office" and used the multiple methods approach, resulting in a 99% realization rate.

Instant Incentives

Instant Incentives participants purchased nearly 106,000 individual program measures in the Transition Period (Table 77). The majority of program measures consisted of linear LEDs, which accounted for approximately 92% of all Transition Period Instant Incentives measures. The evaluation team applied the self-reported participant ISR of 78% to the total verified measure count when calculating savings.[55]

Table 77. Transition Period Instant Incentives Private Sector Verification Results

Measure Type	Program Tracking Measure Count	Verified Measure Count	Verification Rate
Linear LEDs	97,307	97,307	100%
Standard LEDs	2,623	2,623	100%
Specialty LEDs	6,065	6,065	100%
Total	**105,995**	**105,995**	**100%**

Our impact analysis activities for the Instant Incentives program yielded ex post gross electric and peak demand savings. Table 78 shows the ex post energy and demand savings for the Transition Period. The program contributed 8,212 MWh and 1.72 MW in ex post savings (including carryover[56] savings).

Table 78. Transition Period Instant Incentives Private Sector Gross Impacts

	Ex Ante Gross Savings		Realization Rate		Ex Post Gross Savings	
Savings Type	MWh	MW	MWh	MW	MWh	MW
Transition Period Impacts	5,381	1.13	97.6%	97.7%	5,251	1.1
PY9 Carryover	2,609	0.55	99.6%	100.2%	2,600	0.55
PY8 Carryover[a]	49	0.01	740.2%	723.4%	362	0.07
Total	**8,039**	**1.68**	**102.2%**	**102.1%**	**8,212**	**1.72**

Note: Realization rates may not equal reported ex post ÷ reported ex ante due to rounding.
[a] The high realization rate for PY8 carryover arose because ex ante PY8 carryover applies the IL-TRM ISR, whereas ex post PY8 carryover savings apply the researched ISR.

The evaluation team identified two minor differences in ex ante and ex post calculations. Ex ante calculations for the Transition Period and PY9 relied on the ISR that the evaluation team recommended based on PY8 research (77.80%), while the evaluation team used the PY9 researched ISR (77.89%). Additionally, two projects used an ISR of 95.7% instead of the 77.80% used in all other ex ante calculations. This slight difference in ISR, in addition to the two projects using the higher ISR, led to the discrepancies between ex ante and ex post savings.

[55] For more detail, please see the PY9 C&I Standard evaluation report.

[56] Our past research for this offering indicates that participants do not install all bulbs that they purchase immediately. Some bulbs are placed into storage and installed in future years, resulting in additional carryover savings for lamps purchased in PY8 and PY9 but not installed until the Transition Period. For more detail, please see the PY9 C&I Standard Program evaluation report.

Green Nozzles

The evaluation team verified the number of measures within the database and applied a verification rate of 100%. The implementer supplied detailed calculations, including variable assumptions and algorithms, which were carefully reviewed and compared against the IL-TRM V5.0. Ex post savings are consistent with ex ante savings, summarized in Table 79.

Table 79. Green Nozzles Private Sector Gross Impacts

Measure Type	Verified Measures	Ex Ante Gross			Realization Rate			Ex Post Gross		
		MWh	MW	Therm	MWh	MW	Therm	MW	MWh	Therm
Green Nozzles	6	27	0	757	N/A	100%	100%	27	0	757

Laminar Flow Restrictors

In this pilot offering's second year, LFRs totaled 16 measures installed over the Transition Period (Table 80). LFRs are intended to meet rigorous OSHA requirements in healthcare facilities, hospitals, senior care facilities, and medical labs. Standard faucet aerators, intending to reduce water consumption, agitate the flow of water to mix surrounding indoor air and produce an aerated stream. However, this indoor air can contain unwanted bacteria and contaminants, compromising the necessary purity of the treated water in healthcare facilities and thus putting public health at risk. LFRs do not agitate the flow of water, making them suited for healthcare use, while maintaining water reduction goals.

Table 80. Transition Period LFR Private Sector Verification Results

Measure Type	Program Tracking Measure Count	Verified Measure Count	Verification Rate
LFR	16	16	100%

Table 81 summarizes the ex ante and ex post savings for the LFR initiative.

Table 81. LFR Private Sector Gross Impacts

Measure Type	Verified Measures	Ex Ante Gross			Realization Rate			Ex Post Gross		
		MWh	MW	Therm	MWh	MW	Therm	MWh	MW	Therm
LFR	16	–	–	324	N/A	N/A	100%	–	–	324

The evaluation team carefully reviewed the database and found that savings for LFRs are custom calculated for each project. Therefore, we requested detailed ex ante calculations and variable assumptions from the implementer. The implementer provided additional documentation that outlined calculations for planning purposes and provided the existing fixture and efficient fixture flow rates for each project. The evaluation team did not find any discrepancies between ex ante and ex post savings for the LFR offering.

Net Impacts

The evaluation team applied PY9 NTGRs approved by the Illinois SAG to determine net impacts for the Transition Period Standard Program. Table 82 presents the net impacts for private sector Transition Period Standard Program measures installed through the Core Program, Online Store, Instant Incentives, Green Nozzles, and LFR offerings.

Table 82. Transition Period Standard Core Program Private Sector Gross and Net Impacts

Savings Category	Ex Post Gross	NTGR	Ex Post Net
Energy Savings (MWh)			
Core Offering	23,528	0.78	18,460
Instant Incentives[a]	8,212	0.78	6,376
Online Store	479	0.83	397
Green Nozzles	27	0.92	25
LFR	0	N/A	0
Total MWh[b]	**32,246**	**0.78**	**25,259**
Demand Savings (MW)			
Core Offering	2.50	0.79	1.98
Instant Incentives[a]	1.72	0.78	1.33
Online Store	0.11	0.83	0.09
Green Nozzles	0	N/A	0
LFR	0	N/A	0
Total MW[b]	**4.33**	**0.79**	**3.41**
Gas Savings (Therms)			
Core Offering	1,538,321	0.61	932,305
Instant Incentives	0	N/A	0
Online Store	0	N/A	0
Green Nozzles	757	0.89	674
LFR	324	0.68	218
Total Therms[b]	**1,539,402**	**0.61**	**933,198**

[a] Includes carryover savings for CFLs and LEDs purchased in PY8 and PY9.
[b] Columns may not sum to the totals listed due to rounding error.

Public Sector Impacts

Gross Impacts

In the Transition Period, Standard Program offerings were made available to the public sector. The STEP and MOSL offerings were also available to these customers. Table 83 presents the public sector ex ante gross savings, ex post gross savings, and gross realization rates for electric and gas energy and electric demand for the Transition Period Standard Program.

Table 83. Standard Program Public Sector Gross Impact Summary

Savings Category	Ex Ante Gross	Realization Rate	Ex Post Gross
Energy Savings (MWh)			
Core Offering	7,195	93.3%	6,711
Instant Incentives	2,145	100.1%	2,147
Online Store	77	100.0%	77
Green Nozzles	–	N/A	–
LFR	–	N/A	–
MOSL	591	100.0%	591
STEP	1,224	100.0%	1,224
Total MWh Savings	**11,231**	**95.7%**	**10,749**
Demand Savings (MW)			
Core Offering	1.09	95.6%	1.04
Instant Incentives	0.46	100.1%	0.46
Online Store	0.01	100.0%	0.01
Green Nozzles	–	N/A	–
LFR	–	N/A	–
MOSL	–	N/A	–
STEP	–	N/A	–
Total MW Savings	**1.56**	**96.9%**	**1.51**
Gas Savings (Therms)			
Core Offering	72,258	97.2%	70,235
Instant Incentives	–	N/A	–
Online Store	–	N/A	–
Green Nozzles	757	100.0%	757
LFR	–	N/A	–
MOSL	–	N/A	–
STEP	31,901	100.0%	31,901
Total Therm Savings	**104,916**	**98.1%**	**102,893**

Core Program

Public sector customers installed more than 6,800 individual measures through the Core Program in the Transition Period (Table 84) as part of 100 unique projects. Similar to the private sector, the majority of measures consisted of lighting installations followed by steam traps; however, HVAC measures supplanted specialty equipment for third among measure counts.

Table 84. Transition Period Core Program Public Sector Verification Results

Measure Type	Program Tracking Measure Count	Verified Measure Count	Verification Rate
Lighting	6,475	6,475	100%
VFDs	29	29	100%
HVAC	139	139	100%
Leak Survey and Repair	–	–	N/A
Specialty Equipment	8	8	100%
Steam Traps	182	182	100%
Total	**6,833**	**6,833**	**100%**

Our impact analysis activities for the public sector Core Program yielded similar ex post gross realization rates for electric savings, gas savings, and peak demand savings to the private sector, with a notable exception in the HVAC offering (Table 85). The major part of the discrepancy between ex ante and ex post gross savings for HVAC measures stems from a single project, which we describe in more detail below.

