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Ameren Illinois Company Electric & Gas Residential, and Commercial and Industrial Energy Efficiency Portfolios – PY8 Summary Evaluation Report

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NAVIGANT



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1. Executive Summary

This report presents the evaluation results from the eighth program year (PY8) of the Ameren Illinois Company (AIC) portfolio of commercial and industrial (C&I) and residential energy efficiency programs,¹ which ran from June 1, 2015 through May 31, 2016. In this document, we provide the integrated portfolio results for PY8, as well as the detailed findings for each program as appendices.

During PY8, AIC offered three programs for C&I customers and nine programs for residential customers. The portfolio of residential and C&I programs included the following:

- Residential²
 - Heating and Cooling (HVAC)
 - Behavioral Modification³
 - Appliance Recycling
 - Multifamily In-Unit⁴
 - Home Efficiency Standard (HES)
 - Home Efficiency Income Qualified (HEIQ)
 - ENERGY STAR® New Homes (ES New Homes)
 - School Kits
- Commercial and Industrial (C&I)
 - Standard
 - Custom
 - Retro-Commissioning (RCx)

The subsequent sections of this report present high-level findings from the evaluation of the PY8 programs. We also provide context around AIC's portfolio savings goals and resources, as well as an overview of the evaluation approaches employed.

¹ For simplicity, this report refers to the period of study as PY8. However, the June 2015 to May 2016 program year is composed of Electric Program Year 8 (EPY8) and Gas Program Year 5 (GPY5).

² Additionally, the summary tables in this report include carryover savings from the AIC Residential Lighting Program offered in PY7. These savings are not presented in a separate section in this report as the AIC Residential Lighting Program did not operate in PY8. For information on these savings, please see the PY8 IPA Residential Lighting Program evaluation report.

³ AIC offers the gas portion of the Behavioral Modification Program while the Illinois Power Agency (IPA) offers the electric portion of the program. This report contains information pertaining to evaluation of gas impacts of the Behavioral Modification program, covered under Section 8-104.

⁴ In addition to the AIC Multifamily Program, the IPA offers a Multifamily Program focused on common areas and major measures.

1.1 Overall Portfolio Results

At the portfolio level, the AIC programs exceeded their filed savings goals for PY8, achieving total net savings of 202,487 MWh and 6,836,449 therms.⁵ As Table 1 illustrates, the net realization rates for the entire portfolio are 125% for MWh and 151% for therms. Table 2 and Table 3 present ex ante gross, ex post gross, and ex post net savings for each program. For additional detail regarding PY8 savings, including lifetime savings, program costs, and participation, see Appendix A.

Program performance against the filed program goals differed for the residential and C&I portfolios. The C&I portfolio had stronger performance and exceeded program goals by 27% on the electric side and 51% on the gas side. The performance of the C&I Custom program was a large driver of performance on the commercial electric side; the program achieved savings equaling 57% of the portfolio electric goal. In contrast, the residential portfolio achieved electric savings just below the portfolio goal.

Table 1. AIC PY8 Portfolio Ex Post Net Impacts Compared to Planned Net Impacts

Program	Planned Impacts ^a		Ex Post Net Impacts		Realization Rate ^b	
	MWh	Therms	MWh	Therms	MWh	Therms
Residential Portfolio						
Residential Lighting (PY7 Carryover)	-	-	7,465	-	N/A	-
Behavioral Modification ^d	-	1,337,500	-	1,389,206	-	1.04
Appliance Recycling	4,131	-	3,844	-	0.93	-
HVAC	5,314	-	4,302	-	0.81	-
Multifamily	6,232	118,961	6,173	279,047	0.99	2.35
HES	5,018	814,804	1,174	181,178	0.23	0.22
HEIQ	1,194	219,987	3,047	568,483	2.55	2.58
ENERGY STAR New Homes	791	25,663	538	113,893	0.68	4.44
School Kits	366	48,298	782	24,518	2.14	0.51
<i>Residential Total</i>	<i>23,046</i>	<i>2,565,213</i>	<i>27,324</i>	<i>2,556,325</i>	<i>1.19</i>	<i>1.00</i>
Commercial Portfolio						
Standard	65,400	950,625	75,850	3,058,659	1.16	3.22
Custom	32,934	888,230	89,456	807,973	2.72	0.91
Retro-Commissioning	17,017	133,227	9,857	413,492	0.58	3.10
<i>Commercial Total</i>	<i>133,549</i>	<i>1,972,082</i>	<i>175,163</i>	<i>4,280,124</i>	<i>1.31</i>	<i>2.17</i>
Portfolio Total^c	156,595	4,537,295	202,487	6,836,449	1.29	1.51

^a Source: AIC Compliance Filing, p. 7-8, Docket 13-0498 (Filed January 28, 2014). [Accessed: <https://www.icc.illinois.gov/downloads/public/edocket/367603.pdf>]

^b The realization rate = ex post net impacts ÷ planned impacts.

^c Note that the total may not equal the sum of the values in the column due to rounding.

^d Note that this encompasses only the AIC portion of the program, covering gas only.

⁵ AIC's goals are at the portfolio level. The utility does not have to meet program-specific goals.

Table 2. AIC PY8 Portfolio MWh Savings Results

Program	Ex Ante Gross MWh	Gross Realization Rate ^a	Ex Post Gross MWh	NTGR ^b	Ex Post Net MWh
Residential Portfolio					
Residential Lighting (PY7 Carryover)	N/A	N/A	15,882	0.47	7,465
Appliance Recycling	7,190	1.02	7,325	0.52	3,844
HVAC	5,961	1.00	5,928	0.73	4,302
Multifamily	6,033	1.05	6,306	0.99	6,173
HES	1,691	0.91	1,540	0.76	1,174
HEIQ	3,098	0.98	3047	1.00	3047
ENERGY STAR New Homes	697	0.76	532	1.01	538
School Kits	1163	0.64	745	0.98	782
<i>Residential Total</i>	<i>25,833</i>	<i>0.98</i>	<i>41,305</i>	<i>0.66</i>	<i>27,325</i>
Commercial Portfolio					
Standard	97,706	0.99	96,784	0.78	75,850
Custom	111,289	0.99	109,884	0.81	89,456
Retro-Commissioning	12,139	0.88	10,714	0.92	9,857
<i>Commercial Total</i>	<i>221,134</i>	<i>0.98</i>	<i>217,382</i>	<i>0.81</i>	<i>175,163</i>
AIC Portfolio Total	246,967	0.98	258,687	0.78	202,488

^a The ratio of ex post gross energy savings to ex ante gross energy savings. Residential and portfolio total calculations exclude residential lighting carryover, for which ex ante savings are not available.

^b Please note that these NTGRs are program-level, and may differ from SAG-approved values applied at the end-use level.

