



Ameren Illinois Company 2018 Business Program Impact Evaluation Report

Final

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1. Executive Summary

This report presents impact evaluation results from Ameren Illinois Company's (AIC) 2018 Business Program. The Business Program is part of AIC's overall portfolio of residential and non-residential energy efficiency programs implemented during 2018. The overarching impact evaluation objective for the 2018 Business Program was to determine gross and net electric energy, electric demand, and natural gas impacts associated with the Program.

The Business Program is made up of four initiatives, which the evaluation team assessed as part of the 2018 evaluation:

- Standard
- Custom
- Retro-Commissioning
- Streetlighting

1.1 Background

This is the first year of the four-year 2018 Plan period, during which AIC will operate its energy efficiency programs in accordance with Illinois Senate Bill 2814 (the Future Energy Jobs Act [FEJA]) for the first time. Passage of FEJA has led to a number of significant changes in energy efficiency program delivery in Illinois including the following:

- **Discontinuation of energy efficiency programs offered through the Illinois Power Agency (IPA):** Energy efficiency programs adopted through the IPA procurement plan process and previously available to AIC customers, including numerous small business programs, ended on May 31, 2017.
- **Discontinuation of energy efficiency programs offered through the Illinois Department of Commerce and Economic Opportunity (DCEO):** Prior to the Transition Period (June 1, 2017 to December 31, 2017), 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 and the Transition Period allowed AIC to begin to integrate these customers into its programs. Beginning in 2018, public sector AIC customers are fully eligible for the AIC Business Program in the same manner as other AIC customers.
- **Change in eligibility for the largest AIC customers.** As part of FEJA, customers with electric demand of over 10 MW became ineligible for AIC programs as of June 1, 2017. These customers historically provided a majority or near-majority of Business Program electric energy savings, so their exclusion from AIC programs moving forward has had significant effects on the Program and required the Program to generally pursue larger numbers of smaller projects than its past focus. This change particularly affected the Custom Initiative, which historically has derived 50% or more of its energy savings from 10 MW customers.
- **Shift to Cumulative Persisting Annual Savings (CPAS):** Beginning in 2018, electric energy savings goals for Illinois utilities are primarily defined based on persisting savings as a percentage of sales. As such, annual evaluations of AIC's programs, including this one, present both annual, as well as persisting savings over the life of delivered measures. As a result, AIC and its implementer have also sought to

deliver programs that achieve not just savings in the short-term, but that persist for an extended period.

- **Calculation of Weighted Average Measure Life (WAML):** FEJA replaces the existing funding mechanism for electric 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.”¹ Therefore, we present WAML for AIC’s electric energy efficiency programs in this report in accordance with the guidelines for calculation presented in the Illinois Stakeholder Advisory Group’s (SAG) WAML Report.²

1.2 Program Savings

Within the following sections, the evaluation team presents Annual Savings (annualized 2018 energy savings) and CPAS. As discussed in greater detail within the forthcoming 2018 AIC Integrated Impact Evaluation Report, AIC’s performance against its Applicable Annual Incremental Goal (AAIG)³ is determined based on both types of program savings.

1.2.1 Annual Savings

The 2018 Business Program achieved 222,792 MWh, 29.73 MW, and 5,505,837 therms in verified net savings. Table 1, Table 2, and Table 3 present ex ante gross, verified gross, and verified net electric energy, electric demand, and gas savings by initiative for the 2018 Business Program.

Table 1. 2018 Business Program Electric Energy Annual Savings Summary

Initiative	Ex Ante Gross MWh	Gross Realization Rate	Verified Gross MWh	Net-to-Gross Ratio (NTGR)	Verified Net MWh
Standard	230,044	100%	229,444	0.835	191,518
Custom	34,555	83%	28,816	0.825	23,775
Retro-Commissioning	5,992	107%	6,416	0.914	5,864
Streetlighting	1,638	100%	1,635	1.000	1,635
Business Program Total	272,229	98%	266,310	0.837	222,792

Table 2. 2018 Business Program Electric Demand Annual Savings Summary

Initiative	Ex Ante Gross MW	Gross Realization Rate	Verified Gross MW	NTGR	Verified Net MW
Standard	34.14	95%	32.40	0.826	26.76
Custom	4.06	79%	3.19	0.825	2.63
Retro-Commissioning	0.61	61%	0.37	0.914	0.34
Streetlighting	0.00	N/A	N/A	N/A	N/A
Business Program Total	38.81	93%	35.96	0.827	29.73

¹ Weighted Average Measure Life Report. Illinois Energy Efficiency Stakeholder Advisory Group. February 20, 2018.

² Ibid.

³ AAIG is defined as the difference between the cumulative persisting goal for the year being evaluated and the cumulative persisting goal for the previous year. Further explanation is provided in the 2018 AIC Integrated Impact Evaluation Report.

Table 3. 2018 Business Program Gas Annual Savings Summary

Initiative	Ex Ante Gross Therms	Gross Realization Rate	Verified Gross Therms	NTGR	Verified Net Therms
Standard	5,885,866	100%	5,891,848	0.604	3,560,533
Custom	1,482,699	127%	1,880,202	0.939	1,765,510
Retro-Commissioning	190,552	103%	196,712	0.914	179,795
Streetlighting	0	N/A	N/A	N/A	N/A
Business Program Total	7,559,118	105%	7,968,762	0.691	5,505,837

1.2.2 Cumulative Persisting Annual Savings

Table 4 summarizes CPAS and WAML for the 2018 Business Program at the initiative level. For additional detail around CPAS and measure life, please see the individual initiative chapters and the overall CPAS spreadsheet, presented separately from this report. The overall WAML for the Business Program is 12.2 years.

Table 4. 2018 Business Program CPAS and WAML

Initiative	WAML	First-Year Verified Gross Savings (MWh)	NTGR	CPAS - Verified Net Savings (MWh)							Lifetime Savings (MWh) ^a
				2018	2019	2020	2021	...	2030	...	
Standard	12.5	229,444	0.835	191,518	186,282	186,221	185,444	...	60,387	...	2,157,200
Custom	12.1	28,816	0.825	23,775	23,775	23,676	23,264	...	12,918	...	288,819
Retro-Commissioning	5.1	6,416	0.914	5,864	5,864	5,018	4,075	...	0	...	29,765
Streetlighting	12.0	1,635	1.000	1,635	1,635	1,635	1,635	...	0	...	16,690
2018 CPAS		266,310	0.837	222,792	217,556	216,550	214,417	...	73,306	...	2,492,475
Expired 2018 CPAS				0	5,236	6,242	8,375	...	149,487	...	
WAML	12.2										

^a Lifetime savings are inclusive of all savings for the entire life of all measures. During 2018, the longest-lived measures installed through the Business Program had a measure life of 25 years. Therefore, some CPAS exist through 2041.

2. Evaluation Approach

The 2018 Business Program impact evaluation approach included initiative-specific activities with the primary goal of estimating gross and net energy and demand impacts. As part of the evaluation process, the evaluation team applied versions of the Illinois Energy Efficiency Policy Manual and the Illinois Technical Reference Manual (IL-TRM) applicable to the 2018 program year (Version 1.1 and Version 6.0, respectively) wherever relevant.⁴ This section outlines the impact evaluation activities for each of the 2018 Business Program initiatives.

For the Standard and Streetlighting initiatives, the impact evaluation primarily consisted of applying savings algorithms from the IL-TRM V6.0 to final initiative tracking databases to estimate verified gross savings. For the Custom and Retro-Commissioning initiatives, the team primarily employed a combination of engineering desk reviews and on-site verification to estimate verified gross savings. These evaluation approaches mirror the approaches used in recent years (e.g. Program Year 9 and the Transition Period) to estimate impacts from these offerings. Appendix A of this report provides more detailed initiative-specific methods where appropriate.

2.1 Research Objectives and Evaluation Activities

The overarching research objectives for the impact evaluation of AIC's 2018 Business Program are as follows:

- What were the estimated gross energy and demand impacts from the Program?
- What were the estimated net energy and demand impacts from the Program?

The evaluation team met these objectives by conducting the impact evaluation activities outlined in Table 5. As noted previously, the evaluation approaches outlined here are consistent with recent impact evaluations. In addition, we reviewed initiative materials and interviewed all initiative managers.

Table 5. 2018 Business Program Impact Evaluation Activities

Initiative	Gross Impacts			Net Impacts	
	IL-TRM Application Review	Engineering Desk Reviews	On-Site Verification	Application of SAG-Approved NTGR	Retrospective NTGR Modifications
Standard	✓			✓	✓
Custom		✓	✓	✓	✓
Retro-Commissioning		✓	✓	✓	
Streetlighting		✓		✓	

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

⁴ In future years, the evaluation team will apply updated versions of these manuals to the evaluation of this program as required by law, ICC orders and changes to the manuals themselves.

2.2 Verified Gross Impact Analysis Approach

2.2.1 Application of IL-TRM V6.0

To determine verified gross impacts associated with the majority of measures delivered through the Standard Initiative, we reviewed the content of the initiative tracking database to identify database errors and duplicate records, and to ensure that the implementer correctly applied savings algorithms and assumptions stated in the IL-TRM V6.0 and the IL-TRM V6.0 errata document. In particular, we applied the algorithms and assumptions provided in the IL-TRM V6.0, while using project-specific data from the initiative tracking databases where appropriate. As part of this process, we also verified measure installations through analysis of initiative 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 initiative-specific sections of this report.

In accordance with Illinois policy, the evaluation team omitted heating penalties from savings reported in the body of this report. Appendix B presents detail on heating penalties for cost-effectiveness purposes.

2.2.2 Application of Custom Impact Methods

The Custom, Retro-Commissioning, and Streetlighting initiatives are not suitable for gross impact analysis using the IL-TRM. These initiatives require custom energy savings calculations to determine all gross impacts.⁵ In addition, for a very small number of measures provided through the Standard Initiative during the 2018, we conducted engineering desk reviews to determine savings if the measure was not currently included in the IL-TRM. Further details around the custom impact methods applied for these initiatives are presented in Appendix A.

2.3 Verified Net Impact Analysis Approach

To determine verified net savings for the 2018 Business Program, we primarily applied SAG-approved net-to-gross ratios (NTGRs) to verified gross savings. Details on SAG-approved NTGRs applied are presented in Appendix A.

2.3.1 Staffing Grants

Following our approach from past years, we also conducted research with Staffing Grant participants to estimate the influence of grants on their associated project(s). These interviews developed an independent estimate of attribution associated with the Staffing Grant. We interviewed 10 participants accounting for 23 of the 55 projects associated with Staffing Grants in 2018; 18 of these projects went through the Standard Initiative and five were Custom Initiative projects.

We compared the NTGR developed through the 2018 Staffing Grant interviews with the SAG-approved 2018 NTGR for the associated project(s). We used the SAG-approved 2018 NTGR as a floor, and if the NTGR developed through the Staffing Grant interviews exceeded the SAG-approved 2018 value, we applied the new NTGR to all of the projects associated with that Staffing Grant. However, if the newly developed NTGR fell

⁵ Note that while the Streetlighting impact calculations are technically custom (as there is no IL-TRM V6.0 section for this measure), in practice the calculations are essentially prescriptive. Beginning in 2019, the IL-TRM will specifically include Streetlighting as a prescriptive measure.

below the SAG-approved 2018 value, we applied the SAG-approved 2018 value to each of the participant's projects. Details on adjustments to NTGRs made as a result of Staffing Grant research are presented in Appendix A. More detailed information for the Staffing Grant NTGR calculation is provided in Appendix C.

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 2018 evaluation. In particular, we took the following actions to address potential sources of error.

■ Analysis Error:

- **Prescriptive Gross Impact Calculations:** For prescriptive gross impact calculations, we applied IL-TRM V6.0 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.
- **Custom Gross Impact Calculations:** We determined custom gross impacts using desk reviews and data collected during on-site M&V. To minimize data analysis errors, the evaluation team had all calculations reviewed by a separate team member to verify that calculations were performed accurately.
- **Net Impact Calculations:** For net impact calculations, we applied SAG-approved NTGRs to estimated gross impacts to derive net impacts. To minimize analytical errors, all calculations were reviewed by a separate team member to verify their accuracy.

■ Sampling Error:

- **Custom Impact Sample:** The evaluation team completed an impact review for 56 of 185 Custom projects achieving savings in 2018, drawing three waves of stratified samples separately for projects claiming electric and gas savings. For gross impact results, at the 90% confidence level, we achieved a relative precision of 10.9% for electric energy savings, 11.0% for electric demand savings, and 7.5% for gas savings.
- **Retro-Commissioning Impact Sample:** The evaluation team completed desk reviews for a census (12) of Retro-Commissioning projects, and drew a stratified sample of six electric projects for on-site M&V. While we adjusted electric impacts as a result of desk reviews for a number of projects, we made adjustments to electric projects as a result of on-site M&V for only certainty stratum projects. Therefore, there is no sampling error around electric impacts. All gas projects received desk reviews and on-site M&V, and therefore there also is no sampling error around gas impacts.

■ Non-Sampling Error:

- **Measurement Error:** To minimize data collection error during site visits, the evaluation team used trained engineers and technicians familiar with the equipment covered by the Custom and Retro-Commissioning initiatives and the methods used to calculate the gross impacts.

3. Initiative-Level Results

Within the following sections, we present the results of the impact evaluation of the 2018 Business Program initiatives. Each sub-section presents a summary of the initiative's design, participation, and associated electric and natural gas impacts. Additional details on the impact analysis methods used for these evaluations are presented in Appendix A.

