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Impact and Process Evaluation of 2016-2017 (PY9) Ameren Illinois Company Commercial & Industrial Custom Efficiency Program

Final

February 7, 2018

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1. Executive Summary

This report presents results from the evaluation of the ninth program year (PY9) of the Ameren Illinois Company (AIC) Commercial and Industrial (C&I) Custom Program for electric and gas energy efficiency. In PY9 (June 1, 2016–May 31, 2017), AIC expected the Custom Program to account for 49% of the overall portfolio electric savings and 15% of portfolio therm savings.[1] The Custom Program is comprised of four distinct offerings which account for 100% of the program savings: the core Custom offering; the Competitive Large Incentive Project (CLIP) offering; the New Construction Lighting offering; and the Strategic Energy Management (SEM) offering.[2] The Custom Program also provides several special program offerings (Staffing Grants, Feasibility Studies, and the Metering and Monitoring Pilot) to engage customers and discover energy savings opportunities, but the program does not claim direct savings for these offerings.

To support the process evaluation, we interviewed Staffing Grant recipients, CLIP incentive recipients, participants in the SEM offering, and program staff. We also reviewed program implementation and marketing materials. Gross impact evaluation research efforts included desk reviews and on-site visits to verify custom equipment performance. Net impact analysis included application of Illinois Stakeholder Advisory Group (SAG)-approved NTGRs and interviews with recipients of CLIP incentives and Staffing Grants. Below, we present the key findings from the PY9 evaluation.

Program Impacts

Overall, the Custom Program performed well in PY9. As shown in Table 1 below, the program achieved 94,738 MWh in ex post gross electric energy savings and 1,313,061 therms in ex post gross gas savings[3] equating to gross realization rates of 88% for electric energy and 106% for gas energy in PY9.

Table 1 also provides the PY9 Custom Program ex post net impacts. As outlined in the evaluation plan, the team typically estimated net savings by applying Illinois Stakeholder Advisory Group (SAG)-approved net-to-gross ratios (NTGRs) to program ex post gross savings.[4] The Custom Program achieved 70,803 MWh in ex post net electric energy savings, falling just short of its PY9 electric target, while delivering 1,078,717 therms in ex post net gas savings and exceeding the PY9 gas savings target.[5]

[1] Based on the PY9 Implementation Plan.

[2] While AIC processes small-scale new construction projects through the Standard Program, lighting and large-scale heating, ventilation, and air conditioning (HVAC) projects are processed through the Custom Program. New construction lighting projects falling under the New Construction Lighting offering and large-scale HVAC projects in new construction are included in the Custom incentive offering.

[3] Ex post refers to the estimated impacts found by the evaluation team.

[4] Additional detail on our net impact approach is provided in Section 2.2.7.

[5] Note that while AIC sets savings targets for each program year, programs ultimately aim to achieve a single goal for the 3-year Plan 3 period.

Table 1. Custom Program Impact Summary

Savings	Ex Ante Gross	Realization Rate	Ex Post Gross	NTGR[a]	Ex Post Net
Energy Savings (MWh)					
Total MWh	107,139	0.88	94,738	0.75	70,803
Demand Savings (MW)					
Total MW	13.3	0.87	11.6	0.75	8.7
Gas Savings (Therms)					
Total Therms	1,233,635	1.06	1,313,061	0.82	1,078,717

Note: Values may not multiply cleanly due to rounding.
[a] Blended NTGR based on SAG-approved NTGR for all Custom Program projects except those completed through the CLIP offering, for which an offering-specific NTGR was applied retrospectively to projects based on PY9 research.

The program realized somewhat lower MWh and MW savings in PY9 compared to PY8, and somewhat higher therm savings. This is not surprising, since a certain level of year-to-year variation can be expected due to the large, unique projects that are characteristic of a custom C&I program.

Key Findings and Recommendations

Our research found that PY9 was another successful year for the Custom Program, in terms of achieved savings, participant satisfaction, and program implementation. The program is quite mature, and as a result, we primarily focused our recommendations on the program's newer initiatives; in particular, the SEM offering, which produced savings for the first time in PY9. Below we highlight key findings and recommendations from our research.

- **Finding #1:** SEM interviewees most frequently identified the discovery of new energy-saving opportunities as a benefit of participating in the program. A participant suggested further expanding opportunities for learning about new ideas for energy efficiency projects by facilitating interactions between SEM participants so that participants can learn ideas from each other. This recommendation may be especially useful as the SEM participants in PY9 were from the same two industries, which presents opportunities for collaboration and learning.
  - **Recommendation #1:** Consider facilitating communications between AIC commercial customers through the SEM program. Creating partnerships between SEM participants in the same sector or scheduling meetings and facility tours for SEM participants with similar needs could expand the potential for identification of new savings opportunities and ongoing learning.
- **Finding #2:** The SEM program is offered at no cost to customers. During our research with SEM participants, several participants reported that their participation in the SEM program helped demonstrate the benefits of investing in energy efficiency to their upper management, helping to convince their upper management to invest in energy efficient capital projects they otherwise would not have.
  - **Recommendation #2:** Continue using the SEM program as the program of choice to introduce AIC commercial customers to energy efficiency programs. The SEM program is a powerful recruiting tool to leverage in situations where potential participants are apprehensive about participating in energy efficiency programs due to concern about capital costs.

- **Finding #3:** One of the three SEM projects did not have sufficient details to reproduce the ex ante calculations. The other two projects had some details, but detailed calculations were only available for every measure for one project. Additionally, measure descriptions made it difficult to replicate energy savings based on the provided information.
  - **Recommendation #3:** Measure savings should include a supporting calculation and measure description. The calculation would show the mathematical steps taken to develop the savings estimate. The description would provide the background of the key parameters used in the calculations. Often this can be accomplished with a few sentences for each measure.
- **Finding #4:** Production data and other important operational metrics from industrial and manufacturing program participants have generally not been provided for SEM projects. Energy usage at manufacturing facilities is driven significantly by production-related factors. These may include pounds or widgets produced per day, amount of input material processed, or number of trucks loaded for warehouses.
  - **Recommendation #4:** Working with customers to obtain detailed operational metrics would significantly improve the programs ability to track and normalize expected savings. Additional data would also aid the savings validation completed during evaluation. Operational metrics should be at the daily or hourly level of granularity if possible to best integrate with available interval data. These data would allow AIC to establish detailed savings validation and assist in evaluation. Finally, meaningful operational metrics can be used along with interval data to speed up the feedback process for AIC and participants instead of waiting for 12 monthly data points to be available. The evaluation team will provide detailed feedback on desirable data and project checkpoints in the upcoming evaluation cycle.
- **Finding #5:** Several Staffing Grant interviewees reported facing challenges related to aligning their internal timeline needs with Staffing Grant program scheduling. These challenges included difficulty meeting program deadlines, the inability to reallocate Staffing Grant funds to complete other priority projects that were not pre-approved, and a mismatch between the participant's fiscal budgeting year and AIC's fiscal year.
  - **Recommendation #5:** Consider introducing more flexibility into the Staffing Grant program deadlines and project requirements so that the program can better meet participant schedule needs.

2. Evaluation Approach

The evaluation of the PY9 C&I Custom Program involved both process and impact assessments. The specific research objectives and evaluation activities conducted are outlined below.

2.1 Research Objectives

This evaluation addresses the program's performance in PY9, which began in June 2016 and ended in May 2017. The primary objective of the PY9 Custom Program evaluation is to provide estimates of gross and net electric and gas savings associated with the program. In particular, the PY9 impact evaluation answers the following questions:

1. What were the estimated gross energy and demand impacts from this program?
2. What were the estimated net energy and demand impacts from this program?
3. What was the NTGR (defined as 1 – free-ridership + spillover) for the CLIP offering in PY9?

The evaluation team also investigated several of the Custom Program's special offerings and program components, including CLIP, Staffing Grants, and the Metering & Monitoring Pilot. We explored a number of process-related research topics outlined below.

4. Program Participation
    a. What were program participation levels by offering in PY9?
5. Program Design and Implementation
    a. Did the program's implementation change from PY8? If so, how and why and was this an advantageous change?
    b. Did the program experience any implementation challenges in PY9? If so, what were they, and how were they overcome?
    c. What changes could the program make to improve the customer experience and generate greater energy savings?
6. Participant Experience and Satisfaction
    a. Were participants in the special offerings (CLIP, Staffing Grants, and the Strategic Energy Management offering) satisfied with their experiences? What aspects of program design or implementation could AIC change to improve program effectiveness and participant satisfaction?
    b. What barriers to participation existed for these special offerings? How is the program seeking to overcome them?

2.2 Evaluation Tasks

Table 2 summarizes the PY9 evaluation activities conducted for the C&I Custom Program.

Table 2. PY9 Custom Evaluation Activities

Activity	PY9 Process	PY9 Impact	Forward Looking	Details
Program and Implementation Staff Interviews[a]	✓			Explored changes made since PY9, gathered information about program marketing, implementation—with a focus on special offerings including CLIP, staffing grants, and the SEM offering.
Review Utility Data and Program Materials[a]	✓			Gathered information about program implementation and performance.
Staffing Grant Participant Interviews[a]	✓	✓	✓	Supported the development of NTGRs for these participants to be applied retrospectively and gathered process information.
CLIP Participant Interviews	✓	✓	✓	Gathered NTGR information for each project, investigated ways that CLIP participants' projects differ from other Custom Program projects, and explored satisfaction, program processes, and areas for program improvement.
SEM Participant Interviews	✓	✓		Assessed program implementation processes, investigated customer engagement and satisfaction with the program, and developed a foundation for future attribution research.
Gross Impact Analysis		✓		Conducted desk reviews (including review of the program database, project documentation, and savings calculations) for a sample of projects to inform gross impact analysis. Conducted on-site measurement and verification (M&V) activities to inform measure verification and gross impact analysis.
Net Impact Analysis		✓	✓	Applied SAG-approved NTGRs and CLIP-specific NTGRs to ex post gross impacts to determine ex post net savings.

[a] Conducted in conjunction with the PY9 Standard and Retro-Commissioning Program evaluations

The following activities informed the PY9 evaluation of the Custom Program.

2.2.1 Program Staff Interviews

As part of the evaluation of the Custom Program, the evaluation team conducted an in-depth interview with program implementation staff. The interview focused on program performance in PY9, Business Program-wide changes, and anticipated future developments and changes.

2.2.2 Review of Program Materials and Data

We conducted a comprehensive review of all program materials and tracking data including the program's implementation plan, applications, and extracts from the program tracking database. We received extracts from the program-tracking database in January and March 2017 for evaluation planning and survey sampling.

Additionally, we received updated data in May 2017 and July 2017 as well as the finalized PY9 database in October 2017.