Table 85. Transition Period Core Program Public Sector Gross Impacts

Measure Type	Verified Measures	Ex Ante Gross Savings			Realization Rate			Ex Post Gross Savings		
		MWh	MW	Therms	MWh	MW	Therms	MWh	MW	Therms
Lighting	6,475	2,588	0.49	–	100%	100%	N/A	2,581	0.49	–
VFDs	29	3,151	0.5	–	100%	100%	N/A	3,150	0.5	–
HVAC	139	1,418	0.09	65,706	66%	49%	97%	942	0.05	63,682
Leak Survey and Repair	–	–	–	–	N/A	N/A	N/A	–	–	–
Specialty Equipment	8	38	0	–	100%	100%	N/A	38	0	–
Steam Traps	182	–	–	6,552	N/A	N/A	100%	–	–	6,552
Total	**6,833**	**7,195**	**1.09**	**72,258**	**93%**	**96%**	**97%**	**6,711**	**1.04**	**70,235**

Note: Realization rates may not equal reported ex post ÷ reported ex ante due to rounding.

The evaluation team identified slight differences between ex ante and ex post savings for several program measures, but for reporting purposes we outline discrepancies for measures with notable differences in realization rates (e.g., HVAC). Some discrepancies were also observed in the private sector. Note that while certain inputs may increase savings, others decrease savings. The combination of all inputs brings about the overall realization rate for a specific measure.

- **Lighting Discrepancies**
  - **Office Building Inputs Discrepancy:** For Core Program lighting measures where the building type was listed as office, i.e., not in alignment with the IL-TRM V5.0 taxonomy, the implementer used two methods to calculate electricity peak load reductions and electricity savings and heating penalties. The first method created a generalized office building category by assembling the most conservative input variables across the entire office building classification from the IL-TRM V5.0. The generalized office building characterization was then used to calculate peak load demand reductions. However, the implementer used the input variables associated with the IL-TRM V5.0 building type defined as a high-rise office building with constant air volume and an economizer (Office - High Rise - CAV econ) to calculate electricity savings and heating penalties. This occurred

in 16 projects within the Core lighting offering and an additional 6 projects that implemented occupancy sensors from the Online Store program. For ex post calculations, we assembled the most conservative values from the six office building types into a single generalized office building type for these office projects.

- HVAC Discrepancies
  - **Variable Speed Drive (VSD) Motor Efficiency Discrepancy**: An installed motor efficiency of 10% was recorded by the implementer and used in calculating energy savings for a single VSD project. A VSD modulates the speed of a motor to limit full-load operation while still meeting required demand. Motor efficiency is inversely related to full-load electricity demand, meaning as efficiency decreases, the electricity demand increases. As a result of the 10% motor efficiency, ex ante savings were out of proportion with other similarly sized motors implementing VSD measures. It was determined by the evaluators that a motor operating at 10% efficiency would likely be replaced prior to installation of a VSD, leading ex post calculations to use the default 93% motor efficiency, as specified in the IL-TRM v5.0 for VSD measures.
  - **High-Efficiency Furnace Building Type Discrepancy:** The implementer assumed operation hours are equal to 2,718 and a CF of 0.424 per the IL-TRM V5.0 (when building type is unknown). To arrive at ex post savings, we applied the building type provided in the program tracking database to determine hours and CFs specific to each project.
  - **High-Efficiency Furnace Peak Load Algorithm Discrepancy:** The implementer applied total electricity savings to the high-efficiency furnace peak load savings algorithm. To arrive at ex post savings, we applied only the cooling savings to the peak load savings algorithm, per the IL-TRM V5.0.
  - **AFUE Discrepancy for High-Efficiency Boilers:** The implementer applied the steam boiler AFUE (79%) to a hot water boiler (AFUE=80%). To arrive at ex post savings, we applied the hot water boiler AFUE to the hot water boiler.

Online Store

In the public sector, LED bulbs accounted for a smaller majority (68%) of Transition Period Online Store measures than in the private sector (85%), with LED exit signs accounting for 28% of Online Store measures in contrast to 10% in the private sector (see Table 86).

Table 86. Transition Period Online Store Public Sector Verification Results

Measure Type	Program Tracking Measures	Verified Measures	Verification Rate
LED Bulb	273	273	100%
LED Exit Sign	115	115	100%
Occupancy Sensor	16	16	100%
Total	**404**	**404**	**100%**

Our impact analysis activities for the Online Store offering yielded ex post gross electric and peak demand savings (Table 87). Ex post savings are consistent with ex ante savings, resulting in a realization rate of 100%.

Table 87. Transition Period Online Store Public Sector Gross Impacts

Measure Type	Verified Measures	Ex Ante Gross Savings		Realization Rate		Ex Post Gross Savings	
		MWh	MW	MWh	MW	MWh	MW
LED Bulb	273	46	0.01	100%	100%	46	0.01
LED Exit Sign	115	24	0	100%	100%	24	0
Occupancy Sensor	16	7	0	100%	100%	7	0
Total[a]	**404**	**77**	**0.01**	**100%**	**100%**	**77**	**0.01**

[a] Columns may not sum to the totals listed due to rounding error.

The evaluation team did not find any discrepancies between ex ante and ex post savings for the Online Store program.

Instant Incentives

Public sector Instant Incentives participants purchased more than 50,000 individual program measures in the Transition Period (Table 88). The majority of program measures consisted of linear LEDs, which accounted for approximately 97% of all public sector Transition Period Instant Incentives measures. The evaluation team applied the self-reported participant survey first-year ISR of 78% to the total verified measure count when calculating savings.[57]

Table 88. Transition Period Instant Incentives Public Sector Verification Results

Measure Type	Program Tracking Measure Count	Verified Measure Count	Verification Rate
Linear LEDs	50,474	50,474	100%
Standard LEDs	272	272	100%
Specialty LEDs	925	925	100%
Total	**51,671**	**51,671**	**100%**

Our impact analysis activities for the Instant Incentives offering yielded ex post gross electric and peak demand savings. Table 89 shows the ex post energy and demand savings for the Transition Period. The program contributed 2,145 MWh and 0.46 MW in ex post savings (no carryover savings were available for the public sector).

Table 89. Transition Period Instant Incentives Public Sector Gross Impacts

Savings Type	Ex Ante Gross Savings		Realization Rate		Ex Post Gross Savings	
	MWh	MW	MWh	MW	MWh	MW
Instant Incentives	2,145	0.46	100%	100%	2,147	0.46

As observed in the private sector, ex ante calculations for the Transition Period and PY9 relied on the ISR that the evaluation team recommended based on PY8 research (77.80%). The evaluation team used the PY9 researched ISR (77.89%) in ex post calculations. This slight difference in ISR led to the discrepancies between ex ante and ex post savings.

[57] For more detail, please see the PY9 C&I Standard evaluation report.

Green Nozzles

The evaluation team verified the number of measures within the database and applied a verification rate of 100%. The implementer supplied detailed calculations, including variable assumptions and algorithms, which were carefully reviewed and compared against the IL-TRM V5.0. Ex post savings are consistent with ex ante savings, resulting in a realization rate of 100%, summarized in Table 90.

Table 90. Green Nozzles Public Sector Gross Impacts

Measure Type	Verified Measures	Ex Ante Gross			Realization Rate			Ex Post Gross		
		MWh	MW	Therm	MWh	MW	Therm	MWh	MW	Therm
Green Nozzles	2	–	–	757	N/A	N/A	100%	–	–	757

STEP

The STEP offering, which is targeted at the public sector, installed 4,265 measures during the Transition Period (Table 91). STEP is a self-install program intended for public facilities. The STEP program targets electricity and natural gas reductions through passive improvements (i.e., not requiring changes in occupant behavior). Measures include LED exit signs, faucet aerators, occupancy sensors, and vending machine controls. STEP was not a part of the PY9 report and therefore cannot be compared with historical data.

The evaluation team applied an installation rate of 100% to arrive at the total verified measure count.

Table 91. Transition Period STEP Public Sector Verification Results

Measure Type	Program Tracking Measure Count	Verified Measure Count	Verification Rate
STEP	4,265	4,265	100%

Table 92 summarizes the ex ante and ex post savings for the STEP offering.

Table 92. STEP Public Sector Gross Impacts

Measure Type	Verified Measures	Ex Ante Gross			Realization Rate			Ex Post Gross		
		MWh	MW	Therm	MWh	MW	Therm	MWh	MW	Therm
STEP	4,265	1,224	–	31,901	100%	N/A	100%	1,224	–	31,901

In reviewing the database of STEP projects, the evaluation team found that projects included the quantity of measures implemented, but not the measure-level specificity required by the evaluator. In response, the evaluation team requested additional information from the implementer, including the methods used for evaluating ex ante gross savings. These methods were scrutinized by the evaluation team and determined to be in accordance with the appropriate IL-TRM v5.0 section related to the measure. The evaluation team then applied the limited measure-level data, finding no discrepancies between ex ante and ex post savings for the STEP program.

Municipality-Owned Street Lighting

In the Transition Period, AIC implemented 436 individual lighting improvements over 16 projects (Table 93) as part of the MOSL offering. MOSL improvements focus on replacement of older high-wattage bulbs with more energy-efficient LED bulbs, while meeting lumen-per-watt standards. MOSL was not a part of the PY9 report and therefore cannot be compared with historical data.

The evaluation team applied an installation rate of 100% to arrive at the total verified measure count.