Table 3. AIC PY8 Portfolio Therm Savings Results

Program	Ex Ante Gross Therms	Gross Realization Rate ^a	Ex Post Gross Therms	NTGR ^b	Ex Post Net Therms
Residential Portfolio					
Behavioral Modification	1,389,206	1.00	1,389,206	1.00	1,389,206
Multifamily	260,432	1.29	335,926	0.84	279,047
HES	248,735	0.97	241,534	0.75	181,178
HEIQ	571,594	0.99	568,483	1.00	568,483
ENERGY STAR New Homes	62,494	1.81	113,214	1.01	113,893
School Kits	40,252	0.59	23,592	0.97	24,518
<i>Residential Total</i>	<i>2,572,713</i>	<i>1.04</i>	<i>2,671,955</i>	<i>0.96</i>	<i>2,556,325</i>
Commercial Portfolio					
Standard	3,407,418	1.00	3,407,096	0.90	3,058,659
Custom	806,747	1.18	948,719	0.85	807,973
Retro-Commissioning	514,070	0.88	454,387	0.91	413,492
<i>Commercial Total</i>	<i>4,728,235</i>	<i>1.02</i>	<i>4,810,202</i>	<i>0.89</i>	<i>4,280,124</i>
AIC Portfolio Total	7,300,948	1.02	7,482,157	0.91	6,836,449

^a The ratio of ex post gross energy savings to ex ante gross energy savings.

^b Please note that these NTGRs are program-level, and may differ from SAG-approved values applied at the end-use level.

2. Overview of the AIC Portfolio

The PY8 AIC portfolio had energy savings goals of approximately 157 GWh and 4.5 million therms. Note that AIC’s goals are at the portfolio level and AIC has the ability to shift resources across all programs to meet them.

Table 3 presents the AIC energy goals by program.

Table 3. AIC PY8 Portfolio Planned Savings by Program^a

Program	MWh	Therms
Residential Portfolio		
Residential Lighting	-	-
Behavioral Modification	-	1,337,500
Appliance Recycling	4,131	-
HVAC	5,314	-
Multifamily	6,232	118,961
HES	5,018	814,804
HEIQ	1,194	219,987
ENERGY STAR New Homes	791	25,663
School Kits	366	48,298
<i>Residential Total</i>	23,046	2,565,214
Commercial Portfolio		
Standard	65,400	950,625
Custom	32,934	888,230
Retro-Commissioning	17,017	133,227
<i>Commercial Total</i>	133,549	1,972,082
AIC Portfolio Total	156,595	4,537,295

^a Note that while AIC has required electricity and gas savings goals, there is no statutory requirement for demand goals.

AIC’s planned costs for the PY8 portfolio totaled just over \$45 million. Table 4 provides the costs by program.

Table 4. AIC PY8 Portfolio Planned Costs by Program^a

Program	PY8 Planned Program Cost (\$ Millions)
Residential Portfolio	
Residential Lighting	\$0
Behavioral Modification	\$0
Appliance Recycling	\$1,461,234
HVAC	\$3,186,470
Multifamily	\$1,061,851
HES	\$4,064,512
HEIQ	\$966,933
ENERGY STAR New Homes	\$655,381
School Kits	\$115,375
<i>Residential Total</i>	<i>\$11,511,756</i>
Commercial Portfolio	
Standard	\$15,173,148
Custom	\$9,573,571
Retro-Commissioning	\$2,524,475
<i>Commercial Total</i>	<i>\$27,271,194</i>
Other Costs	
AIC Portfolio Admin Costs	\$1,952,771
AIC EM&V Costs	\$1,362,399
AIC Education Costs	\$976,386
AIC Marketing Costs	\$976,386
Emerging Technologies	\$1,362,399
AIC Portfolio Total	\$45,413,291

^a Source: AIC Compliance Filing, p. 7-8, Docket 13-0498 (Filed January 28, 2014).

[Accessed: <https://www.icc.illinois.gov/downloads/public/edocket/367603.pdf>]

3. Evaluation Approach

The PY8 evaluation plan served as the foundation for the evaluation activities conducted. The evaluation approach included both program- and non-program-specific activities, including efforts to support the Illinois Statewide Technical Reference Manual for Energy Efficiency (IL-TRM) process. The team implemented all aspects of the evaluation plan for PY8. Table 5 provides a summary of the evaluation activities performed by the team. Detailed information about the data collection activities and analyses performed for each program is included in Appendix B.

Table 5. PY8 Evaluation Activities and Type of Assessment

Evaluation Activity	Residential								Commercial		
	Behavioral Modification	ARP	HVAC	Multifamily	HES	HEIQ	ES New Homes	School Kits	Standard	Custom	RCx
Program Material & Data Review	✓All programs										
Program Manager and Implementer Interviews	✓ All programs										
Market Actor Interviews ^a			✓			✓			✓	✓	
Participant Survey	✓			✓		✓	✓		✓	✓	
Non-Participant Survey	✓					✓			✓		
Predictive & Multilevel Modeling	✓										
Expert Interviews											✓
Literature Review		✓									
Incremental Cost Analysis			✓								
Ex Post Gross Impact Analysis											
Application of the IL-TRM		✓	✓	✓	✓	✓		✓	✓		
M&V Site Visits										✓	✓
Consumption Analysis	✓										
REM/Rate Simulation							✓				
Ex Post Net Impact Analysis											
Application of SAG Approved NTGR		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Retrospective Application of Researched NTGR ^b									✓	✓	
Performed NTGR Research for Prospective Use	✓Residential Nonparticipant spillover								✓		

^a Program allies, retailers, or other market actors.

^b Applied offering-specific researched NTGR for Competitive Large Incentive Project (CLIP) Custom projects. Applied project-specific researched NTGR for projects associated with a Staffing Grant in certain cases.

In addition to the activities outlined above, the evaluation team conducted a number of non-program specific activities. We provide an overview of each activity below.

- **IL-TRM Efforts.** Throughout PY8, the evaluation team reviewed documents and measure protocols submitted to the Stakeholder Advisory Group (SAG) by the Vermont Energy Investment Corporation (VEIC), and, as necessary, provided comments. In addition, we participated in a NTG Methodology Working Group tasked with developing protocols for NTG research across the utilities.
- **Coordination with Illinois Utilities.** As part of the evaluation planning process and as needed throughout the program year, the evaluation team consulted with their counterparts supporting evaluation efforts for other utilities in the state. These discussions helped to identify similarities and differences in approach, as well as to inform ongoing discussions of the NTGR framework and its application.
- **Cost-Effectiveness Analysis.** The team is preparing model inputs of evaluated program savings as determined through the evaluation effort for AIC. As needed, the team will also audit AIC's cost-effectiveness analysis based on this year's program results. This may include a review of AIC's assumptions for avoided costs, discount rates, measure cost information, administrative costs, and other relevant data.