2.2.3 Staffing Grant Participant Interviews

We conducted in-depth interviews with Staffing Grant recipients during August and September 2017. These interviews focused on collecting data on free-ridership and spillover, in addition to information about barriers to project completion. Although this report contains discussion of the methodology and findings of this research, Staffing Grants can apply to Custom, Prescriptive, or Retro-Commissioning projects. The team attempted a census of Staffing Grant participants, as shown in the table below.

Table 3. Completed Staffing Grants Interviews

Interviewees	Population of Grant Recipients		Completed Interviews	
	Unique Recipients	Associated Projects	Unique Recipients	Associated Projects
Grant Recipients	17	28	6	12

Overall, the team spoke with six customers who received Staffing Grants and who completed a total of 12 projects associated with their Staffing Grants. The twelve projects were comprised of six C&I Standard Projects (three lighting projects, two variable frequency drive projects, and one specialty equipment project), five Custom projects (three Core Custom projects and two New Construction Lighting projects), and one Large Facilities Retro-Commissioning project. Given that we attempted a census of Staffing Grant Recipients, there is no sampling error or precision estimate associated with our NTGR findings. The team assigned the NTGR developed through the interview process to projects completed by the interviewed Staffing Grants participants if the NTGR based on interview findings was higher than the deemed NTGR for the applicable program (e.g., Custom, Prescriptive, or Retro-Commissioning). It is important to note that this adjustment was made only to relevant Staffing Grant projects and that the average NTGR resulting from these efforts was not extrapolated to the entire participant population of Staffing Grant projects.

2.2.4 CLIP Participant Interviews

We conducted interviews with two CLIP participants, representing two of the four CLIP projects completed in PY9. We used the interviews to gather quantitative data to support the PY9 NTG analysis of CLIP projects. The NTG analysis method and results are discussed in Appendix B. In addition, the survey included questions to inform our process evaluation. Specifically, we explored participant satisfaction with the CLIP offering, recommendations for improvement, and how early completion bonuses may or may not have impacted PY9 CLIP projects. As seen in Table 4 below, we completed interviews representing 91% of PY9 CLIP electric savings and 100% of PY9 CLIP natural gas savings.

Table 4. Completed CLIP Interviews

	Population	Completed Interviews	Share of Population
Participants[a]	4	2	50%
Ex Ante MWh	18,407	16,702	91%
Ex Ante MW	2.1	1.9	91%
Ex Ante Therms	200,985	200,985	100%

[a] The number of participants and projects in the CLIP offering was the same in PY9

2.2.5 Strategic Energy Management Participant Interviews

The evaluation team conducted interviews with SEM program participants to assess program implementation processes, assess customer engagement and satisfaction with the program, and develop a foundation for future attribution research. Given the number of SEM participants in PY9, the team attempted to contact all ten unique PY9 program participants. The evaluation team completed interviews with eight of these ten.

2.2.6 Gross Impact Analysis

The evaluation team's gross impact analysis for the Custom Program used desk reviews and on-site M&V to determine ex post gross impacts. Overall, the evaluation team reviewed a total of 40 Custom Program projects (core, NCL, and SEM), performing desk reviews 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.

The evaluation team conducted desk reviews of all three SEM projects producing savings in PY9.

Additionally, the evaluation team completed desk reviews (and in most cases, on-site M&V to provide increased accuracy) at a sample of 37[6] Custom (core and NCL) projects to determine gross impact results. These projects fell into seven categories as shown in Table 5.

Table 5. PY9 Custom Project Categories

Enduse	Number
Compressed Air	8
Pumps/Fans/Motors	8
EMS/RCx/Controls	7
Lighting	2
Boilers	2
New Construction Lighting	2
Multiple/Miscellaneous	8
Total	**37**

[6] As described in the Sampling Approach section, please note that we sampled 37 projects for a review of savings for a single fuel type (electric or gas) only; one project was independently sampled for both electric and gas review, resulting in a total of 38 reviews across 37 projects for the purposes of estimating realization rates.

Sampling Approach

We selected the sample of PY9 projects for evaluation in two waves,[7] drawing each sample from the entire population of completed Custom projects[8] (except for those completed by SEM participants, which were reviewed separately). 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. The sample drawn included 28 projects chosen for the electric sample and 10 projects chosen for the gas sample. In one instance, the same project was selected for both electric and gas samples. The 38 reviews we conducted account for 77% of the total ex ante gross[9] kWh savings and 69% of ex ante gas savings from the core Custom and NCL offerings. Table 6 and Table 7 show the sample of projects with electric savings and gas savings, respectively, selected in both waves.

Table 6. Two-Wave Custom Site Visit Sampling Approach for Projects with Electric Savings

Sampling Stratum	MWh Savings Range	Population of Projects [a]		Site Visits Completed	
		Count	Ex Ante MWh Savings	Count	Ex Ante MWh Savings
Wave 1					
1	<138.9	33	1,623	2	97
2	>138.9 and < 500.0	17	4,909	3	590
3	>500.0 and <2,000.0	12	13,027	6	7,942
Certainty	>2,000.0	2	12,247	2	12,247
Wave 2					
1	<400.0	38	4,804	2	191
2	>400.0 and < 1,400.0	14	10,964	4	3,478
3	>1,400.0 and <10,000.0	7	23,311	6	21,607
Certainty	>10,000.0	3	34,555	3	34,555
	Total	**126**	**105,440**	**28**	**80,707**

[7] The team drew samples from extracts of the AMPlify tracking system from March 2, 2017 and August 22, 2017.

[8] This population included CLIP projects, New Construction Lighting projects, and projects related to Staffing Grants. Projects with no direct savings, such as Feasibility Studies and Metering & Monitoring projects, were not included in the population from which we drew the sample.

[9] Ex ante gross savings are estimates of savings in the utility tracking system or what the utility believed they had saved prior to the evaluation, not accounting for attribution, or net-to-gross, analysis. Note that the sum of electric savings reviewed includes only savings from the sample of electric projects and does not include electric savings from the sample of projects with gas savings (and vice versa).

Table 7. Two-Wave Custom Site Visit Sampling Approach for Projects with Gas Savings

Sampling Stratum	Therm Savings Range	Population of Projects [a]		Site Visits Completed	
		Count	Ex Ante Therm Savings	Count	Ex Ante Therm Savings
Wave 1					
1	<14,000	5	47,760	1	12,885
2	>14,000	4	234,311	4	234,311
Wave 2					
1	<30,000	9	78,546	1	7,560
2	>30,000 and <100,000	3	198,699	1	74,810
3	>100,000	4	674,319	3	524,148
	Total	**25**	**1,233,635**	**10**	**853,714**

To estimate the program's ex post savings, the evaluation team used the ratio adjustment method.[10] As described in Equation 1, 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 ex post gross savings to the ex ante gross savings (the realization rate) to adjust the ex ante gross savings for the population of all non-SEM PY9 projects with savings (N=135).

$$I_{EP} = \frac{I_{EPS}}{I_{EAS}} * I_{EA} \qquad \text{Equation 1}$$

where:

I_{EP} = the ex post population energy and demand impacts
I_{EA} = the ex ante population energy and demand impacts
I_{EPS} = the ex post sample energy and demand impacts
I_{EAS} = the ex ante sample energy and demand impacts

Precision Calculations

We calculated precision for our gross impact results by pooling the results from both waves of site visits with the results from our review of all SEM projects.[11] To calculate relative precision, the team first determined the variance in the sample and then calculated the standard error and confidence interval. Equations 2 through 5 were used.

$$Stratified\ Ratio\ Estimator = \frac{\sum_{i=1}^{n} w_i\, y_i}{\sum_{i=1}^{n} w_i\, x_i} \qquad \text{Equation 2}$$

$$Standard\ Error = \frac{1}{\hat{x}} \sqrt{\sum_{i=1}^{n} w_i\, (w_i - 1)\, e_i^2} \qquad \text{Equation 3}$$

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

[11] 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.

$$90\%\ Confidence\ Interval = 1.645 * Standard\ Error \quad \text{Equation 4}$$

$$Relative\ Precision = \frac{Confidence\ Interval}{Stratified\ Ratio\ Estimator} \quad \text{Equation 5}$$

where:

w = case weights for each stratum h (N_h/n_h)
y = ex post savings
x = ex ante savings
$e = y_i - b\ x_i$
$\hat{X} = w_i\ x_i$

Evaluation Approach by Project Type

Within this section, we provide additional details about the evaluation team's methodology and assumptions by project category.

- **Compressed Air**: Compressed air projects accounted for eight of the 41 projects we reviewed. The compressed air projects involved replacing older air compressors with more efficient systems, upgrading flow controls and sequencers, repairing leaks, or installing new compressed air dryers or blowers. The ex post savings compared the original system to the proposed system for all the projects evaluated. The team obtained the details of the original and proposed systems from the documentation available, as well as information collected during the site visits. We were able to obtain trended or recorded data for two of the eight sites. Additionally, the team was able to install loggers to measure compressor power use at one site.

  We used metered or customer supplied operational data from these installations to determine typical loading and peak load conditions and then compared this information to the baseline system as described by the customer and project documentation. This ensured that consistent loading profiles were used in both the baseline and energy efficient scenarios.

- **Pumps/Fans/Motors:** Pumps, fans, and motors accounted for eight of the 41 projects reviewed. These projects typically involved upgrades to fans, new impellors or motors on industrial pumps, and installations of variable frequency drives (VFDs) on existing motors. We verified these projects through desk reviews, customer interviews, and site visits. During the site visits, customers were typically interviewed regarding the operation of the equipment prior to the retrofits, as well as the current and expected future operation of the systems.

- **Energy Management Systems (EMS)/RCx/Controls:** EMS/RCx/controls projects accounted for seven of the 41 projects reviewed. These projects involved installing or recommissioning control systems which managed HVAC systems at the customer facilities. These systems included energy savings for improved scheduling, temperature setbacks, outdoor air reset controls, and installing new pressure or temperature sensors.

  The team verified these projects through customer interviews and site visits. The team used a combination of billing data, readouts from the EMS, and building specific models to inform ex post estimates for these projects.

- **SEM:** SEM projects accounted for three of the 41 projects reviewed by the evaluation team. The documentation reviewed included the calculation summaries, supporting measure descriptions, and

any equipment specifications or operations information available. It is important to note that the evaluation team did not complete phone interviews or site visits with customers during this review.

- **Lighting**: Lighting projects accounted for four of the 38 projects verified through site visits. The lighting projects reviewed by the evaluation team involved efficient lighting systems for industrial and storage buildings. For retrofit projects, the evaluation team compared the proposed system to the existing system to determine ex post savings. For new construction projects, the evaluation team compared the proposed system to a baseline lighting power density based on the space type.[12]

  If the program documentation for retrofit projects lacked details about the original fixture and bulb type, the team calculated the ex post savings using the wattages supplied by the customer, vendor, or typical fixture wattage values. The team considered the energy consumption of the ballast, as well as the bulb, to estimate savings.