Table 93. Transition Period MOSL Public Sector Verification Results

Measure Type	Program Tracking Measure Count	Verified Measure Count	Verification Rate
MOSL	436	436	100%

Table 94 summarizes the ex ante and ex post savings for the MOSL program.

Table 94. MOSL Public Sector Gross Impacts

Measure Type	Verified Measures	Ex Ante Gross		Realization Rate		Ex Post Gross	
		MWh	MW	MWh	MW	MWh	MW
MOSL	436	591	–	100%	N/A	591	–

The evaluation team reviewed the database of MOSL projects, finding that the implementer applied the correct lighting algorithms and appropriate exterior lighting operational hours from IL-TRM V5.0 in calculating ex ante savings. The evaluation team did not find any discrepancies between ex ante and ex post savings for the MOSL program.

Net Impacts

The evaluation team applied NTGRs detailed in Section 2.3 to determine net impacts for the Transition Period Standard Program. Table 95 presents the net impacts for public sector Transition Period Standard Program measures installed through the Core Program, Online Store, Instant Incentives, Green Nozzles, LFR, MOSL, and STEP offerings.

Table 95. Transition Period Standard Core Program Public Sector Gross and Net Impacts

Savings Category	Ex Post Gross	NTGR	Ex Post Net
Energy Savings (MWh)			
Core Offering	6,711	0.65	4,362
Instant Incentives	2,147	0.65	1,396
Online Store	77	0.65	50
Green Nozzles	0	N/A	0
LFR	0	N/A	0
MOSL	591	1.00	591
STEP	1,224	0.96	1,175
Total MWh[a]	**10,749**	**0.70**	**7,573**
Demand Savings (MW)			
Core Offering	1.04	0.65	0.68
Instant Incentives	0.46	0.65	0.30
Online Store	0.01	0.65	0.01
Green Nozzles	0	N/A	0
LFR	0	N/A	0
MOSL	0	N/A	0
STEP	0	N/A	0
Total MW[a]	**1.51**	**0.65**	**0.98**
Gas Savings (Therms)			
Core Offering	70,235	0.46	32,308
Instant Incentives	0	N/A	0
Online Store	0	N/A	0
Green Nozzles	757	0.46	348
LFR	0	N/A	0
MOSL	0	N/A	0
STEP	31,901	0.90	28,711
Total Therms[a]	**102,893**	**0.60**	**61,367**

[a] Columns may not sum to the totals listed due to rounding error.

Cumulative Persisting Annual Savings and Weighted Average Measure Life

Table 96 presents CPAS and WAML for the Transition Period C&I Standard Program.

Table 96. Commercial and Industrial Standard Program CPAS and WAML

Measure Category	Measure Life	First-Year Ex Post Gross Savings (MWh)	CPAS - Ex Post Net Savings (MWh)							Lifetime Savings (MWh)
			Transition Period	2018	2019	2020	2021	...	2030	...	
Commercial Solid and Glass Door Refrigerators & Freezers	12.0	44	36	36	36	36	36	...	0	...	432
ENERGY STAR Dishwasher[a]	15.9	14	12	12	12	12	12	...	12	...	194
ENERGY STAR Hot Food Holding Cabinets	12.0	28	18	18	18	18	18	...	0	...	218
High Efficiency Pre-Rinse Spray Valve	5.0	27	25	25	25	25	25	...	0	...	126
ENERGY STAR Electric Convection Oven	12.0	4	3	3	3	3	3	...	0	...	34
Controls for Central Domestic Hot Water	15.0	16	9	9	9	9	9	...	9	...	131
High Efficiency Furnace	16.2	9	5	5	5	5	5	...	5	...	81
Single-Package and Split System Unitary Air Conditioners	15.0	137	77	77	77	77	77	...	77	...	1,159
Variable Speed Drives for HVAC Pumps and Cooling Tower Fans[a]	10.2	6,704	5,233	5,233	5,233	5,233	5,233	...	223	...	53,448
Small Commercial Programmable Thermostats	4.0	305	189	189	189	189	0	...	0	...	757
Demand Controlled Ventilation	10.0	48	31	31	31	31	31	...	0	...	307
Small Commercial Programmable Thermostat Adjustments	2.0	123	70	70	0	0	0	...	0	...	140
Variable Speed Drives for HVAC Supply and Return Fans[a]	10.6	7,389	5,513	5,513	5,513	5,513	5,513	...	797	...	59,115
Electric Chiller	20.0	30	20	20	20	20	20	...	20	...	390
Fluorescent Delamping	15.0	111	85	84	84	84	84	...	84	...	1,256
High Performance and Reduced Wattage T8 Fixtures and Lamps	13.8	6,676	4,925	4,814	4,736	4,736	4,736	...	3,428	...	65,891
LED Bulbs and Fixtures	10.8	17,745	13,629	13,629	13,629	13,628	13,071	...	2,465	...	143,338
Commercial LED Exit Signs	7.7	102	79	79	79	79	68	...	19	...	611
Occupancy Sensor Lighting Controls	8.3	361	263	263	263	263	263	...	8	...	2,199
T5 Fixtures and Lamps	13.8	1,374	1,062	1,036	1,017	1,017	1,017	...	746	...	14,236

Measure Category	Measure Life	First-Year Ex Post Gross Savings (MWh)	CPAS - Ex Post Net Savings (MWh)							Lifetime Savings (MWh)
			Transition Period	2018	2019	2020	2021	...	2030	...	
VSD Air Compressor	10.0	30	25	25	25	25	25	...	0	...	251
Compressed Air No-Loss Condensate Drains	10.0	6	5	5	5	5	5	...	0	...	50
ENERGY STAR Computers	4.0	3	2	2	2	2	0	...	0	...	10
Leak Survey and Repair	5.0	486	341	341	341	341	341	...	0	...	1,704
Savings Through Efficient Products[b]	5.0	1,224	1,175	1,175	1,175	1,175	1,175	...	0	...	5,874
Transition Period CPAS		**42,995**	**32,832**	**32,693**	**32,527**	**32,526**	**31,767**	**...**	**7,893**	**...**	**351,953**
Expiring Transition Period CPAS			**0**	**139**	**305**	**306**	**1,066**	**...**	**24,939**	**...**	
WAML	**11.0**										

[a] Due to existing analytical frameworks, these measures are rolled up to the TRM entry level but contain multiple measure lives. We present the weighted measure life here. However, beginning in 2018, we will separate out measures to the most granular level possible for increased visibility.
[b] No measure life is available for STEP because of the level at which tracking data was provided. We assumed a measure life of 5 years for the purposes of these tables but note that STEP will not be offered in 2018 and this issue will not exist.

3.9.4 Key Findings

- **Finding #1:** Our impact evaluation found electric and gas gross realization rates of, or just under, 100% for virtually all program components, indicating that the program is tracking its savings and projects carefully. However, we continue to find minor discrepancies in the database that do not reflect the latest TRM updates.
  - **Recommendation #1:** We recommend incorporating all IL-TRM V5.0 updates and applying the correct measure assumptions consistently across all measures to ensure that AIC continues achieving high realization rates moving forward.
- **Finding #2:** The IL-TRM V5.0 has a robust list of algorithms for calculating energy savings across a spectrum of commercial building types. In some cases, such as office buildings, this requires specificity when characterizing a building, including building size and HVAC system. However, some office buildings were listed in the database as "Office," lacking the necessary specificity. In these instances, it was observed that the implementer used a mix of methods for assigning algorithm input variables from the IL-TRM V5.0. These methods included assembling the most conservative values from across the office category in creating a generalized office building and assigning the office building type called "Office - High Rise - CAV econ" from the IL-TRM V5.0, which represents a high-rise office operating a constant air volume with economizer HVAC system. This mixture of methods resulted in discrepancies between ex ante and ex post savings.
  - **Recommendation #2:** We recommend collecting the necessary building information to avoid generalizing building types. The input variables within the IL-TRM V5.0 were derived from modeled data specific to the listed building type subgroups in the IL-TRM V5.0.
- **Finding #3:** The evaluation of VFDs, also referred to as VSDs, found that a load factor of 75% was being used for VFDs associated with the VFD offering that is a part of the Standard Core Program (when the load factor is not known). Conversely, VFDs associated with the HVAC offering, also a part of the Standard Core Program, used the IL-TRM V5.0-specified default load factor of 65% when the load factor is not known.
  - **Recommendation #3:** We recommend collection of on-site measured load factors for all Standard Core VFD measures. When on-site measurements are not possible, we recommend the application of IL-TRM v5.0-specified load factors for VFD measures (65%) for all Standard Core offerings, unless the 75% load factor can be substantiated through other supporting documentation.
- **Finding #4:** The evaluation of programmable thermostats requires numerous inputs, as required by the IL-TRM V5.0, including heating capacity, cooling capacity, occupancy hours, and setback temperatures for unoccupied periods. This level of detailed information is not provided within the dataset of information.
  - **Recommendation #4:** We recommend providing the necessary information, as outlined in the IL-TRM V5.0, to improve the evaluation of programmable thermostats. This will limit assumptions and improve the overall evaluation.
- **Finding #5:** The STEP offering provided limited measure-level data, specifically the quantity of measures implemented for each project.

- **Recommendation #5:** To perform a thorough evaluation of the STEP offering, we recommend providing detailed measure-level data similar to what is provided in the Core Program dataset. This information will improve the overall evaluation of the STEP offering.