4. Program-Level Results

4.1 Residential Behavioral Modification

AIC offers the Behavioral Modification Program as a part of its residential portfolio. The Behavioral Modification Program has been offered by AIC since August 2010, but Program Year 8 (PY8) (June 2015–May 2016) is the first year that the electric portion of the program was funded by the Illinois Power Agency (IPA). As such, AIC administers the gas portion of the Behavioral Modification Program, and the IPA is responsible for the electric portion. According to the PY8 Implementation Plan, the expected savings are 30% of the planned PY8 portfolio therm savings.

AIC developed the program to reduce its residential customers' energy consumption; Leidos and OPower implement the program, which seeks to:

- Reduce energy consumption by encouraging energy-efficient behaviors
- Boost customer engagement and education by helping customers understand energy efficiency and how to save energy in their homes
- Educate customers about no-cost and low-cost energy-saving measures and behaviors

The program offered three treatment types: a hard-copy home energy report (HER) mailed to the customer's home, an electronic Home Energy Report (eHER) sent on a monthly basis to all customers with email addresses, and an online portal that customers can access to view the same report along with additional information. It is important to note that the majority of customers participating in this program receive both gas and electricity from AIC, as a result, we conducted a joint evaluation of the AIC and IPA programs. As such, the findings and recommendations presented in this report apply to both the AIC and IPA implementer.

Program Impacts

The Behavioral Modification Program reached about a third of AIC's approximately 1 million residential customers in PY8. Just under 300,000 participants received a report in PY8 (including both dual-fuel and gas-only customers), the majority of whom are in their fifth year with the program.

In PY8, the program achieved adjusted net savings of 1,389,206 therms (Table 6). Adjusted net savings remove the energy savings that resulted from customer participation in other AIC programs. The energy savings for the program were calculated using a model that included weather terms to account for an imbalance in the treatment and control groups detected during the equivalency analysis. The estimated savings are less than the forecasted results, particularly for gas, for several reasons. First, the weather in both the pre-participation period year and PY8 affected the net savings estimates differently for each cohort, and gas savings are more weather dependent than electric savings. In addition, due to attrition, the customer counts used for estimating forecasted savings were different from the number of customers who participated during PY8.

Table 6. PY8 Behavioral Modification Program Impacts

Cohort Name	Adjusted Net Savings (% per household)	Adjusted Net Savings (per household)	Number of Customers Treated in PY8	Adjusted Net Program Savings
Gas Savings (Therms)				
Original Cohort	0.63%	4.8	35,147	168,653
Expansion Cohort 1	1.02%	8.9	53,431	473,208
Expansion Cohort 2	0.60%	3.5	85,967	305,118
Expansion Cohort 3	1.51%	10.4	13,181	137,006
Expansion Cohort 4	0.37%	2.4	22,410	54,348
Expansion Cohort 5	0.34%	2.5	53,791	132,830
Expansion Cohort 6	0.77%	3.4	34,954	118,043
Total Therms	NA	4.6	298,881	1,389,206

^a Totals may not be exact due to rounding.

Note: Number of customers treated in PY8 includes customers who received at least one report in PY8.

Key Findings and Recommendations

The Behavioral Modification Program achieved its stated goals to reduce energy consumption and educate customers about energy savings measures and behaviors. Further, PY8 was characterized by limited program implementation changes, although program staff faced some technical challenges. In particular, program staff added a new cohort of approximately 54,000 dual-fuel customers in April 2015 and offered a new income-qualified customer module initiative to support the Home Efficiency Income Qualified Program. In addition, program implementers continued the “target rank campaign,” which provided customized short-term goals for high-energy users.

However, technical issues resulted in reductions to report frequency for many customers. Specifically, there were widespread issues with monthly billing reads in the fall of 2015 that reduced the frequency of reports for more than 100,000 customers. The AIC information technology team quickly restored missing reads, and these customers received three electric mailed reports instead of the usual four. Further, gas HERs were reduced from six to four reports per year. Finally, eHERs were delivered to all customers with email addresses (45% of the total participant population) on a monthly basis.

Survey findings indicate that participants recalled and engaged with reports. Overall, most participants who responded to our survey recalled receiving the HERs (90%) and reported reading every report (44%). We continue to find that participants, when compared to control group respondents, more frequently indicated that they have discussions about ways to save in their homes and have read their utility bills to understand their home’s energy use in the past 12 months. However, survey results also indicate lower satisfaction for participants when compared to control group respondents. Further, participants were moderately satisfied with the HER, with a mean rating of 6.5 on a 0–10 scale. These results show that the program achieved its goal of boosting customer engagement and education by helping participants understand energy efficiency in their homes, but there are opportunities to enhance customer satisfaction with the report.

The evaluation team provides the following key findings and recommendations for the program:

- **Key Finding #1: The program reduced energy consumption.** Billing analyses results indicate a reduction of 1,389,206 therms. Program participants achieved 4.6 therms savings per household per

year. We calculated these values by dividing the total adjusted net program savings for the evaluated period by the total number of program participants for electricity and gas, respectively.

- **Recommendation:** For future program planning and goal setting, AIC might consider using the average savings estimates for therms over the evaluated period. Theoretically, AIC could multiply these averages by the planned number of future participants and produce estimates of the next program year's anticipated electricity and gas savings.
- **Key Finding #2: Overall, energy savings results appeared to plateau when compared to prior years (with some cohorts increasing and others decreasing usage year over year).** Changes in program delivery, specifically, the reduction in the frequency of gas reports (in PY8) from six to four reports per year, as well as the missing bill reads for some program participants, may have contributed to a dampening effect in savings in PY8. However, reductions in energy savings may have been tempered by the implementation of eHERs in PY8.
 - **Recommendation:** For future program years, AIC should assess if the costs associated with delivering paper reports outweigh the benefits of sending reports only electronically. One such way to test this hypothesis would be to assess the effectiveness of substituting paper reports for eHERs moving forward. We recommend developing a research design where customers would be randomly selected to discontinue paper reports, while continuing to receive eHERs, while another group continues to receive both paper reports and eHERs to assess the incremental savings from these reports.
- **Key Finding #3: Our evaluation identified a lack of equivalency in terms of average daily consumption in the pre-participation period for the electric Original Cohort.** Specifically, our analysis found that the electric Original Cohort had slightly higher pre-participation period consumption in summer months. Although overall average pre-participation period consumption differed by less than 1 kWh, it is possible that these differences in average daily pre-participation period usage during the summer months artificially inflated kWh savings estimates for the electric Original Cohort in models that did not control for this difference. Because it seems likely that differences in the weather conditions experienced by the treatment and control customers during the pre-participation period drove this difference in consumption, we used a weather-adjusted model specification to estimate impacts because it provided the most accurate electric savings estimates for the electric Original Cohort. This is in contrast to prior evaluations, where we used the original model⁶ to report savings estimates.
 - **Recommendation:** Moving forward, we recommend that OPower work with the program evaluators to continue to monitor the lack of equivalency of each cohort and to apply the best model specification to account for differences across groups.
- **Key Finding #4: Predicted savings were not always consistent with evaluated savings.** Savings predictions used different data, data cleaning methods, weather, and models than evaluated savings. These differences, in combination with prediction error, led to the observed differences between predicted and evaluated savings.