3.1 Standard

3.1.1 Initiative Description

Implemented by Leidos, the Standard Initiative offers AIC non-residential customers fixed incentives for the installation of specific energy efficiency measures. Incentives are delivered through several distinct offerings described below:

- **Core:** The Core offering covers lighting, variable speed drives (VSDs), HVAC equipment, refrigeration/grocery equipment, commercial kitchen equipment, steam traps, and other measures.
- **Instant Incentives:** The Instant Incentives offering is a midstream lighting offering that offers discounts at the point of sale, covering a variety of standard, specialty, and linear LEDs.
- **Online Store:** Through the Initiative, AIC operates an Online Store that offers all electric business customers a variety of energy-saving products, including LEDs, occupancy sensors, and LED exit signs.
- **Small Business Direct Install:** Small Business Direct Install (SBDI) became an offering under the Initiative beginning in 2018. SBDI relies on AIC Business Program allies to provide small businesses with a free energy assessment and a simplified process for installing rebated measures.
- **Green Nozzles:** The Initiative also includes the Green Nozzles offering, which offers free low-flow pre-rinse nozzles to all AIC all-gas business customers, as well as customers in the food service sector who use electric water heating.
- **Laminar Flow Restrictors (LFRs):** In PY9, the Initiative 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.

Summary of Key Implementation Changes in 2018

During 2018, the Standard Initiative implemented the following design and implementation changes relative to the Transition Period:

- Increased incentives and bonus offerings for trade allies and customers to help encourage participation
- Added the SBDI offering
- Added advanced thermostats to the Online Store
- Discontinued the Streetlighting offering (Streetlighting shifted to a separate initiative in 2018)

- Discontinued the Savings Through Efficient Products (STEP) offering (STEP was previously offered during the Transition Period as a continuation of previously offered public sector energy efficiency programs)

In addition to these changes, the Standard Initiative continued to serve 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 non-residential and residential energy efficiency programs beginning in the Transition Period. To help drive participation, the implementation team increased marketing activities targeting public sector customers. 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.

3.1.2 Participation Summary

The Initiative reported a total of 193,533 MWh, 26.76 MW, and 5,594,894 therms in ex ante gross savings through 5,988 private sector projects. In addition, the Initiative completed 1,091 public sector projects and claimed 36,511 MWh, 7.38 MW, and 290,972 therms in ex ante gross savings from public sector participants. Altogether, the Initiative reported a grand total of 230,044 MWh, 34.14 MW, and 5,885,866 therms in ex ante gross savings.

Table 6 presents participation and ex ante gross savings estimates. We present these data separated by public and private sectors to provide context as to the primary drivers of initiative participation.

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Table 6. 2018 Standard Initiative Participation Summary

Offering	Total Projects	Ex Ante Gross Savings		
		MWh	MW	Therms
Private Sector				
Core Offering	1,537	106,318	12.91	5,585,194
Instant Incentives ^{a,b}	1,921	28,133	5.94	—
Online Store	380	931	0.23	7,720
Green Nozzles	4	0	0.00	1,010
LFRs	0	0	0.00	0
SBDI	2,146	58,151	7.68	970
Private Sector Subtotal	5,988	193,533	26.76	5,594,894

Offering	Total Projects	Ex Ante Gross Savings		
		MWh	MW	Therms
Public Sector				
Core Offering	370	14,004	2.76	288,743
Instant Incentives ^{a,b}	242	12,100	2.58	n/a
Online Store	34	112	0.04	398
Green Nozzles	14	18	0.00	1,830
LFRs	0	0	0.00	0
SBDI	431	10,276	2.01	<1
Public Sector Subtotal	1,091	36,511	7.38	290,972
Total	7,079	230,044	34.14	5,885,866

^a Private sector savings for the Instant Incentives offering include carryover savings from PY8, PY9, and the Transition Period. Public sector savings for the Instant Incentives offering include carryover savings for the Transition Period and does not include carryover savings from PY8 and PY9 since the public sector was only eligible starting in the Transition Period.

^b The count of projects for Instant Incentives is the number of unique participants.

3.1.3 Initiative Annual Savings Summary

Table 7 presents Standard Initiative annual savings achieved in 2018. Similar to recent years, we generally observe realization rates close to 100% for the Initiative, indicating that implementation is generally effectively applying IL-TRM algorithms and choosing reasonable impact analysis assumptions.

Table 7. 2018 Standard Initiative Annual Savings

	Energy Savings (MWh)	Demand Savings (MW)	Gas Savings (Therms)
Ex Ante Gross Savings	230,044	34.14	5,885,866
Gross Realization Rate	100%	95%	100%
Verified Gross Savings	229,444	32.40	5,891,848
NTGR	0.835	0.826	0.604
Verified Net Savings	191,518	26.76	3,560,533

3.1.4 Initiative Savings Detail

The Standard Initiative distributed a variety of measures through each of its offerings as shown in Table 8 through Table 10. Following these tables, we highlight key findings of our gross impact analysis.

Table 8. 2018 Standard Initiative Electric Energy Savings by Offering

Offering/Measure Category	Ex Ante Gross Savings (MWh)	Gross Realization Rate	Verified Gross Savings (MWh)	NTGR ^a	Verified Net Savings (MWh)
<i>Core Offering</i>					
Lighting	90,248	100%	90,691	0.780	70,572
VSDs	22,027	100%	22,027	0.833	18,349
Leak Survey and Repair	1,044	125%	1,305	0.702	916
HVAC	2,566	99%	2,546	0.557	1,418
Specialty Equipment	4,437	100%	4,443	0.849	3,772
Steam Traps	0	n/a	0	n/a	0
Core Offering Total	120,322	101%	121,013	0.785	95,027
<i>Instant Incentives</i>					
Linear LED	33,629	100%	33,708	0.772	26,029
Specialty LED	5,121	103%	5,253	0.773	4,058
Standard LED	1,484	103%	1,535	0.772	1,185
Occupancy Sensor	0	n/a	10	0.770	8
Instant Incentives Total	40,233	101%	40,506	0.772	31,280
<i>SBDI</i>					
Lighting	68,422	98%	66,889	0.962	64,347
Non-Lighting	5	115%	6	0.962	5
SBDI Total	68,427	98%	66,895	0.962	64,353
<i>Online Store</i>					
Lighting	949	97%	924	0.831	768
Advanced Thermostats	94	95%	89	0.831	74
Online Store Total	1,043	97%	1,013	0.831	842
Green Nozzles Total	18	100%	18	0.920	17
LFR Total	0	n/a	0	n/a	0
Standard Initiative Total	230,044	100%	229,444	0.835	191,518

Note: Totals may not sum due to rounding.

^a Effective NTGRs may differ from the 2018 recommended values due to the inclusion of carryover projects and/or application of Staffing Grants NTGRs.

Table 9. 2018 Standard Initiative Electric Demand Savings by Offering

Offering/Measure Category	Ex Ante Gross Savings (MW)	Gross Realization Rate	Verified Gross Savings (MW)	NTGR ^a	Verified Net Savings (MW)
<i>Core Offering</i>					
Lighting	11.18	100%	11.18	0.778	8.70
VSDs	3.92	100%	3.92	0.833	3.27
Leak Survey and Repair	0.12	127%	0.15	0.702	0.11
HVAC	0.32	100%	0.32	0.557	0.18
Specialty Equipment	0.13	111%	0.14	0.849	0.12
Steam Traps	0.00	n/a	0.00	n/a	0.00
Core Offering Total	15.67	100%	15.72	0.787	12.37
<i>Instant Incentives</i>					
Linear LED	7.20	100%	7.21	0.772	5.57
Specialty LED	1.03	103%	1.05	0.773	0.81
Standard LED	0.30	104%	0.31	0.772	0.24
Occupancy Sensor	0.00	n/a	0.00	0.770	0.00
Instant Incentives Total	8.52	101%	8.58	0.772	6.62
<i>SBDI</i>					
Lighting	9.69	81%	7.83	0.962	7.53
Non-Lighting	0.00	n/a	0.00	0.962	0.00
SBDI Total	9.69	81%	7.83	0.962	7.53
<i>Online Store</i>					
Lighting	0.24	97%	0.24	0.831	0.20
Advanced Thermostats	0.02	199%	0.05	0.831	0.04
Online Store Total	0.27	106%	0.28	0.831	0.23
Green Nozzles Total	0.00	n/a	0.00	n/a	0.00
LFR Total	0.00	n/a	0.00	n/a	0.00
Standard Initiative Total	34.14	95%	32.40	0.826	26.76

Note: Totals may not sum due to rounding.

^a Effective NTGRs may differ from the 2018 recommended values due to the inclusion of carryover projects and/or application of Staffing Grants NTGRs.

Table 10. 2018 Standard Initiative Gas Savings by Offering

Offering/Measure Category	Ex Ante Gross Savings (Therms)	Gross Realization Rate	Verified Gross Savings (Therms)	NTGR	Verified Net Savings (Therms)
<i>Core Offering</i>					
Lighting	0	n/a	0	n/a	0
VSDs	0	n/a	0	n/a	0
Leak Survey and Repair	0	n/a	0	n/a	0
HVAC	247,887	100%	248,048	0.494	122,535
Specialty Equipment	27,376	92%	25,187	0.675	17,001
Steam Traps	5,598,674	100%	5,598,674	0.608	3,403,994
Core Offering Total	5,873,937	100%	5,871,909	0.603	3,543,531
<i>SBDI</i>					
Lighting	0	n/a	0	n/a	0
Non-Lighting	970	208%	2,020	0.962	1,943
SBDI Total	970	208%	2,020	0.962	1,943
<i>Online Store</i>					
Lighting	0	n/a	0	n/a	0
Advanced Thermostats	8,119	186%	15,080	0.831	12,531
Online Store Total	8,119	186%	15,080	0.831	12,531
Green Nozzles Total	2,840	100%	2,840	0.890	2,527
LFR Total	0	n/a	0	n/a	0
Standard Initiative Total	5,885,866	100%	5,891,848	0.604	3,560,533

Note: Totals may not sum due to rounding.

The Standard Initiative achieved gross realization rates of 100%, 95% and 100% for MWh, MW, and therm savings, respectively. Primary contributors to deviations in realization rates, at the offering level, are outlined and discussed below, prioritized by impact on overall Standard Initiative savings.⁶ The majority of issues stemmed from insufficient tracking data.

Small Business Direct Install (SBDI)

Overall, the SBDI offering had gross realization rates of 98% for MWh, 81% for MW, and 208% for therms. In the offering's first year as part of the Standard Initiative, the evaluation team observed data quality issues primarily taking the form of insufficient information on building and measure characteristics.

- For lighting measures, the building type (e.g., office – low rise, refrigerated cases, garage) dictate key parameters (e.g., operation hours, interactive effects) used in quantifying savings for installed measures. The initiative tracking data did not align the building type with the IL-TRM V6.0 Section 4.5 table of building types, which in turn affected the choice of annual operating hours, waste heat factors, and coincidence factors used in ex ante calculations. Moreover, initiative tracking data did not sufficiently include space conditioning information, which also affected the appropriate selection of waste heat factors. These issues led to gross realization rates of 98% for MWh and 81% for MW.

⁶ Broader issues encompassing initiative tracking data and the continued refinement of the Standard Initiative evaluation are documented in the Conclusions and Recommendations at the end of this section.

- Non-lighting measures lacked building-specific characteristics in the initiative tracking data, most notably for HVAC improvements. For the instance of high efficiency furnace replacement, ex ante calculations did not multiply unit savings by the number of units installed, did not calculate demand savings, and applied time of sale savings when initiative tracking data indicated the furnace project was an early replacement. The issues were easily captured and corrected in the evaluation, resulting in gross realization rates for non-lighting SBDI measures of 115% for MWh and 208% for therms.

Online Store

The overall gross realization rates for the Online Store offering were 97% for MWh, 106% for MW and 186% for therms. While the majority of measures purchased through the Online Store are lighting, the discrepancies in realization rates mainly stemmed from advanced thermostats, a new measure in 2018.

- Advanced thermostats are not included in the IL-TRM V6.0. The evaluation team used guidance from the upcoming IL-TRM V7.0 (see Appendix A for a detailed discussion on the calculation method), which directed us to the residential volume for algorithm parameter input variables, such as the energy efficiency ratio (EER). The team discovered several discrepancies between ex ante and verified assumptions, including: coincidence factors, omission of electric heat savings, application of incorrect deemed annual electric heating consumption values, and omission of therm savings for some projects. The evaluation team has communicated these differences to the implementation team. Our recommendation, also discussed in the Conclusions and Recommendations section below, is to align ex ante calculations with the IL-TRM V7.0 in future years.
- Data on replaced equipment is difficult to obtain for lighting measures incented through the Online Store. Therefore, lighting measures apply assumed baseline wattages. Ex ante and verified assumptions differed for one measure, 11-watt A19 (standard base) bulbs. The tracking data incorrectly classified this measure as a specialty lamp and assigned a baseline wattage of 53 watts; we classified it as a general service lamp and assigned a baseline wattage of 43 watts. This resulted in negligible impacts on overall offering savings.

Core Offering

The evaluation team discusses the various end uses covered under the Core offering below.

Standard Lighting for Business (SLB)

SLB overall had gross realization rates of 100% for MWh and MW. Though gross realization rates are 100%, there were still some minor differences in the assumptions used for ex ante and verified calculations of savings.