3.10 Commercial and Industrial Custom

3.10.1 Program Description

Business customers often represent the highest potential for energy savings, but these savings often derive from highly specialized equipment designed for particular industries or types of facilities. The C&I Custom Program offers incentives to AIC business customers for energy efficiency projects involving equipment not covered through the C&I Standard Program. The availability of this program allows customers to propose additional measures and tailor projects to the specific needs of their facilities. It also provides an avenue for piloting new measures prior to incorporating them into the Standard Program.

The Custom Program is implemented via a number of specific offerings. Two core offerings provide the majority of the savings claimed through the program:

- The Custom Incentives (or "Core Custom") offering provides incentives for electric and gas measures not incented through other AIC offerings. Some examples of common Custom measures include compressed air, energy management systems (EMS), and industrial process measures, including heat recovery, process heat, and improvements to steam systems.
- The New Construction Lighting offering offers additional incentives for lighting measures in new construction projects.

Additionally, AIC offers a number of smaller "incubator" offerings through the Custom Program, including Metering and Monitoring, Strategic Energy Management, Feasibility Studies, and Staffing Grants. These offerings typically serve the purpose of engaging AIC's business customers more deeply with energy efficiency, and do not typically yield savings. During the Transition Period, program staff spent time laying the groundwork for these offerings to help ensure that they are successful in 2018.

Summary of Program Design and Implementation Changes

During the Transition Period, a number of changes were made to the implementation of the Custom Program, primarily to reflect two significant policy changes affecting program eligibility that occurred before the Transition Period began.

- First, large customers with energy use of 10 MW or more became exempt from AIC energy efficiency programs as of June 1, 2017. This had a large impact on the Custom Program, which historically targets projects from these customers to achieve a large percentage of savings goals. As a result, Custom Program staff needed to target a larger number of smaller projects to make up for the loss of savings from the exclusion of large customers. AIC added more field staff for the Custom Program during the Transition Period to help make additional customer contacts and boost participation from smaller customers.
- In addition to these changes, AIC began including public ratepayers or public sector customers as a new customer segment. Public sector customers were previously served by the DCEO programs; however, AIC began serving them through both commercial and residential energy efficiency programs beginning in the Transition Period.

To help drive participation, the program implementation team increased marketing activities targeting public sector customers. They also worked with the DCEO to provide customer support and training to help public

sector customers adapt to AIC program offerings. In addition, trade allies serving public sector customers started conducting boiler tune-ups to maximize the efficiency of their customers' heating systems.

To ensure continuity of program offerings, AIC provided tuition support for a number of AIC customers who took a BOC course through MEEA, a program previously available to customers served by DCEO programs. . BOC is a nationally recognized training program offered through seven different training sessions. The target attendees for the BOC training program are commercial facility personnel, including building engineers, maintenance technicians, operations staff, and other building management professionals. The BOC trainings educate attendees about how to operate building equipment and energy systems in a cost-effective and efficient manner. The training focuses on helping attendees identify a range of efficiency opportunities, including low- or no-cost maintenance upgrades, operational improvements, and large-scale energy efficiency retrofits.

Additionally, AIC made two smaller, but significant changes to the Custom Program for the Transition Period:

- The Competitive Large Incentive Project (CLIP) offering was integrated into the Staffing Grant offering during the Transition Period.
- The minimum payback period for custom projects changed from one year to six months during the Transition Period.

3.10.2 Program Performance

During the Transition Period, the Custom Program functioned similarly to other program years. Due to the limited Transition Period budget, program staff focused on gearing up for 2018 during the Transition Period. Staff laid groundwork for 2018 by building a pipeline for public sector customers and working with energy advisors and program allies to help target C&I customers beyond the top 100 customers.

According to the Transition Period implementation plan, AIC expected savings from the Custom Program to account for 13% and 15% of AIC's overall electric and gas savings goals, respectively, for the Transition Period.[58] Savings for public sector customers are accounted for separately. As shown in Table 97, the program achieved a total of 6,734 MWh, 0.80 MW, and 671,637 therms in ex ante gross savings from its historical customer base (private sector customers)

Table 97. AIC Custom Program Participation and Ex Ante Gross Savings during the Transition Period

Offering	Total Projects/ Grants/Participants	Unique Customers	Ex Ante Gross Savings		
			MWh	MW	Therms
Custom Incentive	21	18	3,790	0.51	671,637
New Construction Lighting	11	10	2,944	0.28	0
Strategic Energy Management	7	7	0	0.00	0
Metering and Monitoring	4	4	0	0.00	0
Staffing Grant	1	1	0	0.00	0
Total	**44**	**37**	**6,734**	**0.80**	**671,637**

As shown in Table 98, the program achieved a total of 7,851 MWh and 99,096 therms in ex ante gross savings from public sector customers during the Transition Period.

[58] Source: Transition Period Implementation Plan Sec. 8-103/8-104. Report. Ameren Illinois, April 17, 2017.

Table 98. Public Sector Custom Program Participation and Ex Ante Gross Savings during the Transition Period

Offering	Total Projects/ Grant /Participants	Unique Customers	Ex Ante Gross Savings		
			MWh	MW	Therms
Custom Incentive	11	10	6,437	0.65	89,296
New Construction Lighting	1	1	6	0.00[a]	0
Building Operator Certification	14	14	1,407	0.00	9,800
Metering and Monitoring	1	1	0	0.00	0
Total	**27**	**26**	**7,851**	**0.60**	**99,096**

[a] The program reported demand savings of -2.81 kW, which rounds to zero.

3.10.3 Impact Results

For the Custom Program, we verified program participation and gross impacts through desk reviews and on-site M&V, as described in Section 2.2.2. We also conducted a review of savings claimed through the BOC offering and describe that below. We evaluated savings for all Custom Program projects that achieved savings during the Transition Period. The program-level savings were determined by summing these project-level estimates. Volume II of this report contains detailed site visit reports for five of the largest projects evaluated during the Transition Period.

Gross Impacts – Core Custom and New Construction Lighting

Table 99 presents results from the 32 projects completed by the program's historic customer base (private sector customers). Realization rates for individual private sector projects ranged from 39% to 195% for electric energy savings and 96% to 109% for gas savings. Overall, private sector projects achieved a gross realization rate of 86% for electric energy, 98% for electric demand, and 102% for gas savings.

Table 99. Transition Period AIC Custom Gross Impact Results

Project ID	Ex Ante Gross Savings			Gross Realization Rate			Ex Post Gross Savings		
	MWh	MW	Therms	MWh	MW	Therms	MWh	MW	Therms
800006	0	0.00	97,900	N/A	N/A	100%	0	0.00	97,900
900062	666	0.08	41,903	74%	74%	96%	491	0.06	40,343
900158	0	0.00	149,427	N/A	N/A	109%	0	0.00	162,381
900752	0	0.00	84,430	N/A	N/A	100%	-161	-0.02	84,430
900826	847	0.13	0	63%	90%	N/A	532	0.11	0
900894	96	0.02	6,539	158%	158%	100%	153	0.03	6,539
900958	2,321	0.21	0	77%	99%	N/A	1,785	0.21	0
901164	97	0.01	0	96%	100%	N/A	93	0.01	0
901253	31	0.01	0	100%	86%	N/A	31	0.01	0
901269	12	0.00	0	100%	100%	N/A	12	0.00	0
901495	145	0.02	0	99%	100%	N/A	143	0.02	0
901625	11	0.00	0	100%	100%	N/A	11	0.00	0

Project ID	Ex Ante Gross Savings			Gross Realization Rate			Ex Post Gross Savings		
	MWh	MW	Therms	MWh	MW	Therms	MWh	MW	Therms
901683	559	0.06	0	98%	98%	N/A	549	0.06	0
901696	329	0.05	0	101%	115%	N/A	331	0.06	0
901697	394	0.06	0	100%	115%	N/A	393	0.07	0
1000011	35	0.01	0	100%	100%	N/A	35	0.01	0
1000021	30	0.00	17,594	100%	100%	100%	30	0.00	17,594
1000039	38	0.00	0	58%	92%	N/A	22	0.00	0
1000041	103	0.00	0	100%	N/A	N/A	103	0.00	0
1000048	115	0.02	0	168%	122%	N/A	193	0.03	0
1000049	93	0.02	0	195%	142%	N/A	181	0.02	0
1000081	219	0.02	0	100%	100%	N/A	219	0.02	0
1000086	74	0.00	0	39%	100%	N/A	29	0.00	0
1000089	0	0.00	147,058	N/A	N/A	100%	0	0.00	147,058
1000091	0	0.00	106,306	N/A	N/A	100%	0	0.00	106,306
1000130	85	0.01	0	159%	163%	N/A	135	0.02	0
1000250	27	0.01	0	139%	100%	N/A	37	0.01	0
1000267	0	0.00	9,744	N/A	N/A	100%	0	0.00	9,744
1000296	64	0.01	0	105%	100%	N/A	67	0.01	0
1000321	299	0.03	4,136	100%	100%	100%	299	0.03	4,136
1000519	46	0.01	3,548	100%	100%	100%	46	0.01	3,548
1000553	0	0.00	3,052	N/A	N/A	100%	0	0.00	3,052
Total	**6,734**	**0.79**	**671,637**	**86%**	**98%**	**102%**	**5,759**	**0.78**	**683,031**

Table 100 presents results from the 12 projects completed by public sector customers. Realization rates for individual public sector projects ranged from 0% to 275% for electric energy savings and 0% to 103% for gas savings. Overall, private sector projects achieved a 99% gross realization rate for electric energy, a 101% gross realization rate for electric demand, and a 93% gross realization rate for gas savings.