  The evaluation team verified the quantity of lights by inspection during the site visit and also obtained hours of operation from the customers during visits.

- **Boilers:** Boiler projects accounted for two of the 41 projects we reviewed. Projects in this category involved the installation of new boiler burners, VFDs on blower fans, and O_2 trim controls. During the site visit, the evaluation team verified the installation of the boiler burners, and interviewed the customer regarding project completion and boiler operation. Additionally, we used data from the customer to assess combustion efficiency and daily gas usage.

- **Multiple/Miscellaneous:** The team classified the remaining eight projects as "multiple/miscellaneous." Many of these projects required project-specific calculations. Projects in the miscellaneous category consisted of projects with equipment fitting into multiple categories or equipment different than other custom projects analyzed in PY9. Some examples include:

  - Replacement of new bean flake rollers that improve the throughput energy consumption of the facility;
  - New controls for an ammonia refrigeration system, installation of variable speed drives on evaporator fan motors and recirculation pumps, and boiler condensate recovery; and
  - Installation of a high pressure humidification system to humidify a manufacturing facility.

2.2.7 Net Impact Analysis

After estimating gross impacts, the evaluation team applied the SAG-approved NTGRs of 0.741 and 0.830 for electric and gas projects, respectively, except for those completed through or in conjunction with the CLIP

[12] Based on the applicable International Energy Conservation Code in place at the time of the project's initiation.

offering. For these projects, the team utilized findings from interviews with CLIP participants to determine the applicable NTGR. Table 8 provides details on the NTGRs used for PY9.

Table 8. C&I Custom Program PY9 NTGRs

Project Description	Electric NTGR	Gas NTGR
Custom Projects	0.741	0.830
CLIP Projects	PY9 research for retrospective application	
Staffing Grant Projects	PY9 research for potential retrospective application	

The evaluation team conducted additional research with participants in the Staffing Grant offering that provided the opportunity for additional changes to the NTGR to be applied. We describe our approach for CLIP and Staffing Grant NTG research below.

CLIP NTGR

The evaluation team conducted research with CLIP participants to estimate a NTGR specific to the CLIP offering. We applied this NTGR to all PY9 CLIP projects. Consistent with NTGR research conducted for other Business Program evaluations, we based the NTGR on self-reported information from a CATI survey that quantifies the percentage of the gross impacts that can reliably be attributed to the offering. We used the same battery of free-ridership and spillover questions and methodology as used for the Custom Program's most recent NTG research, conducted in PY8. The detailed methodology and the resulting estimate of the NTGR for the CLIP offering are described in Appendix B.

Staffing Grant NTGR

Following our approach from past years, we conducted research with Staffing Grant participants to estimate the influence of the grant on its associated project(s). These interviews developed an independent estimate of attribution associated with the Staffing Grant. We compared the NTGR developed through the PY9 interviews with the SAG-approved PY9 NTGR for the associated project(s). We used the SAG-approved PY9 NTGR as a floor, and if the NTGR developed through the Staffing Grant interviews exceeded the SAG-approved PY9 value, we applied the new NTGR to all of the projects associated with that Staffing Grant. However, if the newly developed NTGR fell below the SAG-approved PY9 value, we applied the SAG-approved PY9 value to each of the participant's projects.

While this research was conducted as part of the Custom Program evaluation, Staffing Grants could be used on any AIC Business Program project. We interviewed participants accounting for 12 of the 28 projects associated with Staffing Grants in PY9; six of these projects went through the Standard Program, one was a retro-commissioning project, and five were Custom projects. Ultimately, we did not adjust the NTGR upwards for any Business Program projects as a result of these interviews. Further detail on the methodology for Staffing Grant NTG calculation is provided in Appendix C.

2.3 Sources and Mitigation of Error

Table 9 provides a summary of possible sources of error associated with data collection conducted for the Custom Program. We discuss each item in detail below.

Table 9. Possible Sources of Error

Research Task	Survey Error		Non-Survey Error
	Sampling Error	Non-Sampling Error	
Staffing Grant, CLIP, and SEM Interviews	N/A, census attempt	Measurement error Non-response and self-selection bias Data processing error	N/A
Site Visits	Yes	Measurement error	Analysis Error
Gross Impact Calculations	N/A	N/A	Analysis Error
Net Impact Calculations	N/A	N/A	Analysis Error

The evaluation team took a number of steps to mitigate potential sources of error throughout the planning and implementation of the PY9 evaluation.

Survey Error

- **Sampling Error**
  - **Site Visits:** The evaluation team completed an impact review for 40 of 185 Custom projects, drawing two waves of stratified samples separately for projects claiming electric and gas savings and reviewing a census of SEM projects. For gross impact results, at the 90% confidence level, we achieved a relative precision of 0.1% for kW savings, 0.1% for kWh savings, and 1.8% for therm savings.
- **Non-Sampling Error**
  - **Measurement Error**: The validity and reliability of survey data were addressed through multiple strategies. First, we relied on the evaluation team's experience to create questions that align with the idea or construct that they were intended to measure (i.e., face value validity). We reviewed the questions to ensure that we did not ask double-barreled questions (i.e., questions that ask about two subjects, but allow only one response) or loaded questions (i.e., questions that are slanted one way or the other). We also checked the overall logical flow of the questions to avoid confusing respondents, which would decrease reliability.

    All survey instruments were reviewed by key members of the evaluation team and were provided to AIC and ICC Staff for review.

    To minimize data collection error during site visits, the evaluation team used trained engineers and technicians familiar with the equipment covered by the Custom Program and the methods used to calculate the gross impacts.
  - **Non-Response and Self-Selection Bias**: Although the response rate for the interviews with CLIP, and Staffing Grant participants was relatively high, there is still some potential for non-response bias. We attempted to mitigate possible bias by contacting each prospective respondent in the

sample at least eight times via phone and email over several months. To assess whether evidence of non-response bias exists, we compared respondents to the population based on project types and savings. We found no evidence to suggest that non-respondents differed significantly from respondents.

- **Data Processing Error:** The team addressed processing error by training interviewers and checking the quality and consistency of completed survey data. Before they began interviewing, interviewers underwent rigorous training that included a general overview of the research goals and the intent of the survey instrument. Through survey monitoring, members of the evaluation team also provided guidance on proper coding of survey responses. We also carried out continuous, random monitoring of all telephone interviews.

Non-Survey Error

- Analysis Error
  - **Gross Impact Calculations:** We determined 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 Staffing Grant and CLIP participants, the evaluation team had all calculations reviewed by a separate team member to verify that all NTGR calculations were performed accurately.

3. Detailed Evaluation Findings

Opinion Dynamics conducted a process evaluation of the Custom Program using multiple sources, including review of program materials and records, and interviews with participants in Custom Program offerings (including the CLIP offering, the Staffing Grant offering, and the SEM offering). Interviews with participants of each of these initiatives included questions about project scope, participant expectations, program awareness and satisfaction, internal decision-making processes, and barriers to participation. The results of these research efforts are presented below.

3.1 Program Design and Implementation

The C&I Custom Program offers incentives to AIC business customers for energy efficiency projects involving equipment not covered through the C&I Standard Program. The availability of this program allows customers to propose additional measures and tailor projects to the specific needs of their facilities. It also provides an avenue for piloting new measures prior to incorporating them into the Standard Program.

Business customers often represent the highest potential for energy savings, but these savings often derive from highly specialized equipment designed for particular industries or types of facilities. The availability of this program allows customers to propose additional measures and tailor projects to their facility and equipment needs. Custom incentives are available for electric measures, such as lighting, compressed air, EMS, and industrial process measures, among others. The program also offers gas measures, including heat recovery, process heat, and improvements to steam systems.

Several specialized offerings are also included in the Custom C&I Program:

- The CLIP offering provides customers the opportunity to request the amount of incentive needed to complete large energy efficiency projects with total savings greater than 300,000 kWh and/or 30,000 therms. Multiple technologies (such as lighting, VFDs, compressed air, HVAC, and process improvements) are included.
- The New Construction Lighting offering offers additional incentives for lighting measures in new construction projects.[13] Also launched in PY4, New Construction Lighting incentives supported 37 projects in PY9, a decrease from 65 in PY8.
- The Staffing Grant offering provides customers with funding to help address energy efficiency project staffing needs. Launched in PY4, the program distributes funds based on the predicted savings that will be achieved by the grant recipients. Nineteen Staffing Grants were issued in PY9. Savings are not claimed directly through this offering, but each Staffing Grant is associated with one or more projects completed through the AIC Business Program.
- The Feasibility Study offering, also launched in PY4, helps participants define project costs and energy savings opportunities, primarily targeting manufacturing/industrial facilities with compressed air systems. Incentives cover up to 50% of the study cost, with an incentive cap of $10,000 or 25% of the annual estimated savings identified in the study. Five feasibility studies were conducted in PY9. Similar

[13] AIC processes most New Construction projects through the Standard Program, but includes lighting projects in the New Construction Lighting initiative in the Custom Program. Additionally, large-scale new construction HVAC projects fall under the Custom Program.

to Staffing Grants, savings are not claimed directly through this offering, but Feasibility Studies may lead to one or more projects completed through the AIC Business Program.

- The Metering and Monitoring offering, initiated in PY7, promotes customers' ability to review and curtail their energy use using sub-meters and software. The pilot allowed participants to submit their own plan for identifying energy savings opportunities by implementing energy monitoring software. The incentive is structured in two components. The first component provides an incentive of up to 25% of the cost of the metering equipment and software, up to $5,000. The second component is performance-based and provides an incentive based on the annual energy savings generated by Custom or Standard projects identified and implemented through the Metering and Monitoring plan.[14] A total of 10 projects received incentives through in the Metering and Monitoring offering in PY9. To date, AIC has not claimed savings from the Metering & Monitoring offering.

- The SEM offering was piloted in PY8 to help customers achieve ongoing energy and cost savings through motivating changes in participants' organizational culture and business practices to achieve energy reduction and cost savings goals. As part of the SEM program, AIC program staff help participants to identify new energy savings opportunities and assist participants with taking full advantage of AIC program offerings. The program offers a base incentive to participants to assist with SEM implementation. In addition, the program offers a performance incentive for participants that reach their energy reduction targets through the program. Twelve commercial customers participated in the SEM offering in PY9. Three customers completed improvements that led to savings outside of other projects within Standard, Custom, or Retro-commissioning as part of their participation in the SEM offering.[15]

3.1.1 PY9 Implementation Changes

In PY9, the design and implementation of the AIC Custom program was similar to PY8. A summary of changes within individual custom offerings as stated in the PY9 Program Implementation Plan are detailed below:

Table 10. Program Implementation Changes in PY9

Offering	Design Change
CLIP	• T12 replacement projects no longer eligible for CLIP • Establishment of an early completion bonus of 10% for projects completed by Feb. 28, 2017 and final paperwork submitted by March 31, 2017 • Lighting incentives fell under the "other" electric incentive, up to $0.06/kWh ("other" was previously set at up to $0.07/kWh) • Gas incentive decreased to up to $0.90/therm (previously up to $1.00/therm)

[14] The performance incentive is calculated at a rate of $0.01/kWh or $0.20/therm and is capped at $10,000.