- The IL-TRM V6.0 introduced a new building type (see Section 4.5 [Lighting]), which establishes a formula for calculating operating hours of exterior lights that run from dusk to business closing (e.g., 10 pm, 2am, or dawn). The IL-TRM V6.0 provides a working document that calculates savings based on 365 working days per year. Ex ante calculations assumed 260 working days in a year, which aligns with a 5-day, 52-week work-year. The evaluation team followed the IL-TRM V6.0 guidance by applying 365 working days per year, assuming exterior lights operating on timers generally do not differentiate between weekday and weekend nights. This was the main source of difference between ex ante and verified savings, though had a negligible effect on the MWh savings gross realization rate.

- The remaining differences stemmed from the use of generalized building types (e.g., Office, Hospital), further discussed in the Conclusions and Recommendations, and insufficient building cooling information in the initiative tracking data to determine the appropriate waste heat factors for use in calculations.

Heating, Ventilation, and Air Conditioning (HVAC)

The gross realization rates for HVAC measures are 99% for MWh, and 100% for MW and therms. The evaluation team found two sources of difference between ex ante and verified calculations, which had a minimal impact on overall savings:

- For high efficiency furnace measures, ex ante calculations applied coincidence factors from IL-TRM V6.0 Section 4.4 (HVAC End Use), instead of the measure-specific coincidence factors provided in the IL-TRM V6.0 Measure 4.4.11.
- Demand control ventilation (DCV) measures assumed buildings were cooled, which resulted in additional electric savings, but initiative tracking data indicated that all spaces were not cooled. The evaluation team, through discussions with the implementor, determined that a space would be considered cooled if another air conditioning measure (i.e., a unitary air conditioning system) was installed as part of the overall project. This resulted in two projects assigned as uncooled conditioning.

Specialty Equipment

The overall Specialty Equipment offering exhibited gross realization rates of 100% for MWh, 111% for MW, and 92% for therms. Specialty Equipment primarily includes measures focused on commercial kitchens, including combination ovens, dishwashers, and walk-in coolers. Several sources of discrepancies were discovered during the evaluation, ranging from insufficient tracking data to erroneous transcription of deemed savings from the IL-TRM V6.0.

- Energy savings associated with combination ovens are calculated in part from the size of the oven, measured in pans. Initiative tracking data did not track the number of pans but did assign a size range to measures (e.g., <15 pans, ≥15 to <30 pans, ≥30 pans). The evaluation team decided to apply an average of 7 pans to size range "<15," while ex ante calculations assumed 6 pans. The difference in savings led to a measure-specific gross realization rate of 98% for therms.
- The IL-TRM V6.0 calculated deemed savings for ENERGY STAR dishwasher measures. The evaluation team discovered an error in the initiative tracking data that accidentally transcribed the deemed savings for a high temperature, stationary single tank door dishwasher operating on natural gas building and electric booster water heating as 4,484 kWh; the correct savings for this measure is 4,844 kWh. The difference in savings led to a measure-specific gross realization rate of 108% for MWh and MW.
- For ENERGY STAR fryer measures, the IL-TRM V6.0 provides deemed parameters for use when field collected information is unavailable. Initiative tracking data did not include field collected data, and ex ante assumptions differed from the IL-TRM V6.0 deemed parameters; deemed parameters include, but are not limited to the idle time, preheat time, and the efficiency of the existing and efficient units. The evaluation team attempted to replicate the implementation team's assumptions, but with 18 different parameters, the evaluation team was unable to identify the source of discrepancy between ex ante and verified savings. Applying the IL-TRM V6.0 deemed values resulted in a measure-specific gross realization rate of 55%.

- The evaluation team found an error in the ex ante calculations for walk-in cooler/freezer strip curtains. Roughly half of projects installing strip curtains contained an unknown error within demand savings calculations, leading to MW gross realization rates of 2%. The evaluation team explored the initiative tracking data to identify the source of the discrepancy, but the scale of the difference is a multiplier larger than any single parameter. The error was contained to demand savings, with energy savings gross realization rates of 100%.

Instant Incentives

The overall Instant Incentive offering gross realization rates are 101% for MWh and MW. Verified savings for the Instant Incentive offering include both 2018 program year savings and carryover savings from PY8, PY9, and the Transition Period. Overall Instant Incentive offering realization rates of 101% for MWh and MW are a result of PY8 3rd-year carryover savings. The 3rd-year in-service rate applied ex ante is 0.011, which is lower than the verified in-service rate of 0.093, resulting in PY8 carryover realization rates over 500%. However, because the Transition Period shifted the start and end dates for a program year, only 5/12ths of PY8's 3rd-year carryover savings are applied in 2018, minimizing the impact of carryover savings on overall Instant Incentive savings.

3.1.5 Cumulative Persisting Annual Savings

Table 11 presents CPAS and WAML for the 2018 Standard Initiative. The offering-specific and total verified gross savings for the Standard Initiative are summarized, and CPAS in each year of the 2018-2021 Plan are presented.⁷ The WAML for the Initiative is 12.5 years.

Table 11. 2018 Standard Initiative CPAS and WAML

Offering	Measure Life	First-Year Verified Gross Savings (MWh)	NTGR	CPAS - Verified Net Savings (MWh)							Lifetime Savings (MWh)
				2018	2019	2020	2021	...	2030	...	
Lighting	11.4	90,691	0.780	70,572	67,428	67,428	67,371	...	11,178	...	739,075
HVAC	9.7	2,546	0.557	1,418	1,418	1,357	1,357	...	1,102	...	18,208
VSDs	10.0	22,027	0.833	18,349	18,349	18,349	18,349	...	0	...	183,488
Specialty Equipment	11.9	4,443	0.849	3,772	3,772	3,772	3,772	...	75	...	42,896
Leak Survey and Repair	5.0	1,305	0.702	916	916	916	916	...	0	...	4,580
Green Nozzles	5.0	18	0.920	17	17	17	17	...	0	...	84
Instant Incentives ^a	14.9	40,506	0.772	31,280	29,308	29,308	28,964	...	24,864	...	408,850
Online Store	9.0	1,013	0.831	842	838	838	584	...	102	...	6,115
SBDI	13.5	66,895	0.962	64,353	64,236	64,236	64,114	...	23,067	...	753,904
2018 CPAS		229,444	0.835	191,518	186,282	186,221	185,444	...	60,387	...	2,157,200
Expired 2018 CPAS				0	5,236	5,297	6,074	...	131,131	...	
WAML	12.5										

^a Instant Incentives includes carryover savings from PY8, PY9, and the Transition Period.

⁷ For further detail, including achieved CPAS in years not presented in this table and CPAS by measure, please see the summary CPAS spreadsheet attached to this report.

3.1.6 Conclusions and Recommendations

Based on the results of this evaluation, the evaluation team offers the following key findings and recommendations for the Standard Initiative moving forward:

- **Key Finding #1:** Our impact evaluation found electric and gas gross realization rates close to 100% for virtually all Initiative components, indicating that the Initiative 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:** We recommend incorporating all Illinois Statewide Technical Reference Manual Version 7.0 (IL-TRM V7.0) updates and applying the correct measure assumptions consistently across all measures to ensure AIC continues achieving high realization rates.
- **Key Finding #2:** Initiative tracking data omits key lighting measure parameters necessary for defining EISA backstop baseline variables, including the number of lamps per fixture, the wattage per lamp, and the lumens per lamp for the base and efficient units.
 - **Recommendation:** The IL-TRM V7.0 updates lighting definitions to incorporate specialty lamps with general service lamps, reflecting the originally expected broadening of the Energy Independence and Security Act (EISA) backstop standard. Until the U.S. DOE publishes a final rule on the definition of general service lamps, the IL-TRM V7.0 definitions stay in place where specialty lamps will fall under the definition of general service lamps and require a baseline shift in 2024. Therefore, lamp-level detail is needed to identify the appropriate baseline wattage for measures. Currently, initiative tracking data includes fields for quantity and wattage of existing and proposed fixtures, rather than for lamps. The evaluation team cannot discern from the initiative tracking data the number of individual lamps, nor their wattage or lumens for the base and efficient units. This level of detail is necessary to assign EISA backstop wattages. Without this information being available, the evaluation team chose the most conservative baseline parameters. The team therefore recommends capturing available lamp-level detailed information in the initiative tracking data.
- **Key Finding #3:** The IL-TRM V6.0 includes a robust list of building parameters for calculating energy savings across a spectrum of commercial building types. In some cases, specifically office, hospital, and multifamily buildings, this requires specificity when characterizing building size and HVAC systems. In instances where a generalized building type was used for office, hospital, or multifamily common areas, the evaluation team observed that the implementer deployed a mix of methods for assigning algorithm input variables from the IL-TRM V6.0. These methods included: (1) assembling the most conservative values from across the building category in creating a generalized building and (2) assigning a specific building type from the broader category while lacking documentation in initiative tracking data. This mixture of methods resulted in discrepancies between ex ante and verified savings. The SBDI offering, operating under a new implementation team, exhibited a larger portion of projects using generalized building types than the Standard Core offering.
 - **Recommendation:** The evaluation team recommends collecting the necessary building information to avoid generalizing building types. The algorithm input variables within the IL-TRM v7.0 were derived from modeled data specific to the listed building types in the IL-TRM v7.0.
- **Key Finding #4:** Information on space conditioning, such as if a space is cooled or heated and the type of heating equipment, has an impact on energy savings across multiple offerings, most notably lighting and HVAC measures.

- Recommendation: The evaluation team recommends collecting building heating and cooling conditions, in addition to the type of heating and cooling equipment (e.g., natural gas furnace or heat pump) for all projects.
- Key Finding #5: Initiative tracking data included size ranges, rather than the exact number of pans for combination ovens. However, the IL-TRM V6.0 requires the number of pans to calculate energy savings. Without the number of pans, the evaluation team assumes an average based on the size range provided by the implementation team.
 - Recommendation: The evaluation team recommends inclusion of the number of pans for combination oven measures, similar to commercial steam cooker measures.
- Key Finding #6: Advanced thermostat measures are not included in the IL-TRM V6.0 but are introduced in the IL-TRM V7.0.
 - Recommendation: The evaluation team recommends the adoption of the IL-TRM V7.0 methods, including use of the residential volume for algorithm input parameters, as directed in the commercial and industrial version.
- Key Finding #7: The evaluation found that a load factor of 75% was being used for measures that are part of the VSD offering, while VSD measures that are part of the HVAC offering are using a load factor of 65%. The latter value is in alignment with the IL-TRM V6.0 in cases where the load factor is not known.
 - Recommendation: The evaluation team recommends the collection of on-site measured load factors for all Standard Core VSD measures. When on-site measurements are not possible, we recommend the application of the IL-TRM V6.0 specified load factors for VSD measures (65%) for all Standard Core offerings, unless the 75% load factor can be substantiated through other supporting documentation.

3.2 Custom

3.2.1 Initiative Description

The Custom Initiative offers incentives to AIC Business Program customers for energy efficiency projects involving equipment not covered through the Standard Initiative. The Custom Initiative 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 Initiative.

Business customers often represent the highest potential for energy savings, but these savings frequently result from highly specialized equipment designed for particular industries or types of facilities. The Custom Initiative allows customers to propose additional measures and tailor projects to their facility and equipment needs.

The Custom Initiative is delivered to customers through several different offerings. Two core offerings provide all the savings claimed through the Initiative:

- 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 Initiative, 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.

Summary of Key Implementation Changes in 2018

A number of changes were made to the Custom Initiative during the 2018 program year:

- AIC raised incentive levels for Custom electric projects in 2018. These incentive increases were designed to attract more new customers to Custom offerings to meet higher 2018 savings goals and make up for the loss of customers with loads of 10 MW or greater (10 MW customers) as these larger customers became ineligible to receive electric incentives through the Custom Initiative during the Transition Period. AIC initiative staff reported the increased incentive levels helped to encourage enrollment from customers who may not have otherwise participated. The 2018 Custom Initiative incentive changes are as follows:
 - AIC increased electric incentives from \$0.06/kWh to \$0.08/kWh for non-lighting measures and \$0.07/kWh for lighting measures at the beginning of the 2018 program year. AIC increased incentives again to \$0.10/kWh for electric measures in March 2018 and \$0.12/kWh for electric measures in July 2018.
 - AIC reduced Custom gas incentives from \$1.25/therm to \$1.20/therm in 2018.
 - AIC changed the Custom project eligibility requirements to allow Custom incentives to cover 60% of total project costs in 2018.
 - AIC offered a tiered early completion bonus of 15% for projects completed in the 1st quarter of 2018, 10% for projects completed in the 2nd quarter, and 5% for projects completed in the 3rd quarter.
- AIC initiative staff reported that the exclusion of 10 MW customers from AIC Business Program eligibility had some ongoing impacts on Custom Initiative operations in 2018. AIC initiative staff spent significant time and effort developing strategies to achieve higher savings goals with the absence of 10 MW customers in 2018.
- Transition Period customer eligibility changes, including the introduction of public sector customers and the exclusion of 10 MW customers, motivated AIC initiative staff to identify new target customer segments and project types for AIC Custom offerings in 2018.
 - AIC initiative staff identified several new target customer segments including wastewater treatment plants, healthcare facilities, and schools. Target project types included data centers, boiler plants, and Combined Heat and Power (CHP) projects.
 - AIC initiative staff also identified wastewater treatment plants as the public sector customer segment with the greatest savings potential. The Initiative provided higher incentive rates (\$0.21/kWh) and additional technical support to this customer segment to encourage participation.

3.2.2 Participation Summary

Table 12 presents a summary of the Custom Initiative projects completed and unique customers by each Custom Initiative offering.