Table 100. Transition Period Public Sector Custom Gross Impact Results

Project ID	Ex Ante Gross Savings			Gross Realization Rate			Ex Post Gross Savings		
	MWh	MW	Therms	MWh	MW	Therms	MWh	MW	Therms
1000051	75	0.00	6,634	100%	100%	103%	75	0.00	6,850
1000052	3	0.00	4,321	100%	100%	100%	3	0.00	4,321
1000087	318	0.01	0	100%	100%	N/A	318	0.01	0
1000152	4,189	0.48	0	100%	100%	N/A	4,189	0.48	0
1000180	0	0.00	4,062	N/A	N/A	46%	0	0.00	1,887

	Ex Ante Gross Savings			Gross Realization Rate			Ex Post Gross Savings		
Project ID	MWh	MW	Therms	MWh	MW	Therms	MWh	MW	Therms
1000209	418	0.05	0	61%	61%	N/A	253	0.03	0
1000421	181	0.00	0	100%	N/A	N/A	181	0.00	0
1000431	0	0.00	10,159	N/A	N/A	100%	0	0.00	10,159
1000586	143	0.01	3,919	0%	0%	0%	0	0.00	0
1000623	196	0.02	0	275%	275%	N/A	539	0.06	0
1000776	6	0.00	0	80%	100%	N/A	5	0.00	0
1800059	913	0.08	60,200	90%	90%	100%	824	0.07	60,200
Total	**6,444**	**0.65**	**89,296**	**99%**	**101%**	**93%**	**6,388**	**0.65**	**83,417**

Gross Impacts – Building Operator Certification

As described above in Table 98, AIC provided incentives for 14 customers participating in the BOC offering during the Transition Period and claimed 1,407 MWh and 9,800 therms in ex ante gross energy savings.

These savings were developed based on a per-participant estimate of 100,500 kWh in electric savings and 1,400 therms per participant in gas savings. We validated these savings in two parts.

First, we confirming participation in the program. Our validation noted two changes from the ex ante assumptions.

- We determined that one participant, an AIC electric and gas customer, had to drop out of the Bloomington series partway through due to scheduling conflicts; thus, electric and gas savings for this customer were removed.
- Additionally, the electric provider for a second participant was misidentified as Ameren in the tracking database. This customer is actually an electric customer of CWLP (Springfield Municipal) and thus these savings cannot be claimed.

We also examined the source of the ex ante savings claims. We note that the savings claims per participant appear high. The savings claims during the Transition Period are based on the Northwest Energy Efficiency Council (NEEC) *BOC Energy Savings FAQ*, which summarizes BOC Energy Savings Evaluation Results from 17 impact evaluations from 2000 to 2015. NEEC caveats this data by saying "it is important to note that the studies use different methodologies, assumptions and adjustments to generate results, making it not possible to have a true apples-to-apples comparison." These studies all report energy savings in various ways (e.g., all gross savings, attributable savings, BOC savings net of utility rebated projects, operations and maintenance savings, and savings adjusted for results from on-site inspections to validate survey findings).

The savings summarized represent the most conservative numbers reported in the studies considered.[59]

Looking at savings in Illinois from the same time frame (2010–2015) as depicted in Table 101, per-participant kWh savings range from 1,079 kWh to 181,000 kWh and per-participant therm savings range from 0 therms to 557 therms. While savings from BOC programs are as custom as you can get, and thus the wide variation in per-participant savings values are to be expected, these Illinois-specific savings are significantly lower than savings seen in other studies reviewed in the NEEC document.

[59] E.g., after any adjustments, including for attribution, were made. We therefore consider these numbers to be net savings.

We apply the Illinois mean of 55,677 kWh and 4.3 kW per participant in electric savings to the 12 verified electric participants in the Transition Period BOC offering. For gas savings, we chose to apply a mean of the studies below excluding PY3, as Illinois gas energy efficiency programs were in their pilot phase in PY3, potentially affecting results of the PY3 evaluation. We apply a mean value of 63.2 therms per participant in gas savings to the 6 verified gas participants in the Transition Period BOC offering.

Table 101. Per-Participant Net BOC Energy Savings in Illinois: 2010–2014

Evaluator	Program Year	kWh Savings	kW Savings	Therm Savings
ADM	PY7	18,005.	25.6	0.0
ADM	PY6	1,079.	0.3	2.7
ADM	PY5	9,940	0.0	231.3
ADM	PY4	19,038	0.0	18.9
Navigant	PY3	181,000	0.0	557.0
Illinois Mean		**55,677**	**4.3**	**368.3**
Illinois Mean (excluding PY3)		**12,016**	**6.5**	**63.2**

In the 2018 evaluation, the evaluation team suggests that we build in a pre-test component prior to customers participating in the program to increase the validity of the attribution assessment, as well as an on-site verification component, if resources allow. A previous BOC impact evaluation conducted by Opinion Dynamics that included on-site verification found that the measures reported from survey results were not installed as reported—just over one-third of measures claimed from survey results were actually verified as implemented. In addition, the study found that other newly installed energy-saving measures existed that had not been reported in the surveys.

We add BOC savings to public sector savings for the purposes of reporting net impacts below.

Table 102 provides a summary of our evaluation results for the BOC offering.

Table 102. Building Operator Certification Evaluation Results

Metric	Ex Ante	Realization Rate	Ex Post
AIC Electric Customers	14	N/A	12
Gross MWh	1,407	47%	668
AIC Gas Customers	7	N/A	6
Gross Therms	9,800	4%	379

Net Impacts

The ex ante NTGRs for the program are the SAG-approved values of 74.1% for electricity and 83.0% for natural gas for private sector customers, and the most recent DCEO NTGRs for public sector participants (83% for electric energy, 82% for electric demand, and 74% for gas). Following the NTGR framework, we apply these NTGRs to Transition Period Custom Program savings for public and private sector customers. Table 103 provides the Transition Period net impacts for the AIC Custom Program.

Table 103. Transition Period AIC Custom Program Net Impacts

Savings Category	Ex Post Gross	NTGR	Ex Post Net
Energy Savings (MWh)	5,759	74.1%	4,268
Demand Savings (MW)	0.783	74.1%	0.580

Savings Category	Ex Post Gross	NTGR	Ex Post Net
Gas Savings (Therms)	683,031	83.0%	566,916

Table 104 provides the Transition Period net impacts for the public sector participants in the Custom Program. These savings include savings from the BOC offering, which uses a NTGR of 100% as described above.

Table 104. Transition Period Public Sector Custom Program Net Impacts

Savings Category	Ex Post Gross	NTGR[a]	Ex Post Net
Energy Savings (MWh)	7,056	84.6%	5,970
Demand Savings (MW)	0.702	83.3%	0.585
Gas Savings (Therms)	83,796	74.1%	62,108

[a] Incorporating the most recent DCEO NTGRs of 83% for electric energy, 82% for electric demand, and 74.0% for natural gas, as well as an assumption of a 100% NTGR for BOC.

Cumulative Persisting Annual Savings and Weighted Average Measure Life

Table 105 presents CPAS and WAML for the Transition Period C&I Custom Program.

Table 105. Commercial and Industrial Custom Program CPAS and WAML

Measure	Measure Life	First-Year Ex Post Gross Savings (MWh)	CPAS - Ex Post Net Savings (MWh)							Lifetime Savings (MWh)
			Transition Period	2018	2019	2020	2021	...	2030	...	
Custom Incentives[a]	13.0	9,787	7,820	7,820	7,820	7,820	7,820	...	0	...	101,665
New Construction Lighting[a]	11.0	2,360	1,749	1,749	1,749	1,749	1,749	...	0	...	19,243
Building Operator Certification[b]	9.0	668	668	668	668	668	668	...	0	...	6,013
Transition Period CPAS		**12,816**	**10,238**	**10,238**	**10,238**	**10,238**	**10,238**	**...**	**0**	**...**	**126,921**
Expiring Transition Period CPAS			**0**	**0**	**0**	**0**	**0**	**...**	**10,238**	**...**	
WAML	**12.4**										

[a] For Transition Period reporting, we continue to use legacy measure life estimates at an offering level, presented above. Beginning in 2018, we will break out Custom projects more granularly per ongoing discussion with the Illinois SAG.

[b] We note that savings from Building Operator Certification programs will be dependent on the measures that savings result from and may differ year-to-year. For the Transition Period, we assumed a measure life of 9 years, which is roughly representative of the measure lives of savings found in past Illinois BOC program evaluations, which Transition Period verified savings are sourced from.