⁶ The original model does not include weather terms within the model specification.

- **Recommendation:** For future program years, consider requesting interim evaluated savings estimates as part of the evaluation work plan. This would allow for program adjustments when partial-year savings do not align with predicted savings.

- **Key Finding #5: In PY8, AIC launched a new marketing module directed toward income-qualified customers.** AIC conducted this new initiative in PY8 by sending tailored messaging regarding the Home Efficiency Program to HER participants who qualified as income-qualified as part of their HER. The HERs offered a new, customizable marketing module that attempted to channel income-qualified customers into relevant AIC programs. As a result of this initiative, the evaluation team attempted to better understand if customers were more aware of, or had increased their participation in, the income-qualified Home Efficiency Program. Our results suggest that 18% of income-qualified customers had heard of the Home Efficiency Program, which was not statistically significantly different from non-income-qualified customers who had not received the marketing module. In terms of program participation, our review of AIC residential program databases suggests that those customers flagged as income-qualified customers and who received messaging on their HER marketing on the Home Efficiency Program in PY8 did indeed have higher rates of program participation than customers who did not receive this messaging. However, we conducted a similar analysis for the same customers for prior program years and found that those flagged as income-qualified customers also participated at a higher rate than non-flagged HER participants.
 - **Recommendation:** AIC should continue to investigate the merits of offering marketing modules to income-qualified customers via the HERs. We recommend that the program implementer flag both treatment and control group customers as income-qualified, providing a natural experiment to assess the effectiveness of the marketing efforts. In addition, we recommend assessing program uplift in PY9 given that it may take some customers time to make a decision to enroll and participate in a program after receiving the marketing materials.

- **Key Finding #6: Persistent “Very Negative” savers tended to have different characteristics than other program participants.** In PY7, our team conducted a multilevel model analysis that placed participants in five profiles: “High” savers, “Medium” savers, “Neutral” savers, “Negative” savers, and “Very Negative” savers. The evaluation team conducted a follow-up survey to better understand whether we could identify customer characteristics correlated with these savings groups. Primarily, we found that electric “Very Negative” savers tended to be distinct from other electric savings groups. First, their engagement and satisfaction with the HERs were significantly lower, on average, than other savings groups. In addition, despite having similar frequency of reported energy savings actions, electric “Very Negative” savers were much less likely than members of other groups to attribute this behavior to the reports. There also appear to be intrinsic features that are correlated with this particular energy savings group. For example, electric “Very Negative” savers reported a much higher rate of making changes to increase energy usage in their home, while “Very Positive” savers reported a higher rate of making changes to decrease energy usage.⁷ In addition, these customers were much less interested or concerned about climate change than other groups and tended to fall within the AIC “Concerned Parents” marketing segmentation group.⁸ For gas customers, the most relevant difference across

⁷ By this we mean changes in lifestyle, housing, or personal circumstances that could lead to a change in energy usage independent of the customer following HER suggestions. For example, spending more time at home during the day, developing a medical condition that required specialized equipment or strict temperature control, or adding a pool would likely increase energy use. Spending more time out of the house or having a child leave for college could reduce usage.

⁸ For more information on the marketing segmentation groups deployed by AIC see Appendix **Error! Reference source not found.**

groups had to do with geography, with higher energy savers concentrated in the northeast region of the state.

- **Recommendation:** AIC should consider targeting electric “Very Negative” savers for new interventions and consider what types of constraints or barriers these customers may be facing and what types of messaging may be more or less relevant to these customers. After doing so, AIC can establish whether these results can serve to enhance or optimize program delivery. In addition, for any future cohorts, we recommend focusing on other segments rather than “Concerned Parents.” Notably, these results are exploratory and require additional research to confirm trends that appear within the data.

4.2 Residential Appliance Recycling

As part of the Appliance Recycling Program (ARP), AIC offered a \$50 turn-in incentive and free recycling of refrigerators and freezers directly from the homes of AIC electric customers. AIC also provided information and education on the cost of keeping inefficient units in operation. AIC expected ARP to achieve approximately 12% of the electric savings for AIC’s overall residential portfolio in PY8. Leidos Engineering managed the program and oversaw its advertising. Appliance Recycling Centers of America (ARCA) served as a subcontractor, marketing and implementing the program. This included scheduling, pickup, and recycling the appliances as well as customer service.

The evaluation of the PY8 ARP involved both process and impact assessments. The process evaluation included a review of program-tracking data and program materials and interviews with program implementation staff to gauge program performance. Because AIC does not intend to offer the program after PY9, we also conducted interviews and a literature review of how other utilities ended similar programs. Our impact evaluation research efforts involved applying deemed values from the Illinois Statewide Technical Reference Manual for Energy Efficiency Version 4 (IL-TRM V4.0) to calculate gross impacts. To calculate net impacts, we applied the Illinois Stakeholder Advisory Group (SAG)-approved measure-level net-to-gross ratios (NTGR) for freezers and refrigerators. Key findings from the PY8 evaluation are presented below.

Program Impacts

Table 7 summarizes net electricity and demand savings from the PY8 ARP. The evaluation team calculated ex post gross savings by applying IL-TRM V4.0 algorithms to verified measure quantities from the program tracking database. The program achieved ex ante gross savings of 7,190 MWh and ex post gross savings of 7,325 MWh, which resulted in a 102% gross realization rate. We then applied the Stakeholder Advisory Group (SAG)-approved PY8 net-to-gross ratios (NTGR) for the program: the PY6 NTGR of 59% for freezers and the PY6 NTGR of 51% for refrigerators. Similar to PY7, we applied a NTGR of 50% for room air conditioners from ComEd’s PY5 evaluation because a NTGR for air conditioners was not agreed upon by the SAG. The gross savings-weighted average NTGR was 52%.

Table 7. PY8 Net ARP Impacts

	Ex Ante Gross	Realization Rate	Ex Post Gross	NTGR	Ex Post Net*
Energy Savings (MWh)					
Total MWh	7,190	102%	7,325	52%	3,844
Demand Savings (MW)					
Total MW	0.88	102%	0.90	52%	0.47

*Ex post determined by applying NTGR and verified participation.

Key Findings and Recommendations

The ARP surpassed its energy savings and participation goals, achieving 3,844 MWh of net energy savings (109% of its target) and recycling 7,953 units (103% of its target). Program staff attributed the program's PY8 success to customers becoming familiar with and coming to expect the service. That said, the PY8 targets were set lower than the PY7 goals (8,375 units for 4,010 MWh of net savings) with the expectation that the program was more mature and participation would be lower than the previous year.

In assessing programs for inclusion in its PY10 through PY12 plans, AIC decided to discontinue the ARP part way through PY9 since the program was no longer cost-effective due to decreased savings for recycled appliances as appliance stock became more efficient and presented lower avoided costs than in the previous plan.