Table 12. 2018 Custom Initiative Participation Summary

Offering	Total Projects/ Grants/Participants	Unique Customers ^a	Ex Ante Gross Savings		
			MWh	MW	Therms
Custom Incentive	138	92	28,380	3.1	1,482,699
New Construction Lighting	61	51	6,174	0.9	—
Staffing Grant	28	28	—	—	—
Metering & Monitoring	16	13	—	—	—
Strategic Energy Management	6	6	—	—	—
Feasibility Study	3	3	—	—	—
Total	252	174	34,555	4.0	1,482,699

^a Column does not sum to total because some unique customers participated in more than one Custom offering

Public sector customers became eligible for AIC Initiatives during the Transition Period. Table 13 shows that public sector customers contributed significantly to the Custom Initiative overall project mix; public sector customers were responsible for 18% of the total Initiative projects completed in 2018.

Table 13. 2018 Custom Initiative Participation Summary by Sector

Offering	Total Projects/ Grants / Participants	
	Public Sector	Private Sector
Custom Incentive	26	112
New Construction Lighting	7	54
Staffing Grant	7	21
Metering & Monitoring	1	15
Strategic Energy Management	3	3
Feasibility Study	1	2
Total	45	207

Analysis of initiative tracking data shows the highest percentage of Custom projects (30%) were completed by businesses from the manufacturing and industrial sector (Table 14). Education customers represent a growing customer segment as public schools became eligible for the Custom Initiative during the Transition Period and education customers completed the second largest share of projects in 2018. Projects in the retail, warehouse, and grocery sector also represented large shares of participants.

Table 14. 2018 Custom Initiative Projects by Organization Type

Organization Type	Share of Total Projects/Grants/Participants (n=252)
Manufacturing/Industrial	30%
Education	16%
Grocery	15%
Medical	12%
Retail	10%

Organization Type	Share of Total Projects/Grants/Participants (n=252)
Warehouse	4%
Office	2%
Lodging	1%
Municipality	<1%
Other/Unknown	10%

3.2.3 Initiative Annual Savings Summary

Table 15 presents Custom Initiative annual savings achieved in 2018.

Table 15. 2018 Custom Initiative Annual Savings

	Energy Savings (MWh)	Demand Savings (MW)	Gas Savings (Therms)
Ex Ante Gross Savings	34,555	4.06	1,482,699
Gross Realization Rate	83%	79%	127%
Verified Gross Savings	28,816	3.19	1,880,202
NTGR ^a	0.825	0.825	0.939
Verified Net Savings	23,775	2.63	1,765,510

^a Effective NTGRs may not align with SAG-approved NTGRs for the Initiative due to the inclusion of adjustments from Staffing Grants.

3.2.4 Initiative Savings Detail

For the Custom Initiative, we verified initiative participation and gross impacts through desk reviews and on-site M&V of a sample of projects, as described in Appendix A. Site-specific M&V was conducted in three distinct waves with samples independently developed for each wave by fuel type (electric or gas). We used a combined ratio estimator to develop a realization rate for each wave by savings type (presented later in this chapter).⁸

Site-Specific Results

Table 16 presents the results of the gross savings analysis for the 56 Custom Initiative projects we reviewed in 2018. Realization rates for individual projects ranged from 0% to 168% for electric energy and 0% to 238% for gas. Additional detail for 15 project reviews are provided in Appendix D to this report.

Table 16. 2018 Custom Initiative Gross Impact Results for Sampled Projects

Project ID	Sample			Ex Ante Gross Savings			Gross Realization Rate			Verified Gross Savings		
	Wave	Fuel	Stratum	MWh	MW	Therms	MWh	MW	Therms	MWh	MW	Therms
900883	1	Electric	Certainty	1,060	0.121	—	100%	100%	—	1,060	0.121	—
900966	1	Electric	3	374	-0.052	—	17%	163%	—	63	-0.085	—
901641	1	Electric	2	176	0.005	—	99%	100%	—	173	0.005	—
1000030	1	Gas	3	—	—	182,098	—	—	100%	—	—	182,098
1000034	1	Electric	3	721	0.087	—	100%	100%	—	721	0.087	—
1000038	1	Electric	2	133	0.012	—	63%	100%	—	84	0.012	—
1000055	1	Electric	2	125	0.023	—	168%	89%	—	210	0.020	—
1000063	3	Electric	1	64	0.012	—	120%	70%	—	77	0.008	—
1000162	1	Electric	2	257	0.029	—	98%	98%	—	253	0.029	—
1000191	3	Electric	3	1,174	0.134	—	78%	78%	—	920	0.105	—
1000195	1	Electric	3	415	0.051	—	95%	93%	—	393	0.048	—
1000396	1	Electric	3	599	0.087	—	73%	72%	—	436	0.062	—
1000415	2	Electric	3	389	0.024	—	100%	100%	—	389	0.024	—
1000459	1	Electric	1	8	0.002	—	85%	83%	—	6	0.002	—
1000681	1	Electric	2	102	0.012	—	4%	4%	—	4	0.001	—
1800007	2	Gas	1	—	—	12,415	—	—	0%	—	—	0
1800065	1	Electric	3	367	0.036	—	51%	85%	—	186	0.031	—

⁸ Cochran, William G. Sampling Techniques. 1977. New York: John Wiley & Sons.

Project ID	Sample			Ex Ante Gross Savings			Gross Realization Rate			Verified Gross Savings		
	Wave	Fuel	Stratum	MWh	MW	Therms	MWh	MW	Therms	MWh	MW	Therms
1800067	2	Electric	2	302	0.068	—	15%	155%	—	45	0.106	—
1800069	3	Electric	2	86	0.010	—	163%	100%	—	139	0.010	—
1800072	1	Electric	3	738	0.084	—	28%	28%	—	206	0.024	—
1800074	1	Gas	2	—	—	8,686	—	—	198%	—	—	17,209
1800079	1	Gas	3	—	—	23,702	—	—	0%	—	—	0
1800084	3	Gas	3	—	—	84,367	—	—	21%	—	—	17,405
1800089	1	Electric	3	447	0.097	—	143%	100%	—	640	0.097	—
1800092	2	Gas	1	—	—	6,134	—	—	33%	—	—	2,047
1800094	2	Electric	1	80	0.001	—	97%	1272%	—	77	0.009	—
1800103	1	Electric	3	673	0.084	—	93%	102%	—	627	0.086	—
1800108	1	Gas	3	—	—	126,302	—	—	100%	—	—	126,302
1800117	1	Gas	3	—	—	223,046	—	—	97%	—	—	215,987
1800127	3	Electric	3	603	0.069	—	100%	100%	—	603	0.069	—
1800136	2	Gas	Certainty	—	—	70,262	—	—	89%	—	—	62,405
1800140	1	Gas	3	—	—	18,901	—	—	100%	—	—	18,880
1800156	2	Electric	3	935	0.107	—	70%	91%	—	652	0.098	—
1800157	3	Electric	2	219	0.025	—	105%	105%	—	229	0.026	—
1800160	1	Electric	3	348	0.110	—	52%	42%	—	181	0.046	—
1800162	1	Electric	1	35	0.006	—	40%	93%	—	14	0.006	—
1800184	3	Gas	3	—	—	418,158	—	—	238%	—	—	993,317
1800241	1	Electric	1	22	0.008	—	149%	78%	—	33	0.006	—
1800403	1	Gas	1	—	—	1,160	—	—	31%	—	—	355
1800467	2	Electric	2	319	0.005	—	50%	100%	—	161	0.005	—
1800570	3	Gas	3	—	—	29,497	—	—	66%	—	—	19,483
1800607	3	Electric	2	231	0.029	—	123%	88%	—	282	0.026	—
1800804	2	Electric	1	43	0.005	—	105%	105%	—	45	0.005	—
1800874	2	Electric	3	593	0.068	—	70%	64%	—	417	0.043	—
1800966	3	Electric	3	784	0.090	—	58%	59%	—	458	0.053	—
1801007	2	Electric	1	21	0.000	—	100%	N/A	—	21	0.000	—
1801034	2	Gas	1	—	—	9,102	—	—	158%	—	—	14,350
1801045	3	Electric	3	398	0.047	—	30%	47%	—	121	0.022	—

Project ID	Sample			Ex Ante Gross Savings			Gross Realization Rate			Verified Gross Savings		
	Wave	Fuel	Stratum	MWh	MW	Therms	MWh	MW	Therms	MWh	MW	Therms
1801108	3	Electric	1	14	0.000	—	100%	N/A	—	14	0.000	—
1801149	3	Gas	2	—	—	13,539	—	—	94%	—	—	12,764
1801253	3	Electric	3	561	0.064	—	70%	91%	—	391	0.059	—
1801368	3	Electric	3	785	0.015	—	100%	99%	—	785	0.015	—
1801458	3	Gas	3	—	—	46,010	—	—	33%	—	—	15,138
1801596	3	Electric	3	1,340	0.268	—	0%	0%	—	0	0.000	—
1802118	3	Gas	1	—	—	11,065	—	—	100%	—	—	11,065
1900079	3	Electric	3	781	0.089	—	100%	100%	—	781	0.089	—

We present some general comments on variations in savings that we observed below.

- **Lighting Projects.** Lighting-centric projects exhibited a very wide range of observed realization rates.
 - In many cases, we adjusted hours of operation for lighting projects (often significantly) based on what we observed on-site or after conversation with site contacts. These adjustments caused both increases and decreases in realization rates.
 - We also observed that the implementer frequently estimates a baseline for lighting projects including a control factor for occupancy sensors where they are not required by code. In these cases, savings were often significantly underestimated.
- **Compressed Air:** We note that ex ante savings calculations for compressed air-focused Custom projects frequently make assumptions that may not be true.
 - In some cases, air flow is not normalized. If post-case air flow is less than pre-case air flow, savings can be overestimated.
 - In some projects, the post-case compressor loading was assumed to be ideal. If the system does not have a sequencer the loading will not be ideal. If the system does have a sequence, it must be tuned so that compressors are loaded appropriately.
- **EMS/HVAC Controls:**
 - Some EMS projects achieved poor results because our evaluation found that customers were not able to implement the proposed scheduling and setbacks as planned.
 - Regression analysis demonstrated that other EMS projects exhibited reductions in energy usage that were significantly less than ex ante claims. The implementer's ex ante savings claims for these projects appeared optimistic in a number of cases; some projects claimed nearly half of estimated baseline use in savings.
- **Pumps, Fans, Motors:**
 - In a number of cases, these types of projects had insufficient data provided to correctly estimate load profiles or appeared to make optimistic assumptions about motor loads. Actual conditions showed in a number of cases that VSDs were not actually being used to decrease motor load.

Overall Results

We used a combined ratio estimation technique⁹ to estimate gross realization rates for each wave by fuel type.

Table 17. 2018 Custom Initiative Realization Rates by Wave and Fuel Type

Wave	kWh	kW	Therms
1	79.7%	74.0%	97.4%
2	63.0%	123.2%	78.7%
3	89.9%	70.7%	158.4%

Applying these gross realization rates to the population of projects in each wave produced verified gross savings for the Initiative.

Table 18. 2018 Custom Initiative Electric Energy Savings by Wave

Wave	Ex Ante Gross MWh	Gross Realization Rate	Verified Gross MWh	NTGR ^a	Verified Net MWh
1	12,653	80.8%	10,229	0.831	8,497
2	4,074	63.0%	2,566	0.822	2,109
3	17,828	89.9%	16,021	0.822	13,169
Total	34,555	83.4%	28,816	0.825	23,775

^a As described further in Appendix A, one Wave 1 Custom electric project received a Staffing Grant and therefore had an adjusted NTGR applied to calculate verified net electric impacts.

Table 19. 2018 Custom Initiative Electric Demand Savings by Wave

Wave	Ex Ante Gross MW	Gross Realization Rate	Verified Gross MW	NTGR ^a	Verified Net MW
1	1.73	75.1%	1.30	0.829	1.08
2	0.46	123.2%	0.57	0.822	0.47
3	1.87	70.7%	1.32	0.822	1.09
Total	4.06	78.5%	3.19	0.825	2.63

^a As described further in Appendix A, one Wave 1 Custom electric project received a Staffing Grant and therefore had an adjusted NTGR applied to calculate verified net electric impacts.

Table 20. 2018 Custom Initiative Gas Savings

Wave	Ex Ante Gross Therms	Gross Realization Rate	Verified Gross Therms	NTGR	Verified Net Therms
1	603,027	97.4%	587,441	0.939	551,607
2	126,332	78.7%	99,372	0.939	93,310
3	753,340	158.4%	1,193,389	0.939	1,120,592
Total	1,482,699	126.8%	1,880,202	0.939	1,765,510

⁹ Cochran, William G. *Sampling Techniques*. 1977. New York: John Wiley & Sons.

3.2.5 Cumulative Persisting Annual Savings

Table 21 presents CPAS and WAML for the 2018 Custom Initiative. The offering-specific and total verified gross savings for the Initiative are summarized, and CPAS in each year of the 2018-2021 Plan are presented.¹⁰ The WAML for the Initiative is 12.1 years.

Table 21. 2018 Custom Initiative CPAS and WAML

Offering	Measure Life	First-Year Verified Gross Savings (MWh)	NTGR	CPAS - Verified Net Savings (MWh)							Lifetime Savings (MWh)
				2018	2019	2020	2021	...	2030	...	
Custom Incentives	12.1	28,816	0.825	23,775	23,775	23,676	23,264	...	12,918	...	288,819
2018 CPAS		28,816	0.825	23,775	23,775	23,676	23,264	...	12,918	...	288,819
Expired 2018 CPAS				0	0	99	511	...	10,857	...	
WAML	12.1										

Unlike other initiatives in this report, CPAS is not presented by enduse or measure in this table. The evaluation team reviewed and adjusted measure lives provided by the implementation team for all sampled projects and calculated an adjustment to measure life based on that review that was then applied to all projects in the population. That adjustment was applied population-wide, rather than on a per enduse basis, and therefore CPAS is presented in only one line for the Custom Initiative.¹¹ Further detail on this adjustment is provided in Appendix A.