3.10.4 Key Finding

The evaluation team evaluated several New Construction Lighting projects during the Transition Period. When evaluating New Construction Lighting projects, the prevailing energy code determines the appropriate baseline and project requirements (such as controls). Based on the updated IECC 2015 code, several space types are required to have occupancy sensors installed to turn the lights off when the space is unoccupied. However, during the impact evaluation site visits, customers were found to not have installed occupancy sensors even though they were required by code. It is important to note that customers did not install the occupancy sensors and later remove them. They were never planned to be installed, and the customer provided no indication that sensors would be installed in the future.

These findings highlight an important decision point for evaluating energy savings since the implementation team calculates energy savings on the assumption that all code required equipment will be installed.

Other jurisdictions in the state that offer new construction programs (ComEd) use whole building simulation models (IPMVP Option D) to calculate savings for many of their projects. However, the lighting component is only one of several measures in the energy model. During the evaluation, the as-built model is compared against a code compliant baseline model to calculate the energy savings for the building as a whole. The baseline model is not adjusted if code required equipment was not installed (e.g. occupancy sensors). Therefore, the actual energy savings for the project would be different than modeled savings if code required equipment is not installed, since the baseline energy model assumes the equipment is installed.

This situation is different with new construction lighting projects for Ameren. The Ameren implementation team separates out new construction lighting as a standalone measure and does not do whole building simulations. The evaluation team therefore initially calculated the savings based on the equipment and operation determined during the follow-up site visits. Since customers had not installed occupancy sensors, and did not consider installing them, they were not considered in the ex post savings analysis. Upon further discussion with Leidos and the ComEd evaluation team, we determined that this approach was not appropriate per Illinois guidelines and the prevailing standards in the IL-TRM (even though these measure calculations are custom in nature), and revised calculations to align with code.

As this issue applies to the Transition Period, the impact on the program was relatively small. The choice of code as a baseline vs. the actual condition impacted overall program savings by less than 1%. However, the discontinuity between actual customer behavior and what is required by code shines light on how code compliance currently impacts the program. It also raises a future question about how code compliance should be handled during savings evaluation if customers aren't installing code required controls or equipment.

3.11 Commercial and Industrial Retro-Commissioning

3.11.1 Program Description

The C&I RCx Program helps AIC business customers evaluate their existing mechanical equipment, energy management, and industrial compressed air systems to identify no-cost and low-cost efficiency measures to optimize existing energy-using systems.

Over time, deferred maintenance and changing operating directives and practices can lead to inefficient operation of building systems. RCx is a process that examines current operations relative to the needs of equipment owners and those served by the equipment and determines opportunities for increasing equipment

efficiency through maintenance, system tune-ups, scheduling, and optimization of operations. Most of the identified measures require little, if any, capital funds to implement. Secondary objectives of the program include:

- Channeling participation into other AIC programs to implement cost-effective equipment replacements and retrofits
  - AIC offers an additional bonus to customers who complete a Custom Program project within a year of having completed a RCx study
- Developing a network of RCx service providers (RSPs) that will continue to operate in the AIC service territory
- Major market barriers to these energy efficiency opportunities are lack of awareness and the cost of the detailed engineering studies. Furthermore, even with a quality study in-hand, customer apathy can inhibit implementation of recommendations despite being no-cost. To overcome these barriers, the program subsidizes RSP studies and publicizes the benefits of RCx to foster a market for the services, with utility-certified RSPs providing the marketing outreach. AIC incentives pay for 70%–80% of the study cost.

During the Transition Period, the RCx Program had four subcomponents:

- **Compressed Air RCx:** The Compressed Air offering provides incentives to defray the cost of a RCx study of compressed air equipment, leading to the implementation of low-cost/no-cost energy efficiency measures for existing compressed air systems. Typical measures include leak repair, installation of zero-loss drains, and installation or tune-up of compressed air system controls.
- **Industrial Refrigeration RCx:** The Industrial Refrigeration offering provides incentives to defray the cost of a RCx study of industrial refrigeration equipment, leading to the implementation of low-cost/no-cost energy efficiency measures for existing industrial refrigeration systems. Typical measures include lowering condensing pressure, raising suction pressure, evaporator fan control, evaporator defrost settings, and compressor sequencing.
- **Large Facilities RCx.** The Large Facilities offering has historically targeted two separate types of facilities: healthcare facilities and large commercial facilities (primarily offices). Healthcare facilities represent a major opportunity for energy savings in AIC territory and historically have driven this offering. Typical measures include EMS settings adjustments to optimize the operation of HVAC systems. Beginning during the Transition Period, the Large Facilities offering also began to target public sector facilities (e.g., schools).
- **Grocery Store RCx.** Beginning in PY7, the RCx Program began to offer RCx to grocery stores under a separate offering. This offering is similar to the Large Facilities offering with relaxed facility size requirements and an increased focus on refrigeration systems. To date, this offering has not had any activity.

Large Facilities RCx projects go through a screening phase that examines the feasibility of RCx at the facility. Sites with good savings potential are eligible to apply to the program after AIC reviews the project. RSPs commit resources to this deliverable, which may or may not result in a viable RCx project. To defray the financial risk to the RSP and to encourage the RSPs to market the program more aggressively, AIC pays a screening stipend of 10% of the RCx study cost to the RSP for complex projects. This stipend does not require a commitment to implement a project and does not necessarily mean that energy savings will be achieved in future years.

Summary of Program Design and Implementation Changes

The RCX Program dealt with a number of changes during the Transition Period.

As a result of FEJA, AIC's largest commercial customers (10 MW+ in demand) are now exempt from energy efficiency programs. Traditionally, these customers make up a significant amount of program savings, and their exemption has required the Business Program to generally pursue larger numbers of smaller projects than its past focus. Additionally, public sector customers became newly eligible to participate in the program during the Transition Period.

As a result of these changes, much of the Transition Period implementation effort was focused on building the 2018 program pipeline and introducing public sector customers to the program. Four public sector projects, initiated through the DCEO, were completed during the Transition Period, and additional DCEO-initiated projects are expected to be completed in 2018.

3.11.2 Program Performance

During the Transition Period, projects were completed in the Compressed Air and Large Facilities categories. No projects were completed under the Grocery Store or Industrial Refrigeration offerings. All four Large Facilities projects during the Transition Period were public sector projects completed at educational facilities.

Table 106 displays the contributions of each component to the RCx Program's overall Transition Period ex ante gross savings.

Table 106. Summary of Transition Period RCx Program Components

Program Component	Projects[a]	Ex Ante Gross Savings			
		MWh	%	Therms	%
Compressed Air	2	436	47%	0	–
Industrial Refrigeration	0	0	–	0	–
Large Facilities	4	496	53%	266,604	100%
Healthcare	*0*	*0*	–	*0*	–
Commercial	*0*	*0*	–	*0*	–
Public Sector	*4*	*496*	*53%*	*266,604*	*100%*
Grocery	0	0	–	0	–
Total	**6**	**932**	–	**266,604**	–

[a] The project count reflects all projects claiming savings in the Transition Period, which does not include seven projects that only received a stipend.

Table 107 shows historic program participation for PY1 through the Transition Period.

Table 107. Summary of Past Program Participation

Program Year	Projects[a]	Ex Ante Gross Savings	
		MWh	Therms
PY1	1	2,045	0
PY2	17	10,640	0
PY3	21	29,819	0
PY4	25	19,273	412,666
PY5	35	29,257	577,834

Program Year	Projects[a]	Ex Ante Gross Savings	
		MWh	Therms
PY6	26	12,091	248,851
PY7	16	10,175	226,171
PY8	19	12,193	514,070
PY9	21	10,741	252,564
Transition Period	6	932	266,604

[a] This project count reflects projects with associated savings. A number of projects listed in the AIC database as paid have no associated savings, the vast majority of which are "stipend" projects.

The evaluation team noted in PY9 that six stipends were paid, all for healthcare studies. None of these stipends led to a completed project during the Transition Period. Seven stipends were paid during the Transition Period, also all for healthcare studies.

RSP participation during the Transition Period was limited. Three allies engaged with the program; one ally completed both compressed air projects, one ally (a new RSP for the program) completed all four public sector projects, and one ally completed all seven healthcare studies that received stipends.

In addition to the RCx Program's primary goal of achieving electric energy and gas savings during the Transition Period, we have verified that the program is channeling participation into the C&I Custom Program, a secondary goal for the program. One C&I Custom project completed during the Transition Period received a bonus incentive for having been completed within a year of a RCx study at the same site. This project yielded 559 MWh in ex ante gross electric energy savings, claimed through the Custom Program.

3.11.3 Impact Results

Gross Impacts

The evaluation team conducted site visits at both compressed air projects and desk reviews of all four public sector projects. We analyzed the project RCx and post-inspection reports and re-estimated savings with data in the documentation and our own best estimates. In most cases, our re-estimations confirmed reported savings with the available data.

Table 108 presents project-level ex ante and ex post gross savings and realization rates for AIC Transition Period projects. The ex post impacts are based on on-site visits for both compressed air projects.

Table 108. Transition Period AIC RCx Program Gross Impact Results

Project ID	Project Type	Ex Ante Gross Savings			Gross Realization Rate			Ex Post Gross Savings		
		MWh	MW	Therms	MWh	MW	Therms	MWh	MW	Therms
901757	Compressed Air	215	0.024	0	99%	102%	N/A	212	0.025	0
901758	Compressed Air	221	0.035	0	86%	62%	N/A	191	0.022	0
Total		**436**	**0.059**	**0**	**92%**	**78%**	**N/A**	**402**	**0.047**	**0**

Table 109 presents project-level ex ante and ex post gross savings and realization rates for public sector Transition Period projects. The ex post impacts are based on engineering desk reviews.