[15] These three customers completed improvements that did not also pass through another AIC Business Program, and therefore, their savings are directly attributable to the SEM offering. Other customers completed projects that may have been related to their participation in the SEM offering, but these customers received incentives through the AIC Business Program that led to these projects being associated with another program.

All Custom Projects	• Gas and electric projects completed by 9/30/16 received a 9% bonus; Projects completed by 12/31/16 received a 6% bonus; Projects completed by 3/31/17 received 3% bonus[16] • Program Allies were eligible to receive a 10% bonus on electric projects submitted through the Business Program
Metering and Monitoring Program	• The base incentive changed to 25% of cost (previously 50%), capped at $5,000 (previously $10,000) • The performance incentive changed to $0.02 (previously ($0.01) • The maximum possible performance incentive was capped at $15,000

3.2 Program Performance and Participation

3.2.1 Program Performance

Overall, the Custom Program approved 185 unique projects for completion in PY9.[17] This represents a decrease from 236 projects completed in PY8 and an increase from 171 completed in PY7. Table 11 lists these offerings along with their PY9 participation, the number of unique participants associated with each offering, and claimed savings.

Table 11. Custom Program Offering Participation in PY9

Offering	Total Projects/ Grants	Unique Customers	Gross Ex Ante Savings		
			MWh	MW	Therms
Custom Incentive	98	74	82,670	10.0	1,032,650
New Construction Lighting	37	32	6,062	1.1	0
Staffing Grant	19	17	0	0	0
Strategic Energy Management[a]	15	10	1,699	0.2	0
Metering and Monitoring Pilot	10	8	0	0	0
Feasibility Study	5	4	0	0	0
Custom Large Incentive (CLIP)[b]	4	4	18,407	2.1	200,985
Total	**185**	**125**	**107,139**	**13.3**	**1,233,635**

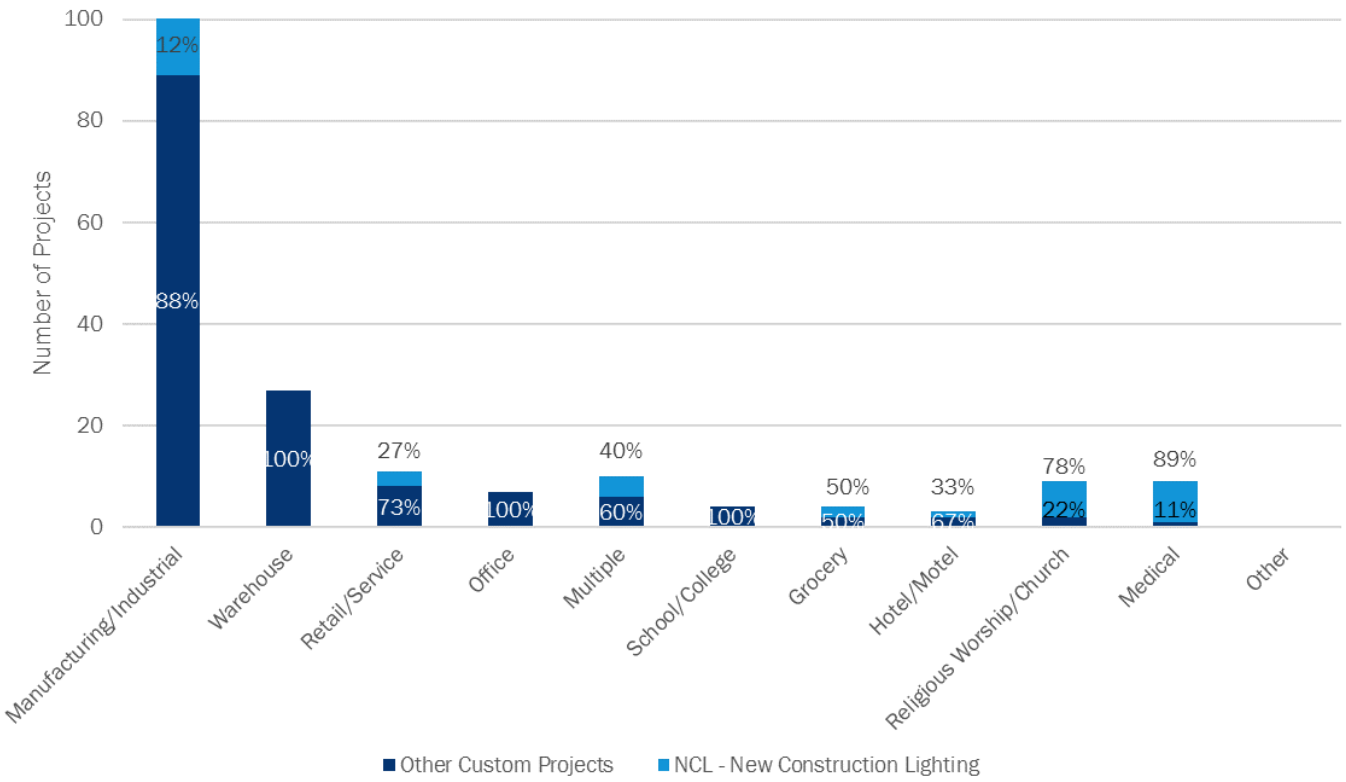
[a] The AMPlify database considers three SEM projects, including all savings from the offering, to be in the "Custom Incentive" offering; we recategorize them in this table for the purposes of reporting.
[b] The AMPlify database considers these projects to be in the "Custom Incentive" offering; we re-categorize them in this table for the purposes of reporting.

Figure 1 below shows the number of PY9 Custom Program projects completed by business type and segmented by New Construction Lighting participants and all other custom projects besides New Construction Lighting.

[16] Early completion bonuses did not apply to Staffing Grants.

[17] A unique project is defined as a record in the AMPlify database with a unique project ID. In some cases (e.g., regular and performance incentives for an SEM participant), a "project" in terms of actual activities may be defined as two or more projects in the AMPlify database.

Figure 1. PY9 Custom Program Projects Completed by Business Type (N=185)



Analysis of the program tracking data shows the highest percentage of Custom projects (55%) were completed in businesses from the industrial sector. Projects in the retail, warehouse, and grocery sector also represented large shares of participants. New Construction Lighting projects accounted for approximately one-fifth (20%) of all PY9 projects. These New Construction Lighting projects were completed mostly in the industrial and retail segments.

3.3 Process Research

3.3.1 CLIP Offering

We completed interviews with two out of the four participants in the PY9 CLIP offering. Each participant completed one project. One respondent is in the food production sector, while the other respondent is in the agricultural and light manufacturing sectors. Both respondents had participated in AIC Energy Efficiency for Business programs previously and learned about the CLIP offering through previous experience with AIC.

Both respondents reported that primary decision-making criteria for implementing energy saving projects at their company is Return on Investment (ROI) and projects must pass a minimum ROI threshold before they can be implemented. One participant noted that the CLIP incentive helped the project meet their internal ROI threshold:

> *""It was basically to enable us to meet the hurdle rate that we have to get a capital project approved. It enabled the project to move ahead."*

Overall, both respondents had a positive experience participating in the AIC Custom Program in PY9. The respondents both received follow up contact from an Energy Advisor after they implemented the project and have had positive interactions with program staff:

> *"We thought the folks that worked on the [AIC C&I Custom Program] were very good. We were extremely happy with those folks and extremely happy with their efforts."*

One respondent has participated in the CLIP program for several years and feels that the program has evolved over time in a way that is mutually beneficial for both AIC and the respondent. This respondent felt that they were able to implement projects of choice through the program while helping AIC to claim significant savings.

Starting in January 2018, the program's tenth year will bring a suite of regulatory and funding changes that will reshape program design and implementation. With the passage of the Illinois Future Energy Jobs Bill (SB 2814), large electric commercial and industrial customers (demand of 10MW or greater) will no longer be eligible to participate in energy efficiency programs offered through AIC. Additionally, the bill carries a requirement for Illinois energy efficiency programs to mark success in terms of persistent savings, rather than first-year savings as administrators have done from PY1 through PY9. These changes mean that neither of the two respondents interviewed are eligible for the CLIP program in future years. As such, neither respondent had suggestions for program changes or improvements.

3.3.2 Staffing Grant Offering

We completed interviews with six of the 17 PY9 Staffing Grant recipients. One of the six participants completed four projects, one participant completed three projects, another completed two projects, and the other three completed only one project each. Respondents completed Healthcare Retro-Commissioning projects, Custom projects, Variable Frequency Drives projects, Standard Lighting for Business projects, New Construction Lighting Projects, and a Specialty Equipment Project associated with a Staffing Grant.

All but one of the interviewed participants reported that their company and facility's energy efficiency project decision-making process is primarily determined by the project payback period and ROI. Some Staffing Grant recipients run payback studies and research their opportunities for energy savings. Participants reported the additional funding from the Staffing Grant generally helped with the overall payback calculation for the energy efficiency projects they implemented.

The intended purpose of the Staffing Grant offering is to provide participants with funding for staff resources to increase participants' capacity to manage energy efficiency projects. All Staffing Grant interviewees reported using the Staffing Grant funds as they were intended. Half of the interviewees reported hiring additional employees using Staffing Grant funds (three of six respondents), one interviewee reassigned internal staff to

support the implementation of energy efficiency projects after receiving Staffing Grant funds, and a few participants hired new staff and reassigned internal staff (two of six respondents).

Most Staffing Grant recipients learned about the program from an AIC representative (five of six respondents) and some participants received information about the program via direct mail (two of six respondents). Additional sources of information about the program included emails, symposiums run by AIC, and the application for the Standard Program (one interviewee each). After receiving information about the program, all Staffing Grant recipients reported having helpful in-person meetings with AIC staff.

Two interviewees reported that they received help from program staff when filling out applications for the Staffing Grant, while one of these interviewees declined the assistance after it was offered to them. Interviewees had mixed opinions about the application process: one participant expressed that the application process was cumbersome, while another recipient reported the application has become more streamlined compared to prior program years and it was helpful that AIC kept portions of their previous Staffing Grant applications on file.