Conclusions and Recommendations

Based on the research discussed, the evaluation team provides the following conclusions and recommendations to help AIC manage the transition after the program's closure:

- **Key Finding #1.** The utilities that the evaluation team interviewed considered appliance recycling to be an important customer service offering. Appliance recycling programs typically have high customer satisfaction ratings. Utilities deciding whether to continue or end the program carefully considered the program popularity in their decision.
- **Key Finding #2.** Some utilities deciding to end appliance recycling programs tried to communicate alternative options for recycling appliances. Interviewed utilities discussed directing customers to waste management services or state natural resource management agencies. Evidence from evaluations of Commonwealth Edison's PY5 program and from one run by PG&E suggest that many retailers recycle the appliances picked up when customers purchase new appliances. This service continues to remove some appliances from operating on the grid.
 - **Recommendation.** Consider directing customers interested in recycling an appliance to an appliance waste management service or to retailers that participate in the EPA Responsible Appliance Disposal (RAD) Program or recycle haul-away appliances.
- **Key Finding #3.** Advanced planning for program discontinuation will be critical to minimizing customer confusion. Utility program staff we interviewed did not anticipate their programs being interrupted and had no chance to communicate future program changes. Call centers and program websites serve as the two key methods used by interviewed utilities to update customers about program operations.
- **Recommendation.** AIC's ARP participants most commonly cited friends/neighbors and bill inserts as their two primary sources of program information when asked how they learned about the program. Unlike the interviewed utilities, AIC has time before the program discontinues, and bill inserts may be an effective method of communicating the termination of the program. AIC could include names and contact information for alternative recycling facilities in the bill inserts and should continue to recommend that consumers recycle appliances on their own.

4.3 Residential Heating and Cooling (HVAC)

The HVAC program offered customers incentives through registered program contractor trade allies for purchases of brushless/electronically commutated motors (ECMs), air-source heat pumps (ASHPs), and central air conditioners (CACs). AIC discontinued incentives for the CACs midway through the program year.

This occurred due to issues with cost-effectiveness (the 16 SEER CAC was not cost-effective) and the fact that CAC participation was at twice the predicted levels.

AIC HVAC Program registered program allies performed all equipment installations. AIC offered incentives that varied based on equipment types and baseline efficiency levels, which were deducted from the contractor installation invoice at the time of sale. AIC worked with Leidos as the HVAC program administrator, and CLEAResult (formerly Conservation Services Group [CSG]) continued to work as an implementation subcontractor, under Leidos’ management.

The evaluation of the PY8 HVAC Program involved both process and impact assessments. Key findings from the PY8 evaluation are presented below.

Impact Results

Table 8 summarizes the net electricity and demand savings from the PY8 HVAC Program. The evaluation team followed the Illinois Statewide TRM (IL-TRM) Version 4.0 protocol and used equipment information from the program tracking data to calculate unique savings values for every measure reported. The program achieved ex ante gross savings of 5,961 MWh and ex post gross savings of 5,928 MWh, which resulted in a 99.5% gross realization rate for energy. The program also achieved ex post demand savings of 2.19 MW (compared to ex ante demand savings of 2.38 MW) resulting in a gross realization rate of 91.8%. We then applied the Illinois Stakeholder Advisory Group (SAG)-approved measure-specific net-to-gross ratios (NTGRs) to the ex post gross impacts to get the ex post net impacts. Overall, the program NTGR for energy was 0.726 and the program NTGR for demand was 0.708. These values differ because of the specific measure mix and variation in measure-level savings within the program (e.g., the ECM measure does not contribute significant demand savings). The program achieved ex post net savings of 4,302 MWh and 1,550 kW.

Table 8. PY8 Net HVAC Program Impacts

	Ex Ante Gross	Gross Realization Rate	Ex Post Gross	NTGR	Ex Post Net
Energy Savings (MWh)					
Total MWh	5,961	99.5%	5,928	0.726	4,302
Demand Savings (MW)					
Total MW	2.38	91.8%	2.19	0.708	1,550

Program and measure-level realization rates varied for numerous reasons, including the following:

- Mischaracterization of heating and cooling zones for a number of sites
- Discrepancies in the reported equipment attributes (e.g., capacity, Seasonal Energy Efficiency Ratio [SEER], Energy Efficiency Ratio [EER], Heating Seasonal Performance Factor [HSPF]) when compared to the Air Conditioning, Heating and Refrigeration Institute (AHRI) database⁹
- Disagreements between the program tracking database and the input values used in the ex ante saving calculations.

⁹ The AHRI database can be accessed online at <https://www.ahridirectory.org/ahridirectory/pages/home.aspx>

- Improper or incomplete application of IL-TRM V4.0-approved methodology for ductless mini-split heat pumps (DMSHPs), which require a different savings approach than traditional ASHPs
- Application of deemed efficiency values for early replacement (ER) equipment, rather than using the actual efficiency of the replaced equipment, in the ex ante savings calculations.
- Overlap in savings due to the interaction between ECMs and the efficiency ratings (SEER, EER, HSPF) of new CACs and ASHPs. Of the 3,693 ECM projects, 63.4% also included a new CAC or ASHP. The efficiency ratings of these equipment types already account for the unit being operated with a furnace ECM, limiting the savings that can be claimed for an ECM installation.

The evaluation team based ex post results on actual equipment characteristics (as recorded in the program tracking data and on participants' local climate zones). The ex post results also included an adjustment factor, developed by the evaluation team, based on an in-depth AHRI matching process to account for differences between the tracking database reported equipment characteristics and actual equipment characteristics identified in the AHRI database. The team determined net savings by applying measure-specific NTGRs agreed upon by the SAG.

Process Results

Overall, PY8 achieved strong program participation but fell short of reaching AIC's net energy savings target of 5,329 MWh. AIC reported that program processes remained the same as those for PY7, and that contractor relationships and communication among program implementers (AIC, Leidos, and CLEAResult) were effective for handling program eligible measure and incentive changes.

The HVAC program experienced a stable transition from PY7 to PY8, as program staff continued offering the same measures despite updating incentive levels. AIC increased incentive levels for ASHP measures, but reduced them for ECM and CAC measure offerings. Though the removal of CAC measures midway through the program year somewhat disrupted processes (e.g., creation of new forms, communication with contractors), program implementers confirmed that clear and preemptive communication with program allies allowed the process to proceed smoothly and the program to continue through the rest of PY8 without exceeding budget limits. The removal of this measure likely impacted overall PY8 HVAC savings, since the measure experienced participation increases towards the end of previous program years.

One area of improvement identified by the evaluation team related to the program tracking database. During the impact evaluation, a large percentage of AHRI numbers recorded in the program data could not be matched against the AHRI database (approximately 28% of unique AHRI numbers and 19% of all AHRI numbers). For those AHRI numbers that were found in the AHRI database, the evaluation team noted a number of discrepancies between the equipment characteristics recorded in the AHRI database and the program tracking data. These discrepancies were addressed during the ex post savings evaluation.