Table 109. Transition Period Public Sector RCx Program Gross Impact Results

Project ID	Project Type	Ex Ante Gross Savings			Gross Realization Rate			Ex Post Gross Savings		
		MWh	MW	Therms	MWh	MW	Therms	MWh	MW	Therms
1000337	Large Facilities	227	N/A	17,559	102%	N/A	115%	231	N/A	20,267
1000338	Large Facilities	0	N/A	138,957	N/A	N/A	38%	0	N/A	52,300
1000343	Large Facilities	268	N/A	14,072	155%	N/A	149%	415	N/A	20,900
1000356	Large Facilities	0	N/A	96,016	N/A	N/A	96%	0	N/A	91,965
Total		**496**	**N/A**	**266,604**	**130%**	**N/A**	**70%**	**646**	**N/A**	**185,432**

Overall, the impact evaluation made largely minor changes to ex ante gross savings. The decrease in savings for private sector projects is due to installation of one project component (a sequencer to optimize staging) not yet being completed. Public sector savings were challenging to estimate due to poor documentation for these projects. In cases where we disagreed with savings estimates, we needed to construct new calculations from scratch, and therefore identifying the specific differences in savings estimates is not possible. Among most reviewed projects, verification adjustments represented isolated cases of miscalculated savings and not systematic problems.

Net Impacts

The ex ante NTGRs for the program are the SAG-approved values of 91% for electricity and 91% for gas for the AIC program, and the most recent DCEO NTGRs for public sector participants (98% for electric energy, 103% for electric demand, and 94% for gas). Following the NTGR framework, we apply these NTGRs to Transition Period savings. Table 110 provides the AIC net impacts, and Table 111 provides public sector net impacts.

Table 110. Transition Period AIC RCx Program Net Impacts

Savings Category	Ex Post Gross	NTGR	Ex Post Net
Energy Savings (MWh)	402	91%	366
Demand Savings (MW)	0.05	91%	0.04
Gas Savings (Therms)	0	91%	0

Table 111. Transition Period RCx Program Public Sector Net Impacts

Savings Category	Ex Post Gross	NTGR	Ex Post Net
Energy Savings (MWh)	646	98%	633
Demand Savings (MW)	0.00	103%	0.00
Gas Savings (Therms)	185,432	94%	174,306

Cumulative Persisting Annual Savings and Weighted Average Measure Life

Table 112 presents CPAS and WAML for the Transition Period C&I RCx Program.

Table 112. Commercial and Industrial Retro-Commissioning Program CPAS and WAML

Measure	Measure Life	First-Year Ex Post Gross Savings (MWh)	CPAS - Ex Post Net Savings (MWh)							Lifetime Savings (MWh)
			Transition Period	2018	2019	2020	2021	...	2030	...	
Compressed Air Retro-Commissioning	5.0	402	366	366	366	366	366	...	0	...	1,831
Large Facilities Retro-Commissioning	5.0	646	633	633	633	633	633	...	0	...	3,167
Transition Period CPAS		**1,049**	**999**	**999**	**999**	**999**	**999**	**...**	**0**	**...**	**4,997**
Expiring Transition Period CPAS			**0**	**0**	**0**	**0**	**0**	**...**	**999**	**...**	
WAML	**5.0**										

[a] For Transition Period reporting, we continue to use legacy measure life estimates at an offering level, presented above. Beginning in 2018, we will likely revise measure life estimates for RCx projects per ongoing discussion with the Illinois SAG.

Appendix A. Cost-Effectiveness Inputs

Overview

By agreement with ICC staff, AIC is not penalized for interactive effects resulting from installation of efficient prescriptive measures that create an increase in usage when considering savings for the purpose of goal attainment. Therefore, we exclude those effects in the tables reported above.

However, these effects are required to be considered as part of cost-effectiveness testing. For that purpose, we report two types of effects in this Appendix: heating penalties from installation of efficient lighting and heating penalties from the installation of ECMs.

Lighting Heating Penalty Overview

Efficient lighting products generate less waste heat than baseline lighting products. When customers replace baseline products with more efficient lighting, they must use more space heating to compensate for "lost" heat from lighting. The heating penalty represents the increase in gas usage because of the additional space heating needed due to the reduction of waste heat generated by the more-efficient lighting.[60] The penalty is used in the analysis of program cost-effectiveness.

ECM Heating Penalty Overview

According to the IL-TRM V5.0, installing an ECM in a home increases the heating load due to reduced waste heat. High efficiency ECMs operate at cooler temperatures than traditional furnace blower motors. The amount of heat released decreases due to cooler operating conditions. Heating equipment must make up for this loss of heat during the heating season, resulting in an increase in HVAC heating loads (negative therm savings).

Retail Products

Lighting Heating Penalty Methodology

The IL-TRM V5.0 provides different algorithms to calculate the heat penalty for residential and commercial installations.

To calculate the weighted program heat penalty, we apply both the residential and commercial savings algorithms outlined in the IL-TRM V5.0 and multiply them by the probability of being installed in each location. Our weighted savings equation is:

Equation 4. First-Year Per Bulb Heating Penalty Algorithm

$$\text{Year 1 } \Delta Therms = \text{LA} \times\ 0.97 \times \left[\frac{(Base\ Watt - Bulb\ Watt)}{1000} \times ISR_{yr1} \times HOU_{res} \times WHFe_{res} \times 0.03412\right] \Big/ \eta Heat$$

[60] We follow the direction of the IL-TRM V5.0 and assume all homes are gas heated because we do not have information on the heating fuel of customers' homes. Thus, we calculate only a gas-heating penalty.

$$+ \text{LA} \times 0.03 \times \left[\frac{(Base\ Watt - Bulb\ Watt)}{1000} \times ISR_{yr1} \times HOU_{com} \times IFTherms\right]$$

Where:

LA = Leakage adjustment equal to (1 − leakage rate) or (1 − %Leakage)
0.97 = Residential install rate
0.03 = Commercial install rate
$Base\ Watt$ = EISA-compliant base wattage
$Bulb\ Watt$ = Actual wattage of installed bulb
ISR = In-service rate
HOU = Hours of use
$WHFe$ = Waste heat factor for energy savings
Res = Residential values
Com = Commercial values
0.03412= Conversion factor from kWh to Therms
$\eta Heat$ = Efficiency of residential heating system
$IFTherms$ = Lighting-HVAC integration factor representing the increased commercial space gas heating requirements due to the reduction of waste heat rejected by the efficient lighting

To calculate the heating penalty for Transition Period purchases that will be installed during the next 2 years, we simply apply the ISR for year 2 and year 3. No modifications to the base wattages are necessary prior to 2020.

$$\text{Year 2 } \Delta Therms = LA \times 0.97 \times \left[\frac{(Base\ Watt - Bulb\ Watt)}{1000} \times ISR_{yr2} \times HOU_{res} \times WHFe_{res} \times 0.03412\right] \Big/ \eta Heat +$$

$$LA \times 0.03 \times \left[\frac{(Base\ Watt - Bulb\ Watt)}{1000} \times ISR_{yr2} \times HOU_{com} \times IFTherms_{com}\right]$$

$$Year\ 3\ \Delta Therms = LA \times 0.97 \times \left[\frac{(Base\ Watt - Bulb\ Watt)}{1000} \times ISR_{yr3} \times HOU_{res} \times WHFe_{res} \times 0.03412\right] \Big/ \eta Heat +$$

$$LA \times 0.03 \times \left[\frac{(Base\ Watt - Bulb\ Watt)}{1000} \times ISR_{yr3} \times HOU_{com} \times IFTherms_{com}\right]$$

The heating factors represent the increased gas space heating needed due to the reduction of waste heat generated by the more-efficient lighting. The IL-TRM V5.0 provides different factors based on installation location.

Table 113. Heating Penalty Factors for Calculating Gas Heat

Bulb Type	Ex Post Residential	Ex Post Commercial
	Heating Factor	Lighting-HVAC Integration Factor
Standard		
Standard	0.49	0.014

Bulb Type	Ex Post Residential	Ex Post Commercial
	Heating Factor	Lighting-HVAC Integration Factor
Specialty		
A-lamp	0.49	0.014
Bug Light	0.00	0.000
Candelabra	0.49	0.014
Dimmable Spiral	0.49	0.014
Exterior Reflector	0.00	0.000
Globe	0.49	0.014
High-Output Spiral	0.49	0.014
Interior Reflector	0.49	0.014
Post Light	0.49	0.014
Three-Way	0.49	0.014

The gas heating penalty that results from the additional space heating needed due to the reduction of waste heat generated by more efficient lighting installed through the Retail Products Program is shown in Table 114.