Our interviews with Staffing Grant recipients revealed that participants faced challenges related to aligning their internal timeline needs with program scheduling. Three interviewees reported experiencing impacts associated with this challenge. One Staffing Grant recipient expressed that while they receive more than enough time to complete the projects, the deadline to begin the projects is too early and it would be beneficial to have more flexibility in the project start dates. Another interviewee identified other priority projects during the Staffing Grant funding period and were not able to reallocate Staffing Grant funds to complete these projects as they had not been pre-approved. Finally, one interviewee identified the tight timeframe of the application as a scheduling challenge because their company's fiscal budgeting year is not the same as AIC's fiscal year.

In terms of program improvement, Staffing Grant recipients made a variety of suggestions regarding the application process and allocation of funding. With regards to the application process, one interviewee suggested AIC create a master list of program offerings particularly for lighting measures. Another interviewee recommended AIC develop a standardized method for calculating returns and incentives that customers are eligible for. A third participant advised that AIC provide information for the offerings that are permanently available for incentives through AIC, as this participant expressed that the rules and regulations and their associated deadlines seemed to change frequently. Another interviewee suggested increasing the flexibility of the Staffing Grant funding allocation to allow funds to be transferred to a different project in the case where a company changes their priorities for energy efficiency projects.

Overall, respondents report high satisfaction with all phases of the Staffing Grant process. We asked participants to rate their satisfaction with the program using a scale of 0 to 10, where 0 is "very dissatisfied" and 10 is "very satisfied."

Table 12. Participant Satisfaction with Program Components

Program Component	Level of Satisfaction
The grant award process	9.4
The final review process	7.7
The application process	6.4

Table 12 shows participants reported high levels of satisfaction with the grant award process (9.4/10) and lower levels of satisfaction with the application process (6.4/10). Notably, one respondent reported a very low

level of satisfaction with the application process, bringing down the average rating. This respondent noted that one of their projects took three months for pre-approval.

3.3.3 SEM Offering

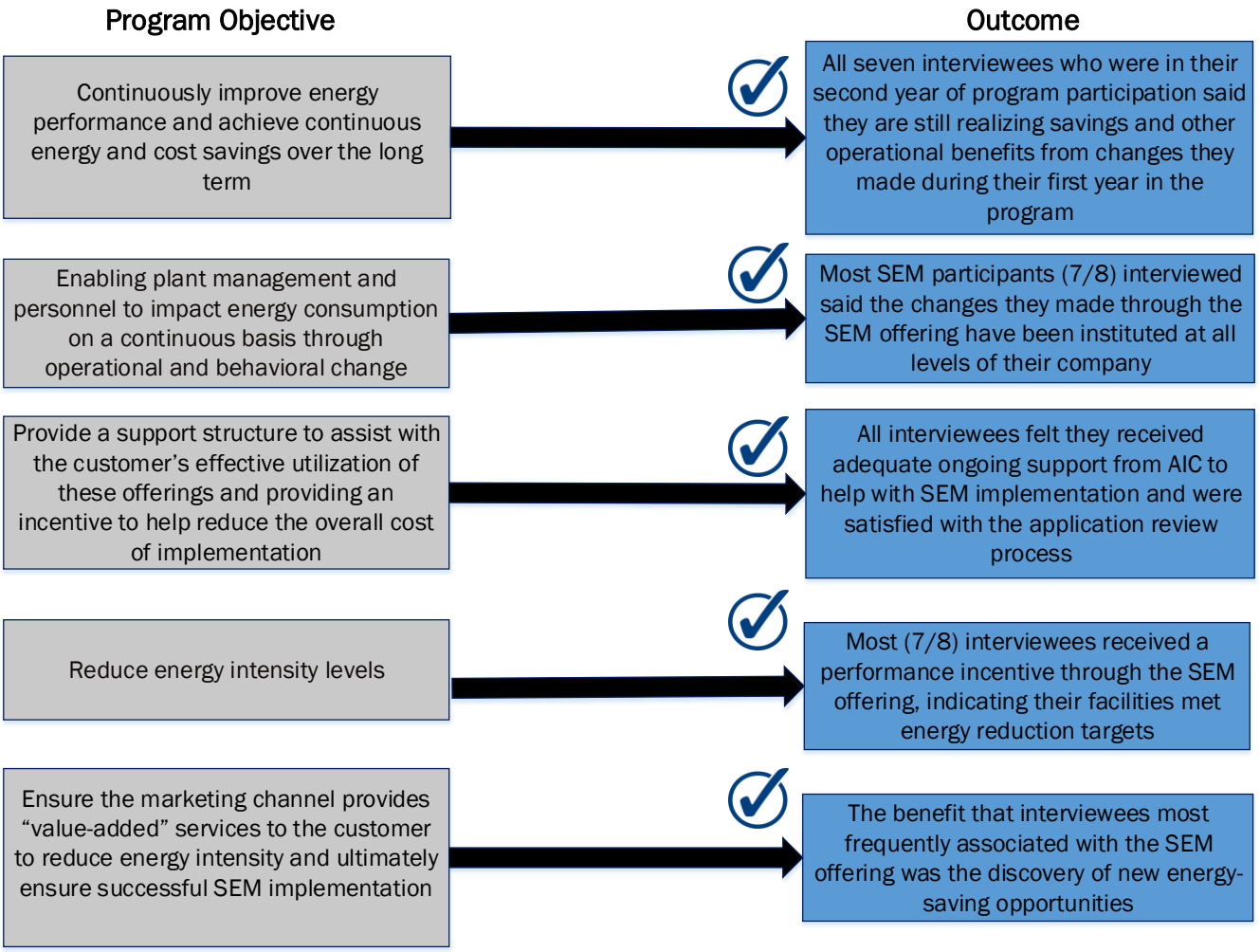
The SEM offering includes both a base incentive ($15,000) to assist customers with SEM implementation and a performance incentive based on savings achieved (at a rate of $0.01/kWh, $0.20/therm, or a combination of both, up to a total of $15,000). To qualify for the base incentive, SEM participants must sustain several implementation activities for a one-year period.

The evaluation team conducted interviews with SEM offering participants to assess implementation processes, understand customer engagement and satisfaction with the offering, and to develop a foundation for future attribution research. The team attempted to contact a census of all PY9 offering participants and completed interviews with eight out of 10 PY9 participants.

Overall, the SEM offering was very successful in PY9; most interviewees reported participating in a way that aligns with the offering objectives.[18] Figure 2 summarizes the SEM offering's performance against the stated objectives.

[18] Offering objectives we considered were from the PY9 AIC Program Implementation Plan.

Figure 2. SEM Offering Objectives and Associated Outcomes



We provide a detailed explanation of SEM offering implementation, outcomes, and effectiveness in the following sections.

Participant Characteristics

The SEM participants interviewed were primarily from the manufacturing sector (6/8) with a few participants from the healthcare sector (2/8). Six out of eight participants learned about the offering through outreach from their AIC representative. Participants had a variety of motivations for participating in the offering. Most participants worked towards specific quantitative reduction goals in terms of energy costs or sales dollars per kWh used (5/8), while others had goals for making a renewed commitment to their corporate energy conservation policies (3/8). Furthermore, some participants had a specific goal to use the offering as an opportunity to spread their SEM model to other facilities (2/8) and to develop new ideas for savings opportunities (4/8).

SEM Offering Implementation

Table 13 shows that all interviewees reported completing and maintaining all activities required by the offering, with the exception of three participants who did not establish a baseline energy usage level. These three participants were manufacturing companies with varying levels of production, and noted that that varying production makes it difficult to track energy usage at the building level. However, these participants *were* able to establish baselines and track energy usage at the equipment level.

Three participants already had energy management programs in place when they began participating in the SEM offering. As such, these participants had already implemented some of the activities the SEM target actions before their participation in the offering began. These participants used their participation as an opportunity to revisit and improve their existing activities.

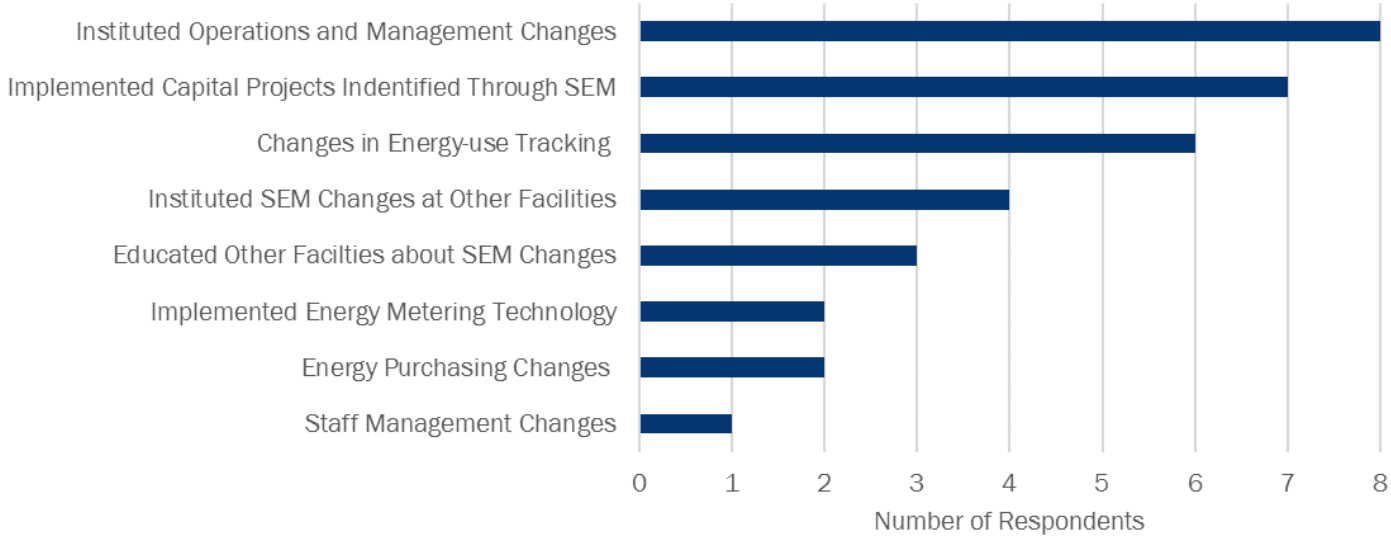
Table 13. SEM Participant Completion of Offering Actions

SEM Milestones	Participants Completing Milestone
Conduct an energy management assessment and gap analysis to determine current status	8
Establish a baseline energy usage level for building(s)	5
Develop a formal organization energy policy	8
Appoint an executive sponsor to oversee implementation of SEM	8
Conduct mid-year and year-end program management reviews	8

In addition to achieving the milestones laid out by the offering, customers had the opportunity to implement additional projects and business changes suggested by their AIC key account executives and Leidos Energy Advisors. Figure 3 shows that all participants instituted operational and management changes, such as employee behavioral changes and equipment scheduling changes. In addition, most participants implemented new capital projects they identified through SEM (7/8).[19] Some participants also made changes to their energy use tracking, including installing meters or sub-meters (2/8) and making improvements to spreadsheets used to track energy usage information (1/8). Some participants (3/8) continued using the same energy use tracking strategy they implemented before their participation in the SEM offering; these participants felt the offering helped them to pay more attention to their energy usage data, and they felt better equipped to utilize this information to make changes to their energy use.