In terms of meeting energy savings targets, the HVAC program achieved 4,302 net MWh of energy savings, representing 81% of its 5,329 MWh target and a 15.0% decline in MWh savings from PY7. Participation showed that a total of 7,016 measures were installed through the program, representing a 12.3% increase over PY7.

Key Findings and Recommendations

Based on the evaluation activities, the evaluation team determined that AIC, Leidos, and CLEAResult implemented the HVAC Program effectively through program changes, managing the budget marketing, and

internal communication appropriately. The program, however, fell short of its savings goal, likely due to the loss of CAC measures (which realized high participation levels during the first part of the program year).

The evaluation team offers the following key findings and recommendations for AIC's consideration:

- **Key Finding #1.** AIC has made significant changes to program eligible measures and incentives over the past two years. As the drivers of program awareness (based on findings from previous evaluations), contractors may have feedback on how the program changes over the past two years have affected them and their ability to market and sell energy efficient HVAC equipment to customers.
 - **Recommendation.** Conduct trade ally interviews to gather feedback on how program process and measure changes have impacted contractors, and to identify opportunities to improve the partnership between program staff and trade allies.
- **Key Finding #2.** The evaluation team identified multiple incidences of missing or incorrect information in the tracking database.
 - **Recommendation.** Add an additional step in the data entry process to compare the rebate forms to the AHRI database. Also, ensure sufficient quality control in reviewing information entered into the tracking database to ensure consistent and accurate data is recorded.
- **Key Finding #3.** The evaluation team found that while a measure in the IL-TRM V4.0 outlines savings for furnace blower motors, it does not account for the installation of an ECM along with a new CAC or ASHP. The team believes that savings from this measure may overlap with savings from the installation of a new ASHP or CAC. The overlap occurs because the presence of an ECM is already accounted for in the efficiency ratings (SEER, EER, HSPF) of the new equipment.
 - **Recommendation.** Provide ECM incentives only to those installations where a new CAC or ASHP has not been installed.
 - **Recommendation.** Consider further research to assess incremental ECM savings for use when being installed with a new CAC or ASHP.
- **Key Finding #4.** The evaluation team identified a number of DMSHPs entered in the PY8 tracking database. While this type of ASHP is not excluded based on the program requirements, it does require a different savings algorithm than is used for a traditional ASHP.
 - **Recommendation.** Ex ante savings estimates for DMSHPs should not use the ASHP approach from the IL-TRM V4.0, but rather the DMSHP algorithm and track the additional required savings inputs which include percent load displaced, annual household heating load, home type, and whether the DMSHP is replacing or supplementing an existing system.
- **Key Finding #5.** PY8 ex ante savings do not align with the IL-TRM V4.0-approved methodology for some measure types.
 - **Recommendation.** Review the tracking database calculations and assumptions to ensure the ex ante savings methodology aligns with the approved methodology outlined in the IL-TRM V4.0. In some cases, especially for early replacement measures, the IL-TRM V4.0 recommends the use of existing equipment efficiency values (SEER, EER, HSPF) rather than a default value, when existing equipment information is available.

- **Key Finding #6.** The program tracking database is ambiguous about whether new ASHP equipment are installed into an existing system, with a gas furnace for backup heat, or as a separate standalone system in which the ASHP is the only heating unit. In cold climates, the backup system will turn on to provide heating when the ASHP is unable to meet the heating load of the home.
- **Recommendation.** Add a flag to the tracking data that indicates whether ASHPs are installed in systems with fossil fuel backup heating equipment (such as a gas furnace or boiler).

4.4 Residential Multifamily In-Unit

As with PY7, multifamily program offerings in the AIC service territory are split between the AIC Multifamily Program and another multifamily program approved through the Illinois Power Agency (IPA) procurement process (referred to as the IPA Multifamily Program). This chapter presents results from PY8 of the AIC Multifamily Program, which was implemented from June 1, 2015 to May 31, 2016, by implementation contractors Leidos and CLEARResult and their pool of program allies.

Together, the two programs offer AIC multifamily customers three program components: common area lighting (AIC and IPA), major measures for the building shell (AIC and IPA), and measures for tenant units (AIC only). CLEARResult's program allies deliver the major measures component, which includes lead generation, program enrollment, and completion of major measure installations. In contrast, CLEARResult delivers the direct install components themselves (common area lighting and in-unit), which include lead generation, program enrollment, and completion of direct installations (except for smart thermostats, which the implementer provides for property staff to install). Where applicable, CLEARResult and the program allies share leads with one another across the major measures and direct install components, so that property managers¹⁰ are exposed to all applicable measures. Further, from the customer perspective, these programs and their components function as one offering.

In terms of program delivery, the Multifamily Program provides all of the in-unit measures (CFLs for permanent light fixtures, faucet aerators, low-flow shower heads, and programmable thermostats); standard and specialty CFLs for common areas; and major measures, such as air sealing and attic insulation at buildings with gas heat.¹¹ As a result of PY8 installations, the Multifamily Program was expected to contribute 26.6% of the overall PY8 residential portfolio's electric savings (8,512 MWh) and 5.3% of the residential portfolio's gas savings (164,940 therms). These goals represented an increase relative to PY7.

Our evaluation of the Multifamily Program included impact and process assessments.¹² We reviewed program materials and program-tracking data and interviewed program administrators and implementation staff. Our quantitative research included surveys of property managers who completed upgrades through the program and of tenants living in upgraded units. We also collected and analyzed data to support updated net-to-gross ratios (NTGRs) for prospective application to the Multifamily Program's components. Below we present the key findings of the PY8 AIC evaluation.

¹⁰ We use the term "property manager" to refer to both property managers and property owners.

¹¹ The IPA Multifamily Program sponsors the remaining types of common area lighting (LED exit signs, linear fluorescents, modular CFLs, and occupancy sensors) and major measures for buildings with electric heat. The IPA Multifamily Program does not sponsor any in-unit direct installs.

¹² Several evaluation activities were completed in conjunction with the IPA Multifamily Program evaluation (program administrator and program implementer interviews, property manager survey, and net-to-gross ratio calculations for prospective application). The evaluation team provides results from the evaluation of the IPA Multifamily Program in a separate report.

Program Impacts

Overall, the ex post net savings from the PY8 Multifamily Program were 6,173 MWh, 1.21 MW, and 279,047 therms (Table 9). The evaluation team verified all program measures through a review of the program-tracking database, and applied NTGRs from the Illinois Statewide Technical Reference Manual for Energy Efficiency Version 4.0¹³ (IL-TRM V4.0). Based on this review, the program’s realization rates for gross savings range from 105% to 129%; differences between ex ante gross and ex post gross savings calculations are due to variances in savings assumptions for specific measures.