Lighting Heating Penalty Results

Table 114. Gas Heating Penalty

Measure	Heating Penalty (Therms)		
	Transition Period	2018	2019
Omnidirectional LEDs	-658,230	-11,086	-9,700
Specialty LEDs	-576,328	-9,707	-8,493
Total	**-1,234,559**	**-20,793**	**-18,193**

HVAC

ECM Heating Penalty Results

We calculated heating penalties associated with ECM installations through the HVAC Program during the Transition Period.[61] Program tracking data did not include customer heating fuel type, and therefore, the evaluation team followed the IL-TRM V5.0's direction and assumed all homes used gas heating. Table 115 shows total ex ante gross and ex post therm savings attributable to ECM installations.

Table 115. Summary of Database Analysis Results—Therm Savings

Measure	Count of ECM Fans Installed in Gas Furnaces	Ex Ante Annual Gross Savings	Ex Post Per-Unit Gross Savings	Ex Post Annual Gross Savings	Annual Gross Realization Rate
ECM	1,277	-19,171	-15.4	-19,632	102.4%

Note: Negative savings represent an increase in therm consumption due to ECM installation.

Table 116 shows ECM net ex ante and ex post savings, determined by applying the NTGR value agreed upon by the SAG.

Table 116. Net Ex Ante and Ex Post Annual Savings

Measure Type	NTGR	Ex Ante Annual Net Savings Therms	Ex Post Annual Net Savings Therms
ECM	76.1%	-14,589	-14,940

Note: Negative savings represent an increase in therm consumption due to ECM installation

Multifamily

Lighting Heating Penalty Results

For efficient lighting distributed through the Multifamily Program in the Transition Period, we applied project specific heating types to arrive at gross heating penalties. For the cases where the program-tracking data did not list the heating type, we assumed natural gas heating per the IL-TRM V5.0. The evaluation team calculated heating penalties for 11 LED and CFL bulb types, resulting in total gross heating penalties of 316,812 kWh and 16,568 therms. Table 117 summarizes the heating penalties across all indoor lighting measures.

Table 117. Total Heating Penalties by Measure

Measure	kWh	Therms
9W LED - In-Unit	-158,434	-4,553
7W LED Globe - In-Unit	-89,537	-1,995
9W LED Reflector - In-Unit	-33,283	-2,109
9W LED Interior - Common Area	-17,308	-2,939
5W LED Candelabra - In-Unit	-11,293	-983

[61] The evaluation team followed the IL-TRM V5.0's direction and assuming all homes used gas heating, given the missing information on heating fuels in customers' homes.

9W LED Reflector Interior - Common Area	-6,228	-1,820
5W LED Candelabra Interior - Common Area	-730	-1,959
14W CFL Globe - In-Unit	0	-97
7W LED Globe Interior - Common Area	0	-38
9W CFL Candelabra - Common Area	0	-59
9W CFL Candelabra - In-Unit	0	-14
Total	**-316,812**	**-16,568**

Note: Numbers may not total due to rounding

Table 118 presents total gross impacts for Multifamily Program cost-effectiveness calculations. After the application of waste heat factors, a heating penalty of 316,812 kWh reduced the overall gross program savings to 3,175,664 kWh and a heating penalty of 16,568 therms reduced gross gas savings to 25,109 therms.

Table 118. Total Multifamily Program Gross Impacts with Heating Penalties

	kWh	kW	Therms
Gross Savings	3,492,475	427	41,677
Lighting Heating Penalty	-316,812	N/A	-16,568
Total Gross Savings with Heating Penalty	**3,175,664**	**427**	**25,109**

Home Efficiency Income Qualified

Lighting Heating Penalty Results

We calculated heating penalties associated with efficient lighting installed through the HEIQ Program during the Transition Period. We applied the heating penalty to 4,369 lamps based on heating fuel type and installed lamp type. The heating fuel type is known for 98% (4,282 lamps) of the installed lighting measures. For the remaining 87 lamps with unknown space heating fuel types, we applied waste heat factors assuming gas heating as directed per the IL-TRM V5.0. Table 119 summarizes the percentages of installed lamps for each heating fuel type.

Table 119. HEIQ Program Heating Fuel Type for Lighting Measures

Heating Fuel	Heating Equipment	% of Installed Lamps
Gas	Furnace/Boiler	90.3%
Electric	Electric Resistance	6.3%
Electric	Heat Pump	3.4%

The total heating penalty for lighting measures is 4,766 kWh and 2,922 therms.

Table 125 presents total gross impacts for AIC cost-effectiveness calculations. These values differ from those included in the main report due to the inclusion of heating penalties for lighting measures and also including a the reduction in waste heat for ECMs. Overall, the application of waste heat factors reduces total gross electric energy savings by 0.21% and therm savings by 3.27%.

Table 120. HEIQ Program Gross Impacts (Including Heating Penalties)

	kWh	kW	Therms
Gross Savings	2,308,856	714	387,038
Lighting Heating Penalty	-4,766	0	-2,922
ECM Heating Penalty	0	0	-9,743
Total Gross Savings with Heating Penalty	**2,304,090**	**714**	**374,373**

Public Housing Authority

Lighting Heating Penalty Results

We calculated gas heating penalties for 414 LED bulbs installed through the PHA Program by applying algorithms from the IL-TRM V5.0 that aligned with the heating fuel type specified in the PHA database. As a result, the total heating penalty for lighting measures is 368 therms.

Table 121 presents total gross impacts for cost-effectiveness calculations. These values differ from those included in the main report due to the inclusion of heating penalties for lighting measures.[62] Overall, the application of waste heat factors reduces total gross therm savings by 1.98%.

Table 121. HEIQ Program Gross Impacts (Including Heating Penalties)

	kWh	kW	Therms
Gross Savings	577,738	78	18,544
Lighting Heating Penalty	0	0	- 368
Total Gross Savings with Heating Penalty	**577,738**	**78**	**18,176**

School Kits

Lighting Heating Penalty Results

In addition to the gross gas-heating penalty from measure installations in the Transition Period, the evaluation team calculated the gross gas-heating penalty from delayed LED installations, per the IL-TRM V5.0. In particular, the IL-TRM V5.0 assumed consumers would install 86% of kit LEDs within three years. Table 122 shows the gross gas-heating penalty resulting from efficient lighting installations provided to participants in the Transition Period and realized in the Transition Period, as well those in future years, given later installations.

Table 122. Yearly Gross Heating Penalty Impact of Lighting Measures by Assumed Installation Year

Measure	Heating Penalty (therms)		
	Transition Period	Future Year 1	Future Year 2
9W LED	-2,605	-555	-470
Total	**-2,605**	**-555**	**-470**

[62] Heating penalties are not included in savings calculations for goal attainment purposes per AIC and ICC Staff agreement.

The evaluation team will include the future year heating penalty in future evaluation reports. Table 123 shows the gross gas impacts for cost-effectiveness inputs.

Table 123. Gross Gas Impacts

Measure	Gross Gas Impacts (Therms)		
	Transition Period	Future Year 1	Future Year 2
9W LED	-2,605	-555	-470
1.0 gpm Bath Faucet Aerator	452	—	—
2.0 gpm Kitchen Faucet Aerator	3,113	—	—
1.75 gpm High-Efficiency Shower Head	4,408	—	—
Hot Water Temperature Card Thermometer	999	—	—
Total	**8,416**	**-555**	**-470**

Table 124 shows the net gas impacts for cost-effectiveness inputs.

Table 124. Net Gas Impacts

Measure	Gross Gas Impacts (Therms)		
	Transition Period	Future Year 1	Future Year 2
9W LED	-2,163	-461	-390
1.0 gpm Bath Faucet Aerator	312	—	—
2.0 gpm Kitchen Faucet Aerator	2,350	—	—
1.75 gpm High-Efficiency Shower Head	2,834	—	—
Hot Water Temperature Card Thermometer	627	—	—
Total	**3,960**	**-461**	**-390**

Commercial and Industrial Standard

Lighting Heating Penalty Results

We calculated heating penalties associated with efficient lighting installed through the C&I Standard Program during the Transition Period. The program tracking database does not provide the heating fuel type; therefore, the evaluation team applied gas heat waste heat factors as specified in the IL-TRM V5.0 (when heating fuel is unknown). The total heating penalty for lighting measures in the Standard Program is 314,770 therms.

Table 125 presents total gross impacts for AIC cost-effectiveness calculations. These values differ from those included in the main report due to the inclusion of heating penalties for lighting measures. This approach was taken based on discussions with AIC and past agreements between AIC and ICC staff that heating penalties would not be included in savings calculations for goal attainment. Overall, the application of waste heat factors reduces total gross gas savings by 314,770 therms.

Table 125. Transition Period Standard Program Gross Impacts (Including Heating Penalties)

Program	MWh	MW	Therms
Total Gross Savings without Heating Penalty	42,995	5.84	1,642,295

Program	MWh	MW	Therms
Core Program Heating Penalty	0	0	-96,733
Instant Incentives Heating Penalty	0	0	-208,197
Online Store Heating Penalty	0	0	-9,839
Green Nozzles Heating Penalty	0	0	0
LFR Heating Penalty	0	0	0
MOSL Heating Penalty	0	0	0
STEP Heating Penalty	0	0	0
Total Gross Savings with Heating Penalty	**42,995**	**5.84**	**1,327,525**

Note: Total gross savings include electricity heating penalties for lighting measures aligning with ex ante reporting methods.

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