[19] Not all capital projects identified through the SEM program received incentives from AIC.

Figure 3. Actions Taken As Part of Participation in the SEM Offering



Some participants also instituted changes above and beyond the requirements of the SEM offering. Half of the interviewees reported holding additional internal energy team meetings outside of their monthly meetings with AIC and Leidos representatives. These interviewees reported that the SEM offering was generally a talking point at these meetings. The frequency of these meetings ranged from weekly to bimonthly.

In addition, five interviewees began implementing aspects of the SEM offering in their other facilities after they began participating in the offering. Interviewees facilitated the implementation of SEM activities at other facilities by inviting employees from other facilities to attend SEM meetings, creating behavioral programs that could be replicated company-wide, and instituting energy tracking protocols developed through the SEM offering on a company-wide basis:

> *"The workbook and what we call decks that we've created out of the program activities are shared around the globe and it's really interesting. Most everything applies to all sites; it's just they can't execute them all the time. They will pick off various activities out of that."*

In addition, a few participants also noted that the SEM offering motivated changes in how their company prioritized and invested in energy efficiency upgrades. One interviewee reported that their upper management became more willing to make capital investments in energy efficiency projects after realizing the benefits of the changes the company made through the SEM offering:

> *"We had great success with low cost/no cost, the behavioral processes, that after a year and a half of that, our COO said, "Hey, in order to support the strategic plan, we need to make upgrades to certain systems throughout our company and I'm going to set aside $10 million for you to direct where this money goes into what site."*

In addition, another interviewee formalized the SEM offering into a company-wide energy management and behavioral program and replicated this program at other facilities:

> *"We're implementing the program but it's evolved into something bigger. We don't even call it SEM anymore"*

Attribution for Capital Projects

We asked interviewees about the influence of their participation in the SEM offering on their decision to implement capital projects to build our understanding of how the SEM offering might affect attribution and inform future net-to-gross (NTG) research for the SEM offering.[20]

We asked participants who implemented capital projects identified through the SEM offering to describe how the offering influenced their decision to implement these projects. Two interviewees who identified opportunities for capital projects through the offering and received incentives for these capital projects from other AIC commercial programs both said they would have completed fewer capital projects if they hadn't participated in the SEM offering. One interviewee said that the SEM offering and representatives from AIC helped them discover opportunities for energy saving projects they would not have discovered on their own, as their company had traditionally been focused on only the "low hanging fruit opportunities."

> *"We identified opportunities that, if we hadn't gotten all those people together, we may not have."*

The other interviewee said the SEM offering helped them to identify opportunities for new capital projects earlier than they would have without the program, which allowed them to better manage the application process and complete applications for more projects. This interviewee estimated that they would have completed half the number of capital projects they received incentives for through AIC if the SEM offering had not been available.

As noted in the section above, our research also provides anecdotal evidence of the SEM offering motivating participants to complete other energy efficiency activities outside of the program. Future attribution research

[20] All questions were qualitative; no quantitative NTG questions were asked.

to be conducted around SEM should focus on these impacts of the offering to determine if any program-attributable energy savings exist.

Program Effectiveness

A primary objective of the SEM offering is for participants to "continuously improve energy performance and achieve continuous energy and cost savings over the long term." All seven participants who participated in the SEM offering for multiple years said they are still realizing savings and other operational benefits from changes they made in PY8. Furthermore, these same participants all said that they also implemented new changes through the SEM offering in PY9. These results indicate the offering is reaching its objective of achieving sustained savings across multiple program years.

Another SEM objective is to target changes in business practices at all levels of participants' companies: from upper management to on-the-ground personnel. All but one SEM participant interviewed said the changes they made through the offering have been instituted at all levels of their company.

The SEM offering also aims to provide a support structure for participants so that they can effectively take advantage of program offerings. All interviewees indicated that they received adequate ongoing support to help with program implementation, and were satisfied with the application review process.

Interviewees identified several different benefits they realized through their participation in the SEM offering. Half of interviewees indicated that participating in the offering and working with AIC helped them learn about new energy-saving opportunities. Furthermore, some interviewees felt that the SEM offering brought more awareness to the energy management process within their company and helped to engage employees in this process (3/8 interviewees).

Table 14. Perceived Benefits of the SEM Offering

Perceived Benefit	Number of Interviewees
Discovery of new energy-saving opportunities	4
Engagement of employees in energy management process	3
Energy bill savings	2
Convincing upper management personnel to invest in energy efficiency	2

Although interviewees were satisfied with program implementation overall, they identified several challenges they faced while participating in the offering. Most of the challenges identified related to the way interviewees' companies functioned internally. These challenges included meeting application deadlines (one interviewee), justifying the payback period for capital projects identified through the SEM offering (one interviewee), and encouraging SEM meeting attendance (two interviewees).

Most interviewees had suggestions for program improvement. Three interviewees recommended improving the program Excel tracker by allowing individuals to customize the tracking spreadsheet to meet their individual needs, while still keeping a level of uniformity across participants. An additional suggestion included facilitating interactions between SEM participants so that participants could learn from each other. This recommendation may be especially useful, as all SEM participants in PY9 were from the same two industries, presenting opportunities for collaboration and learning. Furthermore, one participant wanted to replicate the SEM offering at additional facilities and suggested allowing companies to receive incentives to implement the offering at more than one facility.

One interviewee had a more overarching recommendation that AIC use the SEM offering as a gateway for introducing new Efficiency for Business customers to the suite of programs available. Drawing from their own experience, this interviewee suggests that low- or no-cost participation in the SEM offering eliminates barriers to participation that are present with other AIC commercial programs requiring large up-front investment to participate. This interviewee feels that the SEM offering could be a great path to allow these companies to better understand the benefits associated with investments in energy efficiency, which could further motivate these participants to explore other Energy Efficiency for Business programs:

> *"I think the SEM program is a great way for a company to make inroads into a whole another area that isn't competing in the same bucket as every other strategic or just basic maintaining-type facility stuff that is always sucking all the capital out of the company."*

3.4 Impact Results

For the Custom Program, we verified program participation and gross impacts through desk reviews and on-site M&V, as described in Section 2.2.6. For most projects, the site-specific measurement and verification led to the development of a gross realization rate that was applied to the population of all projects in the program.

Site-Specific Results

Table 15 presents the results of the gross savings analysis for the 41 Custom Program projects we reviewed in PY9.[21,22] Realization rates for individual projects ranged from 18% to 241% for electric and 0% to 204% for gas. Across both fuel types, nearly ¾ of projects (71%) had ex ante savings estimates within 20% of our ex post savings determined as a result of our research.[23]

[21] As previously mentioned, we reviewed 40 distinct projects. However, one project was randomly sampled in both the electric and gas sample frames, leading to 41 observations.

[22] Detailed site visit reports from 10 of the largest Custom Program projects are included in Appendix D.

[23] Although site visit data includes both electric and gas savings where available, only the savings and realization rates associated with the fuel type for which the project was sampled are used for analysis of overall program results.

Table 15. PY9 Gross Impact Realization Rate Results for Sampled Projects for the Custom Program

Project ID	Sample			Ex Ante Savings			Ex Post Savings			Realization Rate		
	Fuel Type	Wave	Stratum	kWh	kW	Therms	kWh	kW	Therms	kWh	kW	Therms
700006	Electric	2	3	5,180,729	621.7		5,180,729	592.1		100%	95%	
700022	Electric	1	3	1,279,388	116.6		1,249,666	115.8		98%	99%	
800012	Electric	2	Certainty	12,734,412	1,453.7		12,734,412	1,453.7		100%	100%	
800857	Electric	2	3	5,690,659	660.0		5,381,188	625.1		95%	95%	
800973	Electric	1	3	1,537,506	175.5		1,345,373	153.6		88%	88%	
801148	Electric	1	3	866,580	129.4		866,580	129.4		100%	100%	
801286	Electric	1	2	157,832	18.0		380,153	43.4		241%	241%	
900003	Electric	2	2	860,005	98.2		860,005	98.2		100%	100%	
900009	Electric	1	Certainty	8,793,460	1,056.7		7,377,903	866.9		84%	82%	
900018	Electric	2	3	4,443,303	513.6		4,443,303	513.6		100%	100%	
900020	Electric	1	Certainty	3,453,185	405.3		3,435,763	392.2		99%	97%	
900021	Gas	1	2			79,900			-			0%
900047	Electric	1	1	20,523	5.2		23,538	6.4		115%	123%	
900056	Gas	2	1			7,560			5,093			67%
900066	Electric	1	2	161,147	18.4		29,797	3.4		18%	18%	
900075	Gas	2	3			196,485			238,339			121%
900081	Electric/Gas	2	Certainty/3	11,521,308	1,315.2	200,985	3,484,393	397.8	409,349	30%	30%	204%
900093	Gas	1	2			112,790			66,396			59%
900094	Gas	1	2			14,870			8,008			54%
900137	Electric	1	2	271,230	31.3		104,527	12.1		39%	39%	
900180	Electric	1	1	76,685	8.9		76,791	8.9		100%	100%	
900198	Electric	1	3	1,708,493	196.2		1,768,322	201.9		104%	103%	
900215	Gas	1	1			12,885			13,869			108%
900427	Electric	2	3	1,501,998	139.2		1,501,998	139.2		100%	100%	
900601	Gas	1	2			26,751			25,173			94%
900604	Electric	1	3	1,200,000	-		975,415	-		81%		

Project ID	Sample			Ex Ante Savings			Ex Post Savings			Realization Rate		
	Fuel Type	Wave	Stratum	kWh	kW	Therms	kWh	kW	Therms	kWh	kW	Therms
900606	Electric	1	3	1,350,168	-		1,350,168	-		100%		
900607	Electric	2	2	1,251,431	142.9		1,045,629	127.5		84%	89%	
900784	Electric	2	3	2,045,922	233.6		2,045,922	233.6		100%	100%	
900816	Gas	2	2			74,810			71,821			96%
901012	Gas	2	3			126,678			57,670			46%
901381	Electric	2	Certainty	10,299,120	2,063.1		9,237,629	1,720.0		90%	83%	
901440	Electric	2	2	865,019	-		854,932	-		99%		
901508	Electric	2	1	150,440	17.2		150,440	17.2		100%	100%	
901527	Electric	2	1	40,635	7.0		42,666	8.5		105%	122%	
901588	Electric	2	3	2,744,707	313.3		2,744,707	313.3		100%	100%	
901685	Electric	2	2	501,072	58.8		501,072	58.8		100%	100%	
901989	Electric	SEM	2	739,223	1.0		739,223	-		100%	0%	
901993	Electric	SEM	2	596,383	10.3		596,383	-		100%	0%	
901994	Electric	SEM	1	363,785	148.1		363,785	148.1		100%	100%	
			Total	82,406,349	9,958.2	853,714	70,892,413	8,380.4	895,718	88% (weighted)	87% (weighted)	106% (weighted)

Note: Only the savings and realization rates associated with the fuel type for which the project was sampled are used for analysis of overall program results.