Table 9. PY8 Net Multifamily Program Impacts

	Ex Ante Gross	Gross Realization Rate	Ex Post Gross	NTGR ^a	Ex Post Net
Energy Savings (MWh)					
Total MWh	6,033	105%	6,306	0.99	6,173
Demand Savings (MW)					
Total MW	1.09	115%	1.25	0.97	1.21
Gas Savings (Therms)					
Total Therms	260,432	129%	335,926	0.84	279,047

^a The NTGRs are estimated at a measure level but are shown in aggregate for the program here.

Program staff achieved the PY8 Multifamily Program savings presented above through implementation of 1,128 projects at 1,724 multifamily buildings.¹⁴ Most participants completed projects through the in-unit component (N=599) or major measures component (N=462), with fewer completing common area lighting upgrades (N=67).

Relative to the PY7 program, which achieved net energy and demand savings of 8,306 MWh and 1.72 MW, respectively, the PY8 program achieved significantly lower savings (26% and 30% declines, respectively). However, the program’s gas savings increased by 17% from 239,163 therms in PY7 to 279,047 therms in PY8.

Key Findings and Recommendations

The Multifamily Program is achieving its stated goals to provide measures that enable energy savings and lower operating costs in market-rate multifamily housing. In PY8, the program achieved ex post net savings of 6,173 MWh, 1.21 MW, and 279,047 therms. While the program exceeded its gas savings goal, the program fell short of its electric savings goal despite increased participation garnered from additional marketing and expanding the pool of program allies. Program implementers attributed the savings shortfall to having installed a lower-savings mix of direct installation measures, with fewer direct installs at electric-fueled buildings than planned (and more at gas-fueled properties) and a less-efficient mix of CFL measures than planned.

The Multifamily Program functioned in PY8 similarly to previous program years, but a few small changes were made to meet the higher program savings goals. The first change was allowing additional program allies to support the electric major measures component. This change expanded the pool of allies from one (a large

¹³ Illinois Statewide Technical Reference Manual for Energy Efficiency Version 4.0. Effective June 2015.

¹⁴ The number of projects is smaller than the number of buildings because some project IDs encapsulated upgrades at multiple buildings.

statewide company) to a mix of several allies that included smaller regional companies. Overall, the implementer felt that the addition of local allies was beneficial. Second, given that the market is relatively mature, program administrators explored new program marketing opportunities and, as a result, delivered marketing presentations at several regional landlord-association meetings. According to program staff, these meetings were a “target-rich environment” that generated several new leads for the Multifamily Program.

Overall, program managers reported that the Multifamily Program operated smoothly and effectively in PY8. Moreover, interviews with participating property managers and their tenants suggest that participants were generally satisfied with all aspects of the program. The following findings and recommendations for the program are presented below:

- **Key Finding #1.** Outcomes of the PY8 evaluation found several small issues with the ex ante savings assumptions. In some cases, the program-tracking platform did not calculate ex ante savings in instances where measure records (programmable thermostats and major measures) were missing key project information that is used as inputs to savings calculations (e.g., HVAC equipment age and participant zip code/city). This caused the ex ante savings to underrepresent total savings.
 - **Recommendation.** It is imperative to ensure that the program-tracking platform does not mistakenly exclude measures with incomplete information from ex ante savings calculations. By strengthening a consistent commitment to quality assurance/quality control (QA/QC), the implementers can minimize these occurrences by reviewing data entry as well as the algorithms and the assumptions programmed in Amplify (the program-tracking database).
- **Key Finding #2.** Participating property managers and their tenants tended to be satisfied with their PY8 Multifamily Program experiences. For example, most participating property managers were highly satisfied with the program’s key features, including the available measure offerings, the specific measures that they received, the rebate or discount amount, the program staff, and the contractors that installed upgrades. About one-half of the property managers whom we spoke with thought that there was nothing that the program needed to change to improve. The minority of respondents who did offer suggestions indicated that the program could improve the property manager experience by offering more measures, by increasing the visibility and depth of program marketing, or by offering different contractors. Tenants also appeared to be happy with the measures that the program installed in their units.
- **Key Finding #3.** The program implementer and the program allies worked together to channel properties across major measures and direct install (in-unit, common area) components where applicable, but few properties (4%) participated in multiple components in PY8. Per the implementer, some property owners participate in multiple components across the span of multiple program years. Thus, the program’s cumulative level of cross-component participation is likely to be higher than what annual evaluation data represent. Some of the property managers who completed only major measures upgrades in PY8 expressed a relatively high level of interest in available common area and in-unit offerings, and some individual property managers provided survey responses indicating that they were unaware of program components that they did not participate in. As some property managers may return to complete additional components in future years, the program may be able to capture more savings by formalizing its cross-component marketing procedures.
 - **Recommendation.** Continue to promote collaboration between program allies and program implementers to ensure that all property managers are aware of all program components available to them. As the program brings in a growing number of program allies, program implementers may find it beneficial to formalize the process by which program allies share direct install opportunities

discovered at properties receiving major measures. The goal is to ensure that all property managers are consistently well informed about all types of savings opportunities.

- **Key Finding #4.** PY8 participants were generally satisfied with the mix of measures offered through the program, but they did suggest that the program could offer additional measures. For example, property managers who did not receive programmable thermostats through the PY8 program expressed moderate interest in both programmable thermostats and a potential new offering of “smart” thermostats. A minority of respondents suggested additional measures, including efficient windows and doors, HVAC upgrades, and insulation for walls and other parts of the building shell.
- **Key Finding #5.** Tenant self-reports suggested that, prior to program upgrades, incandescents and CFLs made up the majority of permanent fixture lighting, with a minority of LED and halogen lights in service. Most tenants interviewed for the evaluation were familiar with CFLs (96%) and many were already using them in at least a few of their unit’s permanent fixtures before the PY8 program (65%). In contrast, fewer tenants recalled using any LEDs in permanent fixtures (4%), and few recalled recently purchasing any LEDs. Although most markets are seeing declining opportunities for lighting savings as the market becomes more efficient and efficient lighting saturation increases, tenant survey data suggest that LEDs will offer a greater opportunity for in-unit lighting savings moving forward, compared to CFLs.
- **Recommendation.** Starting in PY10, the Multifamily Program is already planning to switch from a CFL-based in-unit offering to an LED-based in-unit offering. The results of this evaluation provide additional support for this change.

4.5 Residential Home Efficiency Standard

The Home Efficiency Standard (HES) Program is a home energy diagnostic and retrofit program that offers residential customers a home audit, an audit report and recommendations for retrofits, directly installed measures, and incentives for building shell retrofits. In particular, program participants may receive energy-efficient lighting, faucet aerators and shower heads, programmable thermostats, insulation, and air sealing.

While implementation staff do some marketing for the program, trade ally marketing efforts are the main source of customer recruitment. AIC customers can participate in the program in multiple ways, from completing an audit only, a retrofit only, or an audit plus retrofit. CLEAResult implements the HES Program with oversight from Leidos, which manages implementation of AIC’s energy efficiency portfolio.