¹⁰ For further detail, including achieved CPAS in years not presented in this table, please see the summary CPAS spreadsheet attached to this report.

¹¹ The summary CPAS spreadsheet attached to this report also presents estimates of CPAS at the individual project level for all 197 projects in the 2018 Custom Initiative. However, please note that similar to savings adjustments made for the Custom Initiative and consistent with best evaluation practice, those adjustments are made population-wide rather than on a per-project basis, and therefore individual adjustments to measure life made through evaluation are not applied to specific projects.

3.2.6 Conclusions and Recommendations

Based on the results of this evaluation, the evaluation team offers the following key findings and recommendations for the Custom Initiative moving forward:

- **Key Finding #1:** In a number of cases, documentation to support project savings claims was inadequate and/or evaluation was unable to confirm or measure project conditions, resulting in a number of low project-specific realization rates.

We note that the increased speed of the Illinois evaluation process means that additional time pressure is placed on implementers and participating customers to complete projects rapidly, which may have had an effect on projects.

- **Recommendation:** The evaluation team expects that Custom Initiative project savings claims include a number of key components: 1) a full articulation of the baseline conditions chosen for a project (including reasoning to support why the chosen baseline is appropriate), 2) a clear explanation of what was (or will be) done to improve energy efficiency, and 3) a firm understanding of planned/actual post-implementation operating conditions. In the absence of one or more of these components, Custom Initiative projects are subject to significant evaluation risk.
- **Key Finding #2:** Extremely large Custom Initiative projects are significantly less common in 2018 than in prior years, likely as a result of the 10MW customer exclusion. Mid-sized Custom projects were observed to be significantly more important to initiative success in 2018 than in prior years. It is likely to be increasingly critical to the Initiative that high realization rates are maintained for any remaining large projects.
- **Recommendation:** Continue to pursue and engage smaller Custom projects. Engage the evaluation team as early as possible when large Custom projects are identified to ensure that projects unlikely to yield evaluable savings can be identified and avoided.

3.3 Retro-Commissioning

3.3.1 Initiative Description

The Retro-Commissioning Initiative 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. Retro-commissioning 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 Initiative include:

- Channeling participation into other AIC initiatives to implement cost-effective equipment replacements and retrofits
- AIC offers an additional bonus to customers who complete a Custom project within a year of having completed a retro-commissioning study

- Developing a network of Retro-Commissioning 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 Initiative subsidizes RSP studies and publicizes the benefits of retro-commissioning to foster a market for the services, with utility-certified RSPs providing the marketing outreach. AIC incentives pay for 70%–100% of the study cost and implementation incentives are paid at a level of \$0.02/kWh and between \$0.30 - \$0.40/therm depending on offering.

During 2018, the Retro-Commissioning Initiative had five subcomponents:

- **Compressed Air Retro-Commissioning.** The Compressed Air offering provides incentives to defray the cost of a retro-commissioning 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 Retro-Commissioning.** The Industrial Refrigeration offering provides incentives to defray the cost of a retro-commissioning 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 Retro-Commissioning.** 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 energy management system (EMS) settings adjustments to optimize the operation of HVAC systems. Since the passage of FEJA (SB2814), the Large Facilities offering also targets public sector facilities (e.g., schools), as do the other Retro-Commissioning offerings.
- **Grocery Store Retro-Commissioning.** Beginning in PY7, the Retro-Commissioning Initiative began to offer retro-commissioning 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.
- **Retro-Commissioning Lite.** Beginning in 2018, the Retro-Commissioning Initiative began offering an option to smaller facilities that would not qualify for the Large Facilities offering. The most common measures implemented through the Retro-Commissioning Lite offering are optimizations to HVAC and lighting system operations. To date, this offering has not had any activity.

Large Facilities retro-commissioning projects go through a screening phase that examines the feasibility of retro-commissioning at the facility. Sites with good savings potential are eligible to apply to the Initiative after AIC reviews the project. RSPs commit resources to this deliverable, which may or may not result in a viable retro-commissioning project. To defray the financial risk to the RSP and to encourage the RSPs to market the Initiative more aggressively, AIC pays a screening stipend of 5 to 10% of the retro-commissioning 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.

Retro-Commissioning incentives vary by type of project, as shown in Table 22 below.

Table 22. Summary of Retro-Commissioning Initiative Incentives

Offering	Survey Incentive	Customer Implementation Incentive	Incentive Requirements
Compressed Air	80% of survey cost	▪ 2¢/kWh saved	▪ Payback period of 0–1 year ▪ Measure must be complete before incentive is paid
Industrial Refrigeration	70% of survey cost	▪ 2¢/kWh saved	▪ Payback period of 0–1 year ▪ Measure must be complete before incentive is paid
Large Facilities	70% of survey cost	▪ 2¢/kWh ▪ 30¢/therm	▪ Payback period of 0–1 year ▪ Measure must be complete before incentive is paid ▪ Measures do not need to be complete for stipend to be paid
	5 - 10% of survey cost as “stipend” to RSP for complex projects		
Grocery Store	90% of survey cost	▪ 2¢/kWh ▪ 40¢/therm	▪ Payback period of 0–1 year ▪ Measure must be complete before incentive is paid
Lite	100% of survey cost, capped at \$15,000	▪ 2¢/kWh ▪ 30¢/therm	▪ Payback period of 0–1 year ▪ Measure must be complete before incentive is paid

Summary of Key Implementation Changes in 2018

In approximately June 2018, the Initiative introduced a new Retro-Commissioning Lite offering. This offering is similar to the Large Facilities offering, but it is aimed at smaller facilities between 20,000 to 100,000. The new offering is designed for simplicity to encourage additional participation among smaller facilities that have historically not participated in the Retro-Commissioning Initiative. There was no participation in this new offering in 2018.

AIC also adjusted incentives in the Grocery Store Retro-Commissioning offering to encourage participation in 2018. The Initiative raised survey incentives to 90% of the survey cost to encourage participation and marketed the offering to grocery store chains in AIC territory. This offering did not have any participation in 2018.

3.3.2 Participation Summary

Table 23 summarizes Retro-Commissioning Initiative participation during 2018. During 2018, projects were completed in the Compressed Air, Large Facilities, and Industrial Refrigeration offerings. No projects were completed in the Grocery Store or Retro-Commissioning Lite offerings. One Large Facility project was completed in a public sector facility, all other projects were completed in private sector facilities.

Table 23. 2018 Retro-Commissioning Participation Summary

Offering	Projects ^a	Ex Ante Gross Savings			
		MWh	%	Therms	%
Compressed Air	9	4,112	74%	0	—
Industrial Refrigeration	1	328	5%	0	—
Large Facilities	2	1,552	22%	190,552	100%
Grocery	0	0	—	0	—
Lite	0	0	—	0	—
Total	12	5,992	—	190,552	—

^a The project count reflects all projects with savings in 2018, which does not include 6 projects that only received a stipend.

Table 24 shows historic Retro-Commissioning participation for PY1 through 2018.

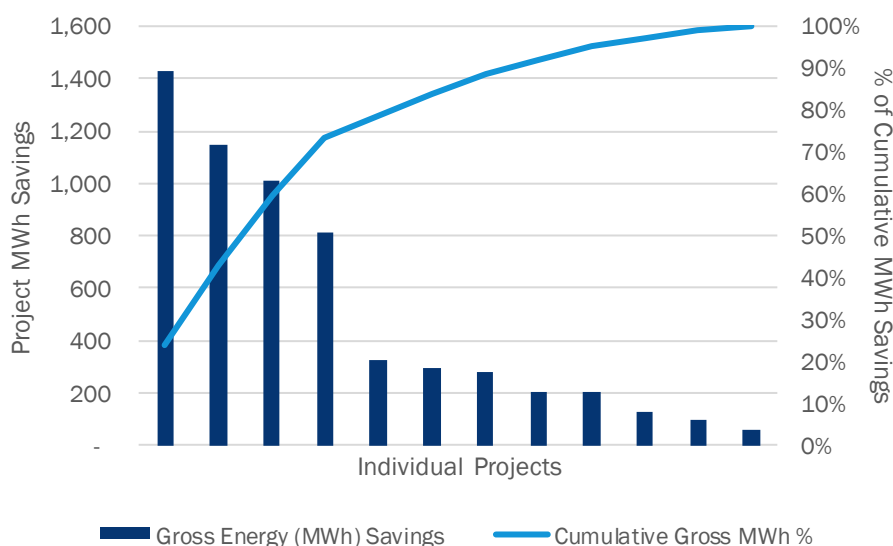
Table 24. Summary of Past Program Participation

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
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
2018	12	5,992	190,552

^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.

Project data show that in 2018, as in past years, initiative savings are heavily reliant on a few large projects. Figure 1 shows that four projects make up approximately 75% of initiative electric savings. Gas savings are dependent on only two Large Facilities projects in 2018.

Figure 1. Annual Project and Cumulative Initiative Ex Ante Electric Savings



Participation levels and ex ante gross savings were lower in 2018 than in any full program year since PY1.¹² The evaluation team noted that in addition to the 12 completed projects in 2018, 6 stipends were paid, all in the Large Facility Retro-Commissioning offering. None of these stipends led to a completed project during 2018.

RSP participation during 2018 was limited. Four allies engaged with the Initiative; one ally completed the two Large Facilities offering projects and all six stipends, two allies completed the nine Compressed Air projects, and one ally completed the Industrial Refrigeration project.

Table 25. Summary of 2018 RSP Participation

RSP	Completed Compressed Air Projects	Completed Industrial Refrigeration Projects	Completed Large Facilities Projects	Completed Stipend-Only Projects
RSP-A	0	1	0	0
RSP-B	2	0	0	0
RSP-C	7	0	1	0
RSP-D	0	0	1	6
Total	9	1	2	6

¹² The Transition Period was a shortened implementation period lasting only 7 months and is not comparable to other program years.

3.3.3 Initiative Annual Savings Summary

In 2018 the Retro-Commissioning Initiative achieved verified net savings of 5,864 MWh, 0.338 MW, and 179,795 therms. Table 26 presents Retro-Commissioning Initiative annual savings achieved in 2018.

Table 26. 2018 Retro-Commissioning Initiative Annual Savings

	Energy Savings (MWh)	Demand Savings (MW)	Gas Savings (Therms)
Ex Ante Gross Savings	5,992	0.606	190,552
Gross Realization Rate	107%	61%	103%
Verified Gross Savings	6,416	0.370	196,712
NTGR	0.914	0.914	0.914
Verified Net Savings	5,864	0.338	179,795

3.3.4 Initiative Savings Detail

The Retro-Commissioning Initiative completed 12 projects through three of the five available Retro-Commissioning offerings. Table 27 presents each project, outlines the review type we completed, and presents ex ante and verified savings.

Table 27. 2018 Retro-Commissioning Initiative Project Results

Project ID	Project Type	Review Type	Ex Ante Gross Savings			Gross Realization Rate			Verified Gross Savings		
			MWh	MW	Therms	MWh	MW	Therms	MWh	MW	Therms
901581	Compressed Air	Desk review only	203	0.047	0	39%	49%	N/A	80	0.023	0
1000097		Desk review only	279	0.032	0	100%	100%	N/A	279	0.032	0
1800093		Site visit	203	0.024	0	100%	100%	N/A	203	0.024	0
1800149		Site visit	812	0.093	0	92%	64%	N/A	750	0.059	0
1800461		Desk review only	297	0.048	0	100%	0%	N/A	297	0.000	0
1800567		Desk review only	100	0.012	0	88%	88%	N/A	88	0.010	0
1800635		Site visit	1,148	0.184	0	100%	71%	N/A	1,148	0.131	0
1800903		Site visit	58	0.009	0	56%	92%	N/A	33	0.008	0
1801106		Desk review only	1,012	0.116	0	100%	42%	N/A	1,012	0.049	0
1800073	Industrial Refrigeration	Desk review only	328	0.035	0	100%	100%	N/A	328	0.035	0
1800058	Large Facility	Site visit	1,427	0.008	148,065	100%	0%	99%	1,424	0.000	145,982
1000341		Site visit	126	0.001	42,487	616%	0%	119%	774	0.000	50,730
Total			5,992	0.606	190,552	107%	61%	103%	6,416	0.370	196,712

While the Initiative generally had realization rates close to 100%, we observed three cases where significant variance in realization rates was noted:

- **Compressed Air:** Two compressed air projects had MWh realization rates significantly below 100% due to incorrect hours of use assumptions for the systems.
- **Large Facilities:** One large facility project had an extremely high MWh realization rate. This project was a legacy DCEO project and documentation was poor. The implementer's savings claim appeared to be conservative. Our on-site visit confirmed that scheduling changes had been made that aligned closely with the originally planned retro-commissioning project (ex ante savings of approximately 900 MWh), but we recalculated savings to align with hours of operation observed as part of our onsite.

3.3.5 Cumulative Persisting Annual Savings

Table 28 presents CPAS and WAML for the 2018 Retro-Commissioning Initiative. The measure-specific and total verified gross savings for the Retro-Commissioning Initiative are summarized, and CPAS in each year of the 2018-2021 Plan are presented.¹³ The WAML for the Initiative is 5.1 years.