Table 16 presents electric savings results by technology for the 31 Custom Program projects we reviewed that claimed electric savings in PY9.

Table 16. Custom Program Site Visit Results, by Technology: Electric and Demand Impacts

Technology	Number	MWh Savings			MW Savings		
		Ex Ante	Ex Post	Realization Rate[a]	Ex Ante	Ex Post	Realization Rate[a]
Compressed Air	8	28,051	27,177	97%	3.2	3.1	97%
Pumps/Fans/Motors	8	30,255	27,707	92%	4.5	3.9	87%
Lighting	4	2,843	2,818	99%	0.3	0.3	101%
EMS/RCx/Controls	4	2,858	2,856	100%	0.0	0.1	172%
Multiple/Miscellaneous	4	16,700	8,635	52%	1.8	0.9	49%
Strategic Energy Management	3	1,699	1,699	100%	0.2	0.1	93%
Total		**82,406**	**70,892**	**88% (weighted)**	**10.0**	**8.4**	**87% (weighted)**

Note: Although site visit data includes both electric and gas savings where available, only the savings and realization rates associated with the fuel type for which the project was sampled are used for analysis of overall program results.
[a] Technology-level realization rates are presented unweighted.

Below, we highlight the major differences between ex ante and ex post savings estimates for electric projects and provide comments.

- Most electric projects reviewed achieved a high realization rate in PY9. Only eight of 40 projects (20%) achieved a realization rate of less than 90%. Overall, the changes to ex post electric savings for the program are primarily a result of decreased savings for three extremely large (certainty stratum) projects, detailed in the bullets below.
- The low realization rates for Multiple/Miscellaneous projects is driven by one large industrial refrigeration project. We found evaluated savings for this project to be lower than the ex ante estimate, driven largely by updates to ex ante assumptions around head pressure savings and suction pressure we made based on trended data on refrigeration load, pressures, and temperatures provided by the customer.
- The realization rates for Pumps/Fans/Motors projects are relatively high; however, it is worth noting that five of the eight projects evaluated achieved realization rates of 100% or above. The remaining differences from 100% are driven nearly entirely by two certainty strata projects; installation of VFDs on process fans and a baghouse fan upgrade project.
  - The decrease in ex post savings for the process fan project is due to significant differences we noted in operating power assumptions between the ex ante assumptions and the verified project. While several other factors lead to modest increases in savings for the project, changes to operating power outweigh savings increases from other factors.
  - Ex ante savings for the baghouse fan project were calculated based on a single month of pre-period data. We used additional metered data to calculate ex post savings.
- After completing the desk reviews, the overall realization rate for the three SEM projects reviewed was found to be 100% for all three fuels (electric demand, electric energy, and natural gas). The evaluation team reviewed project documentation and determined that ex ante assumptions were reasonable. The evaluation team also attempted to utilize our SEM analysis models in conjunction with the supplied

interval data. The SEM models attempt to correlate the interval data to a wide variety of meaningful metrics including occupancy, the day of the week, weather data, and other custom parameters applicable to a specific customer. The project documentation for two of the three projects did not include any operational specific metrics. The third project had monthly production data available. Unfortunately, because all three projects are manufacturing sites, weather alone was not a significant variable to use in conjunction with the interval data. The regression equations developed by the model resulted in very low R^2 values (i.e. R^2 = 0.01) and were not utilized in savings adjustments. The evaluation team will provide AIC with suggestions regarding the type of data that should be obtained in the implementation of these programs moving forward to aid in evaluation.

Table 17. Custom Program Site Visit Results, by Technology: Gas Impacts

Technology	Number	Therm Savings		
		Ex Ante	Ex Post	Realization Rate
Multiple/Miscellaneous	5	506,591	749,775	148%
EMS/RCx/Controls	3	107,655	21,877	20%
Boiler	2	239,468	124,066	52%
Total	**19**	**434,826**	**441,956**	**106% (weighted)**

Major differences in ex ante and ex post savings for gas projects are highlighted below:

- The high realization rates for Multiple/Miscellaneous projects is driven primarily by two large projects.
  - One project is the aforementioned large industrial refrigeration project. Whereas the electric savings claimed for this project were reduced significantly in evaluation, our review found that gas savings for this project were significantly understated. Through interviews with the customer, we learned that condensate loss was decreased from the ex ante assumption. We also noted that the boiler efficiency was not taken into account in the ex ante calculations. We updated boiler blowdown heat recovery calculations to take this into account.
  - Additionally, our revisions to calculations increased savings for a heat exchanger project significantly. We obtained updated operating trends that showed water outlet temperature to be significantly higher than previously assumed.
- Gas savings in the EMS/RCx/Controls category were decreased due to one project for which we determined that no savings were present due to errant assumptions around building square footage, and one project for which our billing analysis showed savings significantly different than the ex ante assumption.
- Finally, both Boilers projects reviewed had realization rates of less than 60%.
  - For one project, we observed flue gas temperatures to be significantly higher than the flue gas temperatures specified in the post-implementation combustion tests used in the ex ante savings calculations. This observation was backed up by trended data provided by the customer. Higher flue gas temperatures result in lower thermal efficiencies, so we found post-implementation efficiency to be lower than what was used in the ex ante calculations.
  - For the second project, we reduced gas savings because the existing boiler efficiency of 81.5% used in the ex ante calculation was lower than the 82.86% used in the ex post case, which we determined via modeling.

Overall Program Results

Table 18 below presents the overall Custom Program realization rates, based on the site visit results detailed above. These results reflect the pooled results from a two-wave, stratified sample design and a review of a census of SEM projects and are not the simple average of the above results. The relative precision of the electric savings is 0.1% for kWh and 0.1% for kW. For gas projects, the relative precision is 1.8%.

Table 18. Custom Program Gross Impacts

Program	Projects	Ex Ante Gross			Ex Post Gross			Realization Rate		
		MWh	MW	Therms	MWh	MW	Therms	MWh	MW	Therms
Custom	138[a]	107,139	13.3	1,233,635	94,738	11.6	1,313,061	88%	87%	106%

[a] This total represents all Custom Program projects with savings in PY9.

3.4.1 Net Impacts

As described in Section 2.2.7, the team applied SAG-approved NTGR values for PY9 to Custom Program ex post gross impacts to determine net impacts for all Custom Program projects except those completed through the CLIP offering. Including the retrospective NTGR of these CLIP projects resulted in a slight increase in the overall NTGR for electric savings compared to the deemed values and a slight decrease in the overall NTGR for gas savings compared to the deemed value.[24]

- Based on interviews with participants representing two CLIP projects, we developed an MBTU-weighted NTGR of 0.778 applicable to both electric and gas projects, and applied this NTGR retrospectively to all PY9 CLIP projects. We developed an MBTU-weighted NTGR of 0.934 applicable to both electric and gas savings. We then applied a CLIP-specific PY9 participant spillover rate of 0% and a Business-Program wide non-participant spillover rate of 0% for gas savings based on the PY7 non-participant spillover analysis.
- Because no Staffing Grant participants we interviewed reported an NTGR higher than the Custom Program-specific NTGR value, we did not adjust any NTGRs based on our Staffing Grant Research,

Table 19 presents the PY9 net impacts for the Custom Program based on the CLIP and Staffing Grant results and the application of SAG-approved NTGRs. The effective NTGR is a blended NTGR based on the SAG-approved NTGR for all Custom Program projects and the NTGR estimated for CLIP projects.

Table 19. Custom Program Net Impacts

Savings Category	Ex Post Gross	Effective NTGR	Ex Post Net
Energy Savings (MWh)	94,738	0.75	70,803
Demand Savings (MW)	11.6	0.75	8.7
Gas Savings (Therms)	1,313,061	0.82	1,078,717

Note: Values may not multiply cleanly due to rounding.

[24] The increase in NTGR was the difference between the deemed rate and the effective rate (i.e., +0.064 for MWh, +0.059 for MW, and -0.085 for therms).

4. Key Findings and Recommendations

Our research found that PY9 was another successful year for the Custom Program, in terms of achieved savings, participant satisfaction, and program implementation. Below we highlight some general conclusions and recommendations from our research.

- **Finding #1:** SEM interviewees most frequently identified the discovery of new energy-saving opportunities as a benefit of participating in the program. A participant suggested further expanding opportunities for learning about new ideas for energy efficiency projects by facilitating interactions between SEM participants so that participants can learn ideas from each other. This recommendation may be especially useful as the SEM participants in PY9 were from the same two industries, which presents opportunities for collaboration and learning.
  - **Recommendation #1:** Consider facilitating communications between AIC commercial customers through the SEM program. Creating partnerships between SEM participants in the same sector or scheduling meetings and facility tours for SEM participants with similar needs could expand the potential for identification of new savings opportunities and ongoing learning.
- **Finding #2:** The SEM program is offered at no cost to customers. During our research with SEM participants, several participants reported that their participation in the SEM program helped demonstrate the benefits of investing in energy efficiency to their upper management, helping to convince their upper management to invest in energy efficient capital projects they otherwise would not have.
  - **Recommendation #2:** Continue using the SEM program as the program of choice to introduce AIC commercial customers to energy efficiency programs. The SEM program is a powerful recruiting tool to leverage in situations where potential participants are apprehensive about participating in energy efficiency programs due to concern about capital costs.
- **Finding #3:** One of the three SEM projects did not have sufficient details to reproduce the ex ante calculations. The other two projects had some details, but detailed calculations were only available for every measure for one project. Additionally, measure descriptions made it difficult to replicate energy savings based on the provided information.
  - **Recommendation #3:** Measure savings should include a supporting calculation and measure description. The calculation should show the mathematical steps taken to develop the savings estimate. The description would provide the background of the key parameters used in the calculations. Often this can be accomplished with a few sentences for each measure.
- **Finding #4:** Production data and other important operational metrics from industrial and manufacturing program participants have generally not been provided for SEM projects. Energy usage at manufacturing facilities is driven significantly by production-related factors. These may include pounds or widgets produced per day, amount of input material processed, or number of trucks loaded for warehouses.
  - **Recommendation #4:** Working with customers to obtain detailed operational metrics would significantly improve the programs ability to track and normalize expected savings. Additional data would also aid the savings validation completed during evaluation. Operational metrics should be at the daily or hourly level of granularity if possible to best integrate with available interval data. These data would allow AIC to establish detailed validations of savings and assist in evaluation.