The expected savings from this program was 2,489 MWh, 1.65 MW, and 407,607 therms, which represents 1% of the overall PY8 portfolio electric savings and 7% of therm savings (including both residential and commercial). CLEAResult also estimated that they would perform 2,000 audits, with 1,400 homes receiving retrofits.

For PY8, the evaluation team conducted a process and impact evaluation of the HES Program. However, AIC has decided to discontinue the HES Program after PY8 due to an estimated prospective Total Resource Cost (TRC) less than 1.0. Thus, the evaluation team conducted only a few process-related evaluation tasks to confirm that the program was implemented as planned and to collect feedback on challenges encountered.

Program Impacts

The program fell short of its participation goals, reaching 1,777 customers in PY8. This represents 1,087 audits and 873 home retrofit projects, which is 54% and 62% of the program’s audit and retrofit goals, respectively. Due to lower-than-expected participation, the program also did not meet its savings goals.

Overall, the program provided net savings of 1,174 MWh, 0.37 MW, and 181,178 therms. The program achieved gross realization rates of 91% for MWh savings, 99% for MW savings, and 97% for therms savings. Table 10 summarizes the impacts for the HES Program in PY8.

Table 10. PY8 HES Program Net Impacts

	Ex Ante Gross	Realization Rate	Ex Post Gross	NTGR ^a	Ex Post Net
Energy Savings (MWh)					
Total MWh	1,691	0.91	1,540	0.76	1,174
Demand Savings (MW)					
Total MW	0.51	0.99	0.51	0.74	0.37
Therm Savings					
Total Therms	248,735	0.97	241,534	0.75	181,178

^a The NTGRs are estimated at a measure level, but are shown in aggregate for the program above. We weighted the measure level NTGR scores by their total savings to calculate the program NTGRs.

Key Findings

Given the limited process evaluation conducted for the final year of this program, key process findings focus exclusively on changes made to the program’s implementation in PY8. In particular, program staff made changes to overcome barriers related to project paperwork, as well as to improve the quality of measure installations and data tracking. For example, CLEAResult streamlined the program’s application process by reducing redundancies in paperwork. The implementer also began using the Amplify database system, which staff believe will improve the accuracy of their data tracking. Finally, quality control issues in PY8 prompted CLEAResult to formalize a quality assurance and quality control (QA/QC) process, which included developing standardized inspection rates¹⁵ and disciplinary protocols for trade allies.

Despite the discontinuation of the HES Program due to an estimated prospective TRC of less and one, program staff note that the improvements to the QA/QC process have benefited other programs, such as the Multifamily and Home Efficiency Income Qualified (HEIQ)¹⁶ programs, by ensuring that each trade ally goes through the same standardized inspection. It is also important to note that the quality control issues identified in PY8 led to the suspension of one of the largest trade allies and, thus, adversely affected customer participation. This lower level of participation and the shifting of funds from the HES Program to the HEIQ Program are defining aspects of PY8 program delivery.

¹⁵ For each trade ally, the first five projects and 10% thereafter are inspected.

¹⁶ This program is referred to as the Moderate Income Program in the Plan 3 filing, but marketed as the Home Efficiency Income Qualified Program.

4.6 Residential Home Efficiency Income Qualified

The Home Efficiency Income Qualified Program (HEIQ), a home energy diagnostic and whole-house retrofit program, began as a pilot in PY3 and is in its fifth year of implementation. The target market for the HEIQ Program is AIC customers with homes heated by a fuel source (electricity or natural gas) provided by AIC and with a household income between 0% and 300% of federal poverty guidelines for household size. CLEAResult implements the HEIQ Program, reporting to Leidos, who manages all of AIC’s commercial and residential programs. Participants can join the program in one of two ways: by applying for a home audit through the program or by applying to the program through a trade ally.

The expected savings from this program is 2% of the overall PY8 portfolio of electric savings and 10% of PY8 portfolio therm savings (including both residential and commercial).¹⁷ Per the Program Implementation Plan, CLEAResult estimated it would serve 945 homes and complete 1,180 retrofits in PY8.

For PY8, the evaluation team conducted a process and impact evaluation of the HEIQ Program, which included research with participating and nonparticipating customers, trade allies, and program staff.

Program Impacts

With an increased implementation budgets of \$7,351,499 for electric and \$1,257,420 for gas¹⁸, the HEIQ Program reached 1,019 participants in PY8, nearly tripling participation rates from previous years. The program provided net savings of 3,047 MWh, 1.29 MW, and 568,483 therms. PY8 performance exceeded PY7, where the program achieved net savings of 873 MWh, 0.52 MW, and 210,250 therms. The HEIQ Program achieved gross PY8 realization rates of 98% for MWh, 97% for MW, and 99% for therms. The variance in net realization rates is due to differences in input values for ex ante (calculated by the implementation team) and ex post (calculated by the evaluation team) savings algorithms. Table 11 summarizes the net impacts for the HEIQ program.

Table 11. PY8 HEIQ Program Net Impacts

	Ex Ante Gross	Realization Rate	Ex Post Gross	Net-to-Gross Ratio (NTGR)	Ex Post Net
Energy Savings (MWh)					
Total MWh	3,098	0.98	3,047	1.00	3,047
Demand Savings (MW)					
Total MW	1.33	0.97	1.29	1.00	1.29
Therm Savings					
Total Therms	571,594	0.99	568,483	1.00	568,483

Key Findings and Recommendations

We identify the following areas for program improvement:

¹⁷ Note that the percentage of expected savings here and throughout the plan is calculated based on AIC Plan 3 Compliance Filing from Docket 13-0498, dated January 28, 2014.

¹⁸ Source: Ameren Illinois Program Year Eight Implementation Plan Sec. 8-103/8-104, December 4, 2015.

- **Key Finding #1.** Through the trade ally interviews, we learned that filling out paperwork is not only time-consuming but also has prevented some contractors from running all of their qualified projects through the program (if the customer needs a quick project turnaround, for example). Extended lead times on payments could discourage and limit program participation.
 - **Recommendation.** Reducing the administrative burden on trade allies would help make the program more attractive and increase satisfaction with the program. As such, we suggest looking for additional ways that this process can be streamlined. Part of this streamlining should include looking for opportunities to reduce the amount of time it takes to pay trade allies.
- **Key Finding #2.** In their interviews, trade allies revealed that many customers' homes had major energy inefficiencies (e.g., windows or doors that did not close properly). This finding is underscored by the survey data from program participants where "windows" emerged as one of the most popular responses to the question about what measures were of interest to them.
 - **Recommendation.** We recommend that AIC consider partnering with other organizations in its territory that could provide support to customers with measures that are not covered by the program.
- **Key Finding #3.** By mapping program participation over the last four years, the evaluation team identified areas within AIC's territory with a high density of low-income homeowners, but historically scant program delivery.
 - **Recommendation.** We recommend that AIC staff begin incorporating the interactive mapping tool that we have provided into future