Table 28. 2018 Retro-Commissioning Initiative CPAS and WAML

Offering	Measure Life	First-Year Verified Gross Savings (MWh)	NTGR	CPAS - Verified Net Savings (MWh)							Lifetime Savings (MWh)
				2018	2019	2020	2021	...	2030	...	
Compressed Air Retro-Commissioning	3.5	3,890	0.914	3,555	3,555	2,709	1,766	...	0	...	12,450
Industrial Refrigeration Retro-Commissioning	7.5	328	0.914	300	300	300	300	...	0	...	2,247
Large Facilities Retro-Commissioning	7.5	2,198	0.914	2,009	2,009	2,009	2,009	...	0	...	15,068
2018 CPAS		6,416	0.914	5,864	5,864	5,018	4,075	...	0	...	29,765
Expired 2018 CPAS				0	0	846	1,789	...	5,864	...	
WAML	5.1										

The evaluation team reviewed measure lives provided by the implementation team for 2018 Retro-Commissioning projects and made adjustments as necessary.¹⁴

¹³ For further detail, including achieved CPAS in years not presented in this table, please see the summary CPAS spreadsheet attached to this report.

¹⁴ Unlike the Custom Initiative, for which only a sample of projects had measure lives reviewed, we reviewed measure lives for all 12 Retro-Commissioning Initiative projects and are therefore able to provide CPAS on an enduse level.

3.3.6 Conclusions and Recommendations

Based on the results of this evaluation, the evaluation team offers the following key findings and recommendations for the Retro-Commissioning Initiative moving forward:

- **Key Finding #1:** The Retro-Commissioning Initiative continues to maintain relatively high realization rates, indicating that implementation methodology for estimation of savings is generally strong. Discrepancies observed in 2018 were generally fairly minor, with the exception of one legacy project that did not go through normal Initiative processes. Some site-specific parameters (e.g. hours of use) were observed to differ from reported parameters
- **Recommendation:** Verifying customer-reported parameters whenever possible may assist in minimizing the degree to which site-specific parameters are found to vary from reported parameters.
- **Key Finding #2:** The Initiative's participation was limited in 2018, likely reflecting the relatively small population of potential retro-commissioning projects in AIC service territory. Participation decreases from prior years likely result from the exclusion of 10 MW customers from the Initiative beginning in 2018. Maintaining participation in the Initiative is likely to be challenging during the 2018-2021 cycle.
- **Recommendation:** Continuing to pursue new channels for the Initiative (e.g. Grocery and RCx Lite) will be important to ensure that the Initiative continues to be a significant contributor to the Business Program's performance.

3.4 Streetlighting

3.4.1 Initiative Description

Made available to AIC customers for the first time in 2018, the Streetlighting Initiative incentivizes municipal customers to upgrade their streetlighting fixtures to LED technology. High-intensity discharge (HID) lighting is still the standard technology used for streetlighting in the United States. The Initiative targets existing streetlighting and other outdoor lighting for upgrades from HID to LED technology.

The Initiative targets both municipal customers who own their streetlighting fixtures and municipal customers with AIC-owned streetlighting fixtures. In both cases, the Initiative provides incentives for customers to upgrade their lighting. AIC currently replaces streetlights it owns with LED technology upon burnout at no cost to customers. Early replacement of these streetlights is available to customers through the Initiative for a per-fixture fee. The Initiative incentivizes customers to request early replacement of these fixtures and provides an incentive to decrease the per-fixture cost to customers.

3.4.2 Participation Summary

Table 29 presents Streetlighting Initiative participation during 2018.

Table 29. 2018 Streetlighting Initiative Participation Summary

Participation	Municipality-Owned	Utility-Owned	Total
Unique Participants	10	1	11
Project Count	18	1	19
Measure Count	634	1,072	1,706

The Streetlighting Initiative had low participation in the 2018 program year and generated only 1,635 MWh in electric energy savings (28% of its internal target savings of 5,811 MWh). Initiative staff attribute low participation to the tariff that requires AIC to replace HID streetlights with LEDs on burnout. This tariff and knowledge that fixtures will eventually be replaced without municipal investment creates a high barrier to Initiative participation.

3.4.3 Initiative Annual Savings Summary

Verified gross electric energy savings amount to 1,635 MWh, achieving a gross realization rate of 100%. The initiative does not achieve electric demand or gas savings. Table 30 presents Streetlighting Initiative annual savings achieved in 2018.

Table 30. 2018 Streetlighting Initiative Annual Savings

	Energy Savings (MWh)	Demand Savings (MW)	Gas Savings (Therms)
Ex Ante Gross Savings	1,638	0	0
Gross Realization Rate	100%	N/A	N/A
Verified Gross Savings	1,635	N/A	N/A
NTGR	1.00	N/A	N/A
Verified Net Savings	1,635	N/A	N/A

The driver of minor differences between ex ante gross savings and verified gross savings is the difference in baseline fixture wattages, explained in detail in Section 3.4.4 below.

3.4.4 Initiative Savings Detail

The Streetlighting Initiative distributed LED streetlighting measures in three categories shown in Table 3. Measures were categorized according to who owns the lighting (the municipality or the utility) and according to the ENERGY STAR and DesignLights Consortium (DLC) requirements. The majority of 2018 savings was achieved by one utility-owned streetlighting project.

Table 31. 2018 Streetlighting Electric Energy Savings by Measure

Measure Category	Ex Ante Gross Savings (MWh)	Gross Realization Rate	Verified Gross Savings (MWh)	NTGR	Verified Net Savings (MWh)
Municipality-Owned: ENERGY STAR or DLC Standard Tier	472	100%	471	1.00	471
Municipality-Owned: DLC Premium Tier	154	100%	154	1.00	154
Utility-Owned Streetlighting	1,012	100%	1,010	1.00	1,010
Total	1,638	100%	1,635	1.00	1,635

The primary driver behind the minor difference observed between ex ante gross savings and verified gross savings is due to adjusting the baseline fixture wattages based on details that the evaluation team found in the project files. In a few cases, the evaluation team found that the baseline fixture wattage in the tracking database was not supported by the project application. Therefore, the evaluation team deferred to the IL-TRM V6.0 for those fixtures (e.g., a 250-watt metal halide or high-pressure sodium fixture is 295 watts).

The secondary driver behind the slightly lower verified savings is due to adjusting the wattage of the efficient fixture, which affected two of the 38 measures incentivized in 2018. In one case, the efficient fixture wattage was decreased by one watt, and in the second case, the efficient fixture wattage was increased by two watts. These adjustments were made based on verifying different wattages in the invoices and specification sheets included in the project files. In one case, the wattage in the application and tracking database aligned but were different than the invoice and specification sheet. In the other case, the wattage in the application and invoice aligned but the wattage in the tracking database was different.

3.4.5 Cumulative Persisting Annual Savings

Table 32 presents CPAS and WAML for the 2018 Streetlighting Initiative. The measure-specific and total verified gross savings for the Streetlighting Initiative are summarized, and CPAS in each year of the 2018-2021 Plan as well as 2030 are presented.¹⁵ The WAML for the Initiative is 12 years.

Table 32. 2018 Streetlighting Initiative CPAS and WAML

Offering	Measure Life ^a	First-Year Verified Gross Savings (MWh)	CPAS - Verified Net Savings (MWh)							Lifetime Savings (MWh)
			2018	2019	2020	2021	...	2030	...	
Municipality-Owned: ENERGY STAR or DLC Standard Tier	12.0	471	471	471	471	471	...	0	...	4,016
Municipality-Owned: DLC Premium Tier	12.0	154	154	154	154	154	...	0	...	1,540
Utility-Owned Streetlighting	12.0	1,010	1,010	1,010	1,010	1,010	...	0	...	8,597
2018 CPAS		1,635	1,635	1,635	1,635	1,635	...	0	...	14,153
Expired 2018 CPAS			0	0	0	0	...	1,635	...	
WAML	12.0									

^a Measure lives for Streetlighting are sourced from the IL-TRM V7.0.

¹⁵ For further detail, including achieved CPAS in years not presented in this table, please see the summary CPAS spreadsheet attached to this report.

3.4.6 Conclusions and Recommendations

Based on the results of this evaluation, the evaluation team offer the following key findings and recommendations for the Streetlighting Initiative moving forward:

- **Key Finding #1:** The baseline and efficient fixture wattages in the project files were at times different than the tracking database.
 - **Recommendation:** Ensure that the manufacturer and model information in the invoice align with the specification sheets, which align with the wattage in the tracking database and the application.
- **Key Finding #2:** The incentive listed in the application did not align with the tracking database.
 - **Recommendation:** In the project files, provide additional transparency that shows how the measure level incentive was calculated and verify that it aligns with the tracking database.
- **Key Finding #3:** There was an inconsistent amount of documentation for each project. For example, most projects had specification sheets except for Project Number 1802397. In addition, the utility-owned streetlighting project (Project Number 1802535) only had calculation workbooks and no invoices or specification sheets.
 - **Recommendation:** Ensure that all projects have a standard list of documentation (e.g., application, savings calculation workbook, specification sheets, and invoice). For utility-owned streetlighting projects, include savings calculation workbooks, specification sheets, and invoices.

Appendix A. Detailed Impact Analysis Methodology

This appendix presents details of the impact analysis methods used for the 2018 Business Program.

Standard

Verified Gross Impact Methodology

The evaluation team primarily calculated verified gross savings for the Standard Initiative by applying savings algorithms from the commercial and industrial section (Volume 2) of the IL-TRM V6.0. The team leveraged initiative tracking data, including measure characteristics (e.g., lamp wattages, fuel usage efficiencies, and motor horsepower) and building characteristics (e.g., building type, climate zone, and floor area), to inform savings assumptions. When necessary, we used default values and common baseline measure parameters (such as removed lamp wattage or fuel efficiencies) prescribed by the IL-TRM V6.0.

Non-TRM Measures

For pool pumps, advanced thermostats, and leak survey and repair (LSR), Volume 2 of the IL-TRM V6.0 does not provide information that can be used to appropriately calculate gross impacts. For these measures, the evaluation team used different approaches, including use of the residential volume of the IL-TRM V6.0 or use of the IL-TRM V7.0. These approaches are summarized below by measure.

High Efficiency Pool Pumps

Pool pump measures were available through the Specialty Equipment offering. Because the commercial and industrial section of the IL-TRM V6.0 does not include a pool pump measure, the evaluation team utilized the residential section (Volume 3). IL-TRM V6.0 Section 5.7.1 (High Efficiency Pool Pumps) contains deemed values for pump motor and pool characteristics, such as daily operating hours, for two types of motors; 2-speed and variable speed. Initiative tracking data includes the type of pool pump motor, which the evaluation team used to verify ex ante savings.

Advanced Thermostats

In 2018, AIC offered advanced thermostats to non-residential customers through the Online Store. A total of 276 advanced thermostats were purchased in 2018. To determine gross impacts for advanced thermostats in non-residential applications, the evaluation team relied on the IL-TRM V7.0, which includes an advanced thermostat measure for small commercial applications. Following the guidance of the IL-TRM V7.0, both the residential and commercial and industrial volumes were necessary to characterize the advanced thermostat usage and energy savings. The residential volume provides algorithm input variables relating to mechanical equipment characteristics, while the commercial and industrial volume provides definitions of equipment and coincidence factors specific to small commercial buildings. Energy savings calculations followed the IL-TRM V7.0 guidance.

Leak Survey and Repair

The Leak Survey and Repair (LSR) offering targets compressed air system leaks. Because compressed air leak detection and air loss quantification are difficult to generalize, the IL-TRM has not adopted a standardized method for evaluating savings. In response, the evaluation team has employed a common method of using

compressed air system characteristics, including motor horsepower and annual operating hours, in combination with field-collected data, including leak orifice diameter and ultrasonic noise measurement to confirm leakage estimates. The algorithms for calculating energy and demand savings are presented below:

Equation 1. LSR Electric Energy Savings

$$\text{Energy (kWh)} = \text{Hours}_{\text{annual}} \times \left[\sum (\# \text{ of Leaks} \times \text{CFM}_{\text{leak}}) \div \text{CFM}_{\text{HP}} \right] \times 0.746 \text{ kW/HP}$$

Equation 2. LSR Electric Demand Savings

$$\text{Demand (kW)} = \left[\sum (\# \text{ of Leaks} \times \text{CFM}_{\text{leak}}) \div \text{CFM}_{\text{HP}} \right] \times 0.746 \text{ kW/HP}$$

In the above equations, CFM_{HP} represents the cubic feet per minute (CFM) per motor horsepower, assumed to be 4 CFM/HP, and CFM_{leak} represents the air leakage rate (in CFM per leak). Air leakage rates are binned into six size categories under two intervention scenarios, repaired and reported but not repaired, summarized in Table 33. Under repaired intervention scenarios, leaks are assumed fully fixed, while under reported-but-not-repaired scenarios, it is assumed leaks will be repaired at a reduced rate than if repaired by the implementer.

Table 33. CFM Leakage Rates by Size of Leak and Intervention Scenario

Leak Size Category	Leak Orifice Diameter (inches)	Intervention Scenario CFM Reduction (CFM _{leak})	
		Reported	Repaired
Small Leaks	1/64	0.25	0.41
Medium Leaks	1/32	1.00	1.62
Large Leaks	1/16	4.00	6.49
Extra Large Leaks	1/8	15.00	26.00
XXL Leaks	1/4	58.00	104.00
XXXL Leaks	3/8	130.00	234.00

Non-HVAC Variable-Speed Drives

Non-HVAC VSDs are offered through the VSD offering, and cover VSD installations on process fans and pumps. In accordance with a 2010 memo,¹⁶ the evaluation team applies a mix of methods to evaluate verified savings, including use of IL-TRM V6.0 Section 4.4.26 algorithms and assumptions in coordination with the 2010 memo, which provides guidance on capping savings at a percentage of estimated base energy consumption. The following discussion details the evaluation team's methods for evaluating verified savings.