Finally, meaningful operational metrics can be used along with interval data to speed up the feedback process for AIC and participants instead of waiting for 12 monthly data points to be available. The evaluation team will provide detailed feedback on desirable data and project checkpoints in the upcoming evaluation cycle.

- **Finding #5:** Several Staffing Grant interviewees reported facing challenges related to aligning their internal timeline needs with Staffing Grant program scheduling. These challenges included difficulty meeting program deadlines, the inability to reallocate Staffing Grant funds to complete other priority projects that were not pre-approved, and a mismatch between the participant's fiscal budgeting year and AIC's fiscal year.
  - **Recommendation #5:** Consider introducing more flexibility into the Staffing Grant program deadlines and project requirements so that the program can better meet participant schedules.

Appendix A. Data Collection Instruments

Ameren CI PY9 CLIP Interview Guide FIN.

Ameren PY9 CI Staffing Grant Interv

Ameren PY9 CI Custom SEM Intervie

Appendix B. CLIP NTG Methodology & Results

In PY9, the evaluation team conducted research with CLIP participants to estimate a NTGR specific to the CLIP program. Unlike the majority of NTGR research conducted as part of the AIC portfolio evaluation, we applied this NTGR retrospectively to all PY9 CLIP projects. Consistent with NTGR research conducted for other Energy Efficiency for Business Program evaluations, we developed the NTGR based on self-reported information from a CATI survey that quantifies the percentage of the gross program impacts that can reliably be attributed to the program.

Key Findings

Table 20 presents the results of our PY9 CLIP NTG analysis for retrospective application. Due to a small number of CLIP projects included in our analysis, we developed a free-ridership rate applicable to both electric and gas. Our CLIP-specific PY9 spillover analysis found a participant spillover rate of 0%. We also applied the SAG-approved non-participant spillover (NPSO) rate of 0%.

Table 20. CLIP NTGR for PY9 Application

Program	Free-Ridership	Spillover	Final NTGR
CLIP	0.222	0.00	0.778

NTGR Background

Net impact evaluation is generally described in terms of determining program attribution. Program attribution accounts for the portion of gross energy savings associated with a program-supported measure or behavior change that would not have been realized in the absence of the program. The program-induced savings, indicated as a net-to-gross ratio (NTGR), is made up of free-ridership (FR) and spillover (SO) and is calculated as (1 – FR + SO). Free-ridership is the portion of the program-achieved verified gross savings that would have been realized absent the program and its interventions. Spillover is generally classified into participant and non-participant spillover. Participant spillover occurs when participants take additional energy-saving actions that are influenced by the program interventions but did not receive program support. Non-participant spillover is the reduction in energy consumption and/or demand by customers who did not participate in the program but were influenced by it.

The formula to calculate the NTGR is:

$$NTGR = 1 - FR + PSO + NPSO$$

The Illinois Evaluation Teams have worked with the Illinois Commerce Commission (ICC) and the Illinois Stakeholder Advisory Group (SAG) to create a standard Illinois Statewide Net-to-Gross approach for use in Illinois energy efficiency evaluation, measurement, and verification work. Per the NTG Methods attachment to the Illinois TRM,[25] all NTG data collection and analysis activities for program types covered by the attachment that began after June 1, 2016 must conform to the statewide NTG methods. This evaluation conforms with these requirements.

[25] Illinois Statewide Technical Reference Manual for Energy Efficiency: Attachment A – Illinois Statewide Net-to-Gross Methodologies. February 8, 2016.

Free-Ridership

Methodology

Free-riders are program participants who would have installed the same energy-efficiency measure(s) or taken the same energy saving actions without program support. Free-ridership estimates are based on a series of questions that explore the influence of the program on participants' purchasing decisions as well as actions the participant likely would have taken had the program not been available.

As prescribed by the Core Non-Residential Protocol in the NTG Methods attachment, the specification of the free-ridership score consists of three components: 1) influence of program components score, 2) overall program influence score, and 3) no-program score (counterfactual), as well as a timing adjustment. Each sub-score serves as a separate estimator of free-ridership and can take on a value of 0 to 1, where a higher score means a higher level of free-ridership. The overall free-ridership score for a project is the average of the three scores, combined with a timing adjustment. Depending on the specification, the timing adjustment is applied to either the no-program score or the preliminary overall FR score (average of the three sub-scores). The free-ridership score for each project thus ranges from 0 (no free-ridership) to 1 (100% free-ridership).

The three scores included in the algorithms, their variations, and the timing adjustment are described below.

1. **Influence of Program Components (PC).** This score is based on a series of questions that ask respondents to rate the importance of program and non-program components in their decision to install the energy efficient equipment, using a scale of 0 to 10 (where 0 is "not at all important" and 10 is "very important").

   Program components considered include items such as the availability of the incentive, recommendations from market actors, and previous program experience. Non-program components considered include standard industry practice, recommendations from a project design consultant, and corporate policy. Table 21 summarizes the program and non-program components included in the algorithm.

Table 21. Components and Assignments by Offering

Type	Component
Program factor	Program incentive
	AIC feasibility study (if applicable)
	Previous experience with the program
	Recommendation from program staff
	Information from program marketing materials
	Endorsement or recommendation from Key Account Executive (if applicable)
Non-program factor	Recommendation from project planning or design consultant
	Standard practice in business or industry
	Corporate policy or guidelines
Either depending on follow-up	Previous experience with equipment
	Payback on investment
Either depending on factor	Other factors
Either depending on if vendor was a program ally	Recommendation from vendor

The Program Components FR score is based on ratings for program factors only. For this study, we used the version of the score calculated as:

Equation 1. Program Components FR Score

$$PCS_A = 1 - \left(\frac{PF_{max}}{10}\right)$$

Greater importance of the program components means a lower level of free-ridership. In this approach, if a respondent rated the program rebate 10 out of 10, the recommendation of program staff 8 out of 10, and the information from program materials 8 out of 10, the final Program Components FR score would be 0 because PFmax (in equation 1) would be 10 (i.e., the maximum score across all program factors)

2. **Program Influence (PI)**. This score is based on a survey question asking the respondent to rate the importance of the program compared to the importance of other factors in their decision to implement the energy-efficient equipment. To do so, respondents are asked to divide 100 points between the program and other, non-program factors. This score is estimated as:

   Program Influence FR Score = 1 – (Points Given to Program / 100)

   More points allocated to the program means lower level of free-ridership. For example, if a respondent gave the program 70 points out of 100, the Program Influence free-ridership score would be 0.30.

3. **No-Program Score (NP).** This score is based on the likelihood that the exact same energy efficient equipment would have been installed without the program, using scale of 0 to 10 (where 0 is "not at all likely" and 10 is "very likely") and is calculated as follows:

   No-Program Score = Likelihood to Install Same Equipment / 10

   A greater likelihood of installing the exact same energy efficient equipment without the program means higher level of free-ridership. For example, if the participant provides a likelihood rating of 7 to install the same equipment in the absence of the program, their No-Program free-ridership score would be a 0.70.

   This score also incorporates a timing adjustment (discussed next) as follows:

   $\text{No-Program Score}_{\text{Adjusted}}$ = (Likelihood to Install Same Equipment / 10) * Timing Adjustment

4. **Program Timing Adjustment.** The program timing adjustment incorporates information from two survey questions. The first question elicits: (1) whether the installation would have been done at the same time without the program; and (2) if the installation would have been done later, how much later. The second question asks the respondent to provide a likelihood, on a 0 to 10 point numeric scale, of implementing the same measure within 12 months of when it was actually implemented.

   For this study, we used the IL-TRM's Timing Adjustment 2. In this adjustment, later purchases without the program means a lower level of free-ridership, but the likelihood of implementing without the program is also taken into account. This adjustment is calculated on a 0 to 1 scale, and a timing adjustment of 1 means that there is no evidence the program changed the timeframe in which the project would have been implemented, while a lower value of the timing adjustment means that the program caused the project to be implemented sooner. Timing Adjustment 2 is calculated as follows:

Timing Adjustment 2 = 1 – ((Number of Months Expedited – 6) / 18[26])((10 – Likelihood of Implementing within One Year)/10)*

Timing Adjustment 2 is applied multiplicatively to the average of the Program Components, Program Influence, and No-Program scores.

This evaluation implemented and analyzed the following specification of the free-ridership algorithm.

- **FR Approach:** (PCScore + PI Score + NP Score) / 3 * Timing Adjustment 2

Spillover

Methodology

Participant spillover refers to the installation of energy-efficient measures by program participants that were influenced by the program but did not receive an incentive. An example of PSO is a customer who installed incented equipment in one facility and, as a result of the positive experience, installs additional equipment at another facility but does not request an incentive (outside SO). In addition, the participant may install additional equipment, without an incentive, at the same facility because of the program (inside SO).

We examined both inside and outside spillover in PY9 CLIP projects using participant responses to the phone survey.

Results

We examined both inside and outside participant spillover in projects from lighting and non-lighting end-uses using CLIP participant responses in the phone interviews. Based on this data, we found no participant spillover among CLIP participants, and therefore, our participant spillover rate for CLIP in PY9 is 0%.

[26] Please note that the NTG Methods attachment prescribes a divisor of 42 and a "number of months expedited" that can range up to 48 months. In these implementations of the algorithm, we allow "number of months expedited" to range up to only 24 months and adjust the divisor appropriately in order to provide responses that are more realistic for the type of purchase (lighting products) captured in this assessment.

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.[27] 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).[28] 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 = "Never," T1 = 0

     IF N11 = "Same time," T1 = 1

     IF N11 = "Within 1 year," T1 = 0.66

     IF N11 = "Within 2–3 years," T1 = 0.33

[27] 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?

[28] 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.

$$Component\ 2 = Average\ (QI, TI)$$

- *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).

$$FR = Average\ (Component\ 1, Component\ 2)$$

- *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.

Figure 4. Spillover Algorithm

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

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 C&I programs.[29] 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 PY9. 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.

[29] Per the Illinois NTGR Framework, the team applied SAG-approved NTGRs for PY9 to determine PY9 net impacts, with the exception of CLIP projects (for which the NTGR was based on PY9 research).

Appendix D. Site Visit Reports

We provide the site visit reports in a separate document.

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