¹⁶ The memo titled "Recommendations for Verifying Savings for non-HVAC VFDs" was submitted in response to program administrator comments regarding the PY2 evaluation methods for non-HVAC VSDs.

The evaluation team adopted IL-TRM V6.0 Section 4.4.26 algorithms for calculating the base energy consumption of processes prior to installation of VSDs. The algorithms for calculating verified energy and demand savings are provided below, with all input variable descriptions and values, if deemed, provided in Table 34:

$$\text{Energy (kWh)} = kWh_{base} \times SL$$

$$kWh_{base} = \left[\left(0.746 \times HP \times \frac{LF}{\eta_{motor}} \right) \times RHRS_{Base} \times \sum_{0\%}^{100\%} (\%FF \times PLR_{Base}) \right]$$

$$\text{Demand (kW)} = \left[\left(0.746 \times HP \times \frac{LF}{\eta_{motor}} \right) \times PLR_{Base,FFpeak} \right] \times SL$$

Energy and demand savings are capped by the savings limit (SL), which is 42% for pump applications and 67% for fan applications. To ensure that savings are capped, the evaluation team compares the verified energy and demand savings against the claimed savings. If the proportion of claimed savings to kWh_{base} is greater than the savings limit, then the savings limit is applied to the kWh_{base}. If the proportion is less than the claimed savings, then the claimed savings are accepted as the verified savings.

Table 34. Deemed Inputs for VSD Calculations

Algorithm Variable	Description	Value	Source
kWh _{base}	Base energy consumption of the existing motor prior to installation of the VSD	Calculated	IL-TRM V6.0
HP	Nominal horsepower of controlled motor	Actual value	Initiative tracking database
Motor LF	Motor load factor	75%	
Σ (%FF * PLR)	Flow Fraction and Part Load Ratio factor; assumes "No Control or Bypass Damper"	1	
η _{motor}	Installed nominal/nameplate motor efficiency, based on horsepower ^a	Calculated	Extracted from IL-TRM V6.0 Table of NEMA Motor Efficiencies
RHRS _{base}	Annual operating hours of base motor	Actual value	Initiative tracking database
SL (pump)	Savings limit for pump applications	42%	
SL (fan)	Savings limit for fan applications	67%	

^a Default motor is a NEMA Premium Efficiency, ODP, 4-pole/1800 RPM fan motor.

Measure Lives and Cumulative Persisting Annual Savings

All measure lives applied for CPAS purposes in this evaluation were sourced from the IL-TRM (either V6.0 where available or V7.0 if unavailable) except for the measure life for Leak Survey and Repair. Leak Survey and Repair uses the implementer's assumption of a five-year measure life. In 2019, the evaluation team expects to examine this measure life assumption more closely in accordance with IL-TRM V7.0 Attachment B,¹⁷ but in the 2018 evaluation the evaluation team had no basis to adjust this measure life assumption.

¹⁷ Illinois Statewide Technical Reference Manual – Attachment B: Effective Useful Life for Custom Measure Guidelines.

Verified Net Impact Methodology

The evaluation team generally applied SAG-approved NTGRs to verified gross savings to calculate verified net savings. SAG-approved NTGRs are presented in Table 35 below.

Table 35. SAG-Approved NTGRs for 2018 Standard Initiative

Measure/Channel	Electric NTGR	Gas NTGR
Lighting	77.8%	77.8% ^a
HVAC	55.7%	49.4%
VSDs	83.3%	N/A
Specialty Equipment	84.9%	67.5%
Leak Survey and Repair	70.2%	N/A
Steam Traps	N/A	60.8%
Green Nozzles	92.0%	89.0%
Laminar Flow Restrictor	84.9%	67.5%
Instant Incentives	78.0%	78.0% ^a
Online Store	83.1%	83.1% ^a

^a The SAG-approved electric NTGRs for lighting measures are also applied to gas heating penalties associated with lighting measures for cost-effectiveness purposes.

In three cases, we adjusted NTGRs for Standard Initiative projects based on Staffing Grant research (see Section 2.3.1 and Appendix C for more detail on Staffing Grants). Table 36 presents NTGR adjustments made to Standard Initiative projects as a result of 2018 Staffing Grant research.

Table 36. 2018 Standard Initiative Staffing Grant NTGR Adjustments

Project Number	Initiative	Project Type	Deemed NTGR	Final NTGR
1801409	Standard	Standard Lighting	0.778	0.975
1802346	Standard	Standard Lighting	0.778	0.817
1800409	Standard	Standard Lighting	0.778	0.875

Custom

Verified Gross Impact Methodology

The evaluation team's gross impact analysis for the Custom Initiative used desk reviews and on-site M&V to determine verified gross impacts. Overall, the evaluation team reviewed a total of 56 Custom projects.

The evaluation team completed desk reviews (and in most cases, on-site M&V to provide increased accuracy) at a sample of 56 (core and NCL) projects to determine gross impact results. Desk reviews were used to compare the inputs provided in the application to the assumptions used in the analysis, verify consistency in savings estimates throughout the project file, and provide insight into the validity of the ex ante energy savings. The team accomplished this through the review of the submitted information and calculations for consistency, accuracy, and correct application of engineering principles.

Sampling Approach

We selected the sample of 2018 projects for evaluation in three waves, drawing each sample from the entire population of completed Custom projects. As part of this process, we selected projects independently by fuel type, by wave, to satisfy random sampling requirements.

We chose the sample of Custom projects using a stratified random sample design targeting 10% relative precision at the 90% level of confidence. For the stratification, we used the Dalenius-Hodges method to determine strata boundaries and the Neyman allocation to determine the optimal allocation of the available projects to the strata. In total, the sample drawn included 39 projects chosen for the electric sample and 17 projects chosen for the gas sample. The 56 reviews we conducted account for 47% of the total ex ante gross electric energy savings and 86% of ex ante gas savings. Table 37 and Table 38 present detail around the sample of electric and gas projects chosen for the 2018 evaluation.

Table 37. Custom Sampling Approach for Projects with Electric Savings

Wave	Sampling Stratum	Savings Range	Population of Projects		Completed Reviews	
			Count	Ex Ante MWh	Count	Ex Ante MWh
1	1	< 75 MWh	38	519	3	64
	2	> 75 MWh & < 305 MWh	20	3,418	5	793
	3	> 305 MWh & < 1,000 MWh	15	7,655	9	4,681
	Certainty	> 1,000	1	1,060	1	1,060
	Subtotal		74	12,653	18	6,598
2	1	< 150 MWh	12	834	3	145
	2	> 150 MWh & < 350 MWh	5	1,322	2	621
	3	> 350 MWh	3	1,918	3	1,918
	Subtotal		20	4,074	8	2,683
3	1	< 75 MWh	40	1,377	2	78
	2	> 75 MWh & < 350 MWh	38	6,048	3	535
	3	> 350 MWh	12	10,403	8	6,426
	Subtotal		90	17,828	13	7,039
	Total		184	34,555	39	16,321

Table 38. Custom Sampling Approach for Projects with Gas Savings

Wave	Sampling Stratum	Savings Range	Population of Projects		Completed Reviews	
			Count	Ex Ante Therms	Count	Ex Ante Therms
1	1	< 2,000 therms	2	3,012	1	1,160
	2	> 2,000 & < 18,000 therms	2	25,966	1	8,686
	3	> 18,000 therms	5	574,049	5	574,049
	Subtotal		9	603,027	7	583,894
2	1	< 70,000 therms	4	56,071	3	27,651
	Certainty	> 70,000 therms	1	70,262	1	70,262
	Subtotal		5	126,332	4	97,912
3	1	< 12,000 therms	12	67,062	1	11,065
	2	> 12,000 & < 29,250 therms	6	108,246	1	13,539
	3	> 29,250 therms	4	578,032	4	578,032
	Subtotal		22	753,340	6	602,636
Total			36	1,482,699	17	1,284,443

To estimate the Initiative's verified savings, the evaluation team used the ratio adjustment method.¹⁸ As described in Equation 3, we calculated the gross realization rate based on the desk reviews (and on-site M&V for the majority of projects) for a stratified random sample of projects. We then used the ratio of the verified gross savings to the ex ante gross savings (the realization rate) to adjust the ex ante gross savings for the population of all 2018 Custom projects with savings (N=197).

Equation 3. Ratio Adjustment Method

$$I_{EP} = \frac{I_{EPS}}{I_{EAS}} * I_{EA} \quad I_{EP} = \frac{I_{EPS}}{I_{EAS}} * I_{EA}$$

where:

I_{EP} = the verified population energy and demand impacts

I_{EA} = the ex ante population energy and demand impacts

I_{EPS} = the verified sample energy and demand impacts

I_{EAS} = the ex ante sample energy and demand impacts

¹⁸ Cochran, William G. *Sampling Techniques*. 1977. New York: John Wiley & Sons.

Precision Calculations

We calculated precision for our gross impact results by pooling the results from all waves of site visits.¹⁹ To calculate relative precision, the team first determined the variance in the sample and then calculated the standard error and confidence interval. Equation 4 through Equation 7 were used.

Equation 4. Stratified Ratio Estimator

$$\text{Stratified Ratio Estimator} = \frac{\sum_{i=1}^n w_i y_i}{\sum_{i=1}^n w_i x_i}$$

Equation 5. Standard Error

$$\text{Standard Error} = \frac{1}{\hat{X}} \sqrt{\sum_{i=1}^n w_i (w_i - 1) e_i^2}$$

Equation 6. Confidence Interval

$$90\% \text{ Confidence Interval} = 1.645 * \text{Standard Error}$$

Equation 7. Relative Precision

$$\text{Relative Precision} = \frac{\text{Confidence Interval}}{\text{Stratified Ratio Estimator}}$$

where:

w = case weights for each stratum h (N_h/n_h)

y = verified savings

x = ex ante savings

$e = y_i - b x_i$

$\hat{X} = \sum w_i x_i$

¹⁹ The error bound of the total savings is estimated by calculating the square root of the sum of the squared error bounds of each wave or group of projects. These calculations are consistent with California Evaluation Framework.

Measure Lives and Cumulative Persisting Annual Savings

In accordance with methods presented and discussed in the IL-TRM V7.0 Attachment B²⁰, the evaluation team reviewed the ex ante measure life assumptions provided by the implementation team for sampled Custom projects in 2018 and revised these assumptions where necessary. We then calculated an adjustment to ex ante measure lives in a manner similar to that of calculating a realization rate and applied that adjustment to all population ex ante measure lives. Table 39 provides a summary of Custom Initiative project measure lives that were adjusted after evaluation. All other ex ante measure lives in our sample were determined to have been appropriately applied.

Table 39. Custom Measure Life Adjustment due to Evaluation

Project Number	Enduse	Measure Life		Rationale for Adjustment
		Ex Ante	Verified	
901641	Lighting	11.45	11.57	Evaluation adjustments were made to project operating hours & affect calculated measure life
1000038	Lighting	5.71	13.86	Evaluation adjustments were made to project operating hours & affect calculated measure life
1000055	Lighting	14.00	5.71	Evaluation adjustments were made to project operating hours & affect calculated measure life
1000063	Lighting	14.00	7.61	Evaluation adjustments were made to project operating hours & affect calculated measure life
1000195	Lighting	5.71	8.28	Evaluation adjustments were made to project operating hours & affect calculated measure life
1000459	Lighting	13.33	15.00	Evaluation adjustments were made to project operating hours & affect calculated measure life
1800067	HVAC Equipment	13.00	20.00	IL-TRM V6.0 Measure 4.4.6 - Electric Chiller
1800069	Lighting	5.71	6.17	Evaluation adjustments were made to project operating hours & affect calculated measure life
1800072	Compressed Air	13.00	15.00	IL-TRM V7.0 Attachment B - Custom Compressed Air - Controls
1800089	Lighting	6.81	6.77	Evaluation adjustments were made to project operating hours & affect calculated measure life
1800127	Compressed Air	10.00	12.50	Average of IL-TRM V6.0 Measure 4.7.1 - VSD Air Compressor & IL-TRM V7.0 Attachment B - Custom Compressed Air - Controls
1800162	Lighting	9.10	13.89	Evaluation adjustments were made to project operating hours & affect calculated measure life
1800241	Lighting	9.29	10.02	Evaluation adjustments were made to project operating hours & affect calculated measure life
1800874	Compressed Air	10.00	12.50	Average of IL-TRM V6.0 Measure 4.7.1 - VSD Air Compressor & IL-TRM V7.0 Attachment B - Custom Compressed Air - Controls
1800966	Compressed Air	13.00	11.67	Average of IL-TRM V6.0 Measure 4.7.1 - VSD Air Compressor, IL-TRM V6.0 Measure 4.7.5 - Efficient Refrigerated Compressed Air Dryer, & IL-TRM V7.0 Attachment B - Custom Compressed Air - Controls

²⁰ Illinois Statewide Technical Reference Manual – Attachment B: Effective Useful Life for Custom Measure Guidelines.

Verified Net Impact Methodology

The evaluation team generally applied SAG-approved NTGRs for the Custom Initiative to verified gross savings to calculate verified net savings. Table 40 presents the SAG-approved NTGR values for the 2018 Custom Initiative.

Table 40. SAG-Approved Custom Initiative NTGRs

Measure	Electric NTGR	Gas NTGR
Core Custom	0.822	0.939
New Construction Lighting	0.822	0.939

In one case, we adjusted the NTGR for a Custom Initiative project based on Staffing Grant research (see Section 2.3.1 and Appendix C for more detail on Staffing Grants). Table 41 presents the NTGR adjustment made to a Custom Initiative project as a result of 2018 Staffing Grant research.

Table 41. 2018 Custom Initiative Staffing Grant NTGR Adjustments

Project Number	Initiative	Project Type	Deemed NTGR	Final NTGR
900883	Custom	Core Custom (Electric Only)	0.822	0.925

Retro-Commissioning

Verified Gross Impact Methodology

The evaluation team examined Initiative impacts to estimate a realization rate of savings between ex ante and verified gross savings in two steps. Given the number of completed projects in 2018 (12), the evaluation team first conducted engineering desk reviews for a census of projects to revise Initiative ex ante savings values.

The engineering desk reviews consisted of a thorough examination of all available project documentation, including project reports, communications, equipment submittals, and calculations, and any other project-specific data that were available to our team. We also spoke to some site contacts to confirm measures and their continued operation and performance.

In addition, the evaluation team went on-site and inspected equipment and measure status for six projects and collected supplemental data, as needed. On-site visits were made to two Large Facility Retro-Commissioning sites, including one educational facility and one medical facility, and four industrial sites for compressed air. The on-site visits represented a sample of electric savings and a census of gas savings achieved by the Initiative in 2018. We selected the samples for electric and gas on-site verification as subsets of Initiative participants. Our sample was developed targeting 90/10 precision around gross savings. Table 42 provides detail on ex ante savings covered by our impact review by review method.

Table 42. Retro-Commissioning Impact Evaluation Savings Covered

Review Type	# of Projects	Ex Ante Gross Savings	
		MWh	Therms
Desk review only	6	2,219	0
Desk review and site visit	6	3,774	190,552
Total	12	5,992	190,552

We conducted a desk review of all savings but completed on-site verification at only a sample of Compressed Air and Industrial Refrigeration Retro-Commissioning sites.²¹ To extrapolate these results to the population, we compared the savings determined for each project through site visits to the savings determined for each project via desk reviews to calculate savings-weighted realization rates (site visit-determined gross savings divided by desk review-determined gross savings) by fuel type. Because no changes were made to gross impacts for these projects as a result of site visits (all changes were made as a result of desk reviews), no extrapolation to the population was conducted.

Measure Lives and Cumulative Persisting Annual Savings

In accordance with methodology presented and discussed in the IL-TRM V7.0 Attachment B,²² the evaluation team reviewed all ex ante measure life assumptions provided by the implementation team for all Retro-Commissioning projects in 2018 and revised these assumptions where necessary. Table 43 provides a summary of Retro-Commissioning Initiative project measure lives that were adjusted after evaluation. All other ex ante measure lives were determined to have been appropriately applied.

Table 43. Retro-Commissioning Measure Life Adjustments after Evaluation

Project Number	Measure Life		Rationale
	Ex Ante	Verified	
1800073	7 years	7.5 years	Project is an industrial refrigeration retro-commissioning project. Ex ante measure life assumption was not sourced. The evaluation team applied the IL-TRM defined measure life for electric retro-commissioning measures of 7.5 years. The evaluation team notes that the IL-TRM defined measure life for electric retro-commissioning was determined from a retro-commissioning study focusing primarily on traditional facility retro-commissioning, and likely is not ideal to apply to industrial refrigeration projects. However, in the absence of any other well-supported value, the evaluation team believes that this value is more appropriate to apply than the TRM's "last resort" EUL of 13 years.
1000341	7 years	7.5 years	Projects are large facility retro-commissioning, primarily including HVAC scheduling and controls changes. Ex ante assumption was not sourced. The evaluation team applied the IL-TRM defined measure life for electric retro-commissioning measures of 7.5 years.
1800058	7 years	7.5 years	

²¹ All Large Facilities Retro-Commissioning projects were chosen for on-sites, and therefore no extrapolation to the population is conducted.

²² Illinois Statewide Technical Reference Manual – Attachment B: Effective Useful Life for Custom Measure Guidelines.

Verified Net Impact Methodology

The evaluation team applied the SAG-approved NTGR by measure type, as summarized below.

Table 44 outlines the SAG-approved NTGR value applied to verified gross savings to calculate verified net savings. The Retro-Commissioning Initiative has a single electric and gas NTGR for all offerings under the initiative.

Table 44. SAG-Approved Retro-Commissioning Initiative NTGRs

Measure	Electric NTGR	Gas NTGR
Retro-Commissioning	0.914	0.914

Streetlighting

Verified Gross Impact Methodology

The evaluation team verified gross impacts for the 2018 Streetlighting Initiative using a desk review. The gross impact analysis did not involve onsite visits or metering. The Streetlighting Initiative had only gross electric energy impacts in 2018; no peak demand or gas impacts were reported or evaluated in 2018. The desk review included the following activities:

- Recalculating the ex ante savings based on the inputs in the tracking database,
- Crosschecking the values in the tracking database against the project files (such as the application, invoice, and specification sheets),
- Comparing the input assumptions against IL-TRM V6.0,
- Making adjustments to inputs based on findings in the desk review, and
- Calculating verified gross savings based on the updated inputs.

Equation 8 below is used to calculate gross electric energy impacts.

Equation 8. Gross Electric Energy Impact Calculation for Streetlighting

$$kWh = (Quantity_{base} * Watts_{base} - Quantity_{EE} * Watts_{EE}) * Hours / 1000$$

Table 45 below provides detail on each input to the equation, including a description of the input, the value, and the source.

Table 45. Streetlighting Gross Electric Energy Inputs and Sources

Input	Description	Value	Source
Quantity _{base}	Number of baseline fixtures	Variable	Project files (application)
Watts _{base}	Wattage of baseline fixture	Variable	Project files (application), IL-TRM V6.0
Quantity _{EE}	Number of efficient fixtures	Variable	Project files (application, invoice)
Watts _{EE}	Wattage of efficient fixture	Variable	Project files (application, invoice, specification sheet)
Hours	Annual operating hours	4,903	IL-TRM V6.0 (Exterior dusk to dawn)
1,000	Conversion from watts to kilowatts	1,000	

Measure Lives and Cumulative Persisting Annual Savings

A measure life of 12 years was chosen for Streetlighting measures.²³

A number of projects completed through the Initiative replaced mercury vapor lamps, rather than the currently accepted baseline of high-pressure sodium lamps. In accordance with guidance presented in the IL-TRM V7.0, the evaluation team assumed a remaining useful life (RUL) of four years for replaced mercury vapor lamps, and calculated savings above the existing condition for the first four years of these replacements, followed by savings above a high-pressure sodium baseline for the remaining eight years. This causes a shift in CPAS for these measures beginning in 2022.

Verified Net Impact Methodology

The evaluation team applied SAG-approved NTGRs to verified gross savings to calculate verified net savings. The SAG-approved NTGR for the 2018 Streetlighting Initiative is 1.00.

²³ No IL-TRM measure specific to Streetlighting exists in the IL-TRM V6.0. This measure life was prospectively sourced from the IL-TRM V7.0 (Measure 4.5.16).

Appendix B. Cost-Effectiveness Inputs

In this appendix, we provide inputs for the cost-effectiveness testing of AIC's Business Program. By agreement with ICC Staff, AIC is not penalized for interactive effects resulting from the installation of efficient prescriptive measures that create an increase in energy usage when considering savings for the purpose of goal attainment. Therefore, we exclude those effects in all savings reported throughout the body of this report. However, these effects must be evaluated and considered as part of cost-effectiveness testing, and are therefore presented in this appendix.

Within the following section, the evaluation team focuses specifically on heating penalties associated with the installation of efficient lighting measures through the Standard Initiative.²⁴ The inclusion of waste heat factors for lighting is based on the concept that heating loads are increased to supplement the reduction in heat that was once provided by the existing, less-efficient lamp type. The team applied the IL-TRM V6.0 (with applicable errata applied) waste heat factors to lamps based on heating fuel types provided in the tracking database to arrive at gross heating penalties.

Standard

We calculated heating penalties associated with efficient lighting installed through the Standard Initiative during 2018. The initiative 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 V6.0 (when heating fuel is unknown).

Table 46 presents total verified gross impacts for the Standard Initiative for cost-effectiveness calculations. These values differ from those included in the main report due to the inclusion of heating penalties for lighting measures. Overall, the application of waste heat factors reduces total gross gas savings by 2,350,119 therms.

Table 46. 2018 Standard Initiative Gross Impacts including Heating Penalties

	MWh	MW	Therms
Total Gross Savings without Heating Penalty	228,481	32.29	5,891,848
Core Standard Heating Penalty	—	—	(746,997)
Instant Incentives Heating Penalty	—	—	(939,007)
Online Store Heating Penalty	—	—	(14,976)
Small Business Direct Install Heating Penalty	—	—	(649,139)
Green Nozzle Heating Penalty	—	—	—
Laminar Flow Restrictor Heating Penalty	—	—	—
Total Gross Savings with Natural Gas Heating Penalty	228,481	32.29	3,541,730

²⁴ Neither the Custom nor the Retro-Commissioning Initiatives include any prescriptive measures. Further, because all measures installed through the Streetlighting Initiative are located in unconditioned space, no heating penalties exist for measures installed through the Initiative.

Appendix C. Staffing Grant NTG Methodology

The evaluation team took the following steps to estimate the Staffing Grant specific-NTGR per participant. We compared this NTGR to the deemed NTGR for all of the projects that participants completed as a result of grants and applied it if it was higher than the deemed value.

1. **Application Review:** The team reviewed project documentation, specifically the Staffing Grant application, to assess the stated need for staff resources in order to complete projects. This review served as background for interviews with participating customers.
2. **Interviews:** Analyst staff conducted participant interviews to estimate NTGR. The NTGR consists of two scores: Program Influence Component 1 and Program Influence Component 2. These components were determined as follows:

Program Influence Component 1: This free-ridership score is based a single survey question (N6) that asks respondents to rate the importance of the Staffing Grants on their ability to implement the energy saving projects completed at their facility.²⁵ To convert this response into the Component 1 score (LI), the team used the following formula:

$$LI = 1 - (N6 \times 0.1)$$

Program Influence Component 2: This free-ridership score is based on two questions: the likelihood that each project would have been completed without the Staffing Grants (N10), and if the project would have been completed at the same time or later (N11).²⁶ The team asked these two questions for each of the projects that the participant implemented as a result of the grant.

The participant responses to N10 were converted into a value between 0 and 1 based on the following formula:

$$QI = N10 \times 0.1$$

In addition, the team assigned free-ridership values between 0 and 1 for responses to N11 using the following formula:

$$IF\ N11 = \text{"Never," } T1 = 0$$

$$IF\ N11 = \text{"Same time," } T1 = 1$$

$$IF\ N11 = \text{"Within 1 year," } T1 = 0.66$$

$$IF\ N11 = \text{"Within 2-3 years," } T1 = 0.33$$

²⁵ Using a scale from 0 to 10 where 0 is "not at all important" and 10 is "extremely important," how important was the staffing grant to your ability to implement the energy saving projects we mentioned earlier at your facility?

²⁶ Question N10: Please tell me how likely you would have been to complete the project if the staffing grant had not been available. Please use a likelihood scale from 0 to 10 where 0 is "not at all likely" and 10 is "extremely likely." Question N11: Please also tell me when the project may have occurred if the staffing grant had not been available. Would you say: never, at roughly the same time, within a year, within two years or within three years?

As outlined above, each sub-component score (Quantity and Timing) can take on a value of 0 to 10, where a lower score means a lower level of free-ridership. The overall Component 2 score for a participant is the average of the QI and TI scores.

$$\text{Component 2} = \text{Average (QI, TI)}$$

Overall Free-Ridership—Combination of Components 1 and 2: To calculate an overall program influence score, the evaluation team averaged Component 1 and Component 2. The resulting free-ridership factor for each participant thus ranges from 0 (no free-ridership) to 1 (100% free-ridership).

$$FR = \text{Average (Component 1, Component 2)}$$

NTGR Score: To develop the NTGR score, the team subtracted the free-ridership score from 1 as shown below:

$$NTGR = 1 - FR$$

Spillover: The team also asked questions to gather information about potential spillover, which would be integrated with the NTGR score as $NTGR = (1 - FR + SO)$. To determine the participant-level spillover factor, the team divided the estimated net savings of the measures installed outside of the program (but influenced by the program) by the gross savings the respondent realized through the program.

$$\text{Spillover} = \frac{\text{Respondent Net Energy Savings from Measures Installed outside the Program}}{\text{Respondent Gross Energy Savings from Measures Installed through the Program}}$$

3. **Consistency Check:** The evaluation team included questions in the survey to identify instances in which the interview findings contradicted the data available in the application and developed protocols to reconcile inconsistent findings, if identified. However, the team found that there were no cases in which interview results contradicted the data in the application.
4. **Final NTGR Determination:** As a final step in this process, the evaluation team compared the NTGR developed through the interview process above with the existing SAG-approved (deemed) NTGRs for the various Business Program initiatives.²⁷ The deemed NTGR values were used as a floor and, if the NTGR developed through the Staffing Grants interview exceeded the deemed value, the team applied the new NTGR to all of the projects completed under the Staffing Grant by that participant in 2018. However, if the newly developed NTGR fell below the deemed value, the team applied the deemed value to each of the participant's Staffing Grant projects. We used the deemed NTGR value as a floor because we are looking to quantify the effect of the Staffing Grant, which provides an incentive above the existing and already researched measure incentives.

²⁷ Per the Illinois NTGR Framework, the team applied SAG-approved NTGRs for 2018 to determine 2018 net impacts.

Appendix D. Custom Initiative Site Visit Reports

This appendix is provided under separate cover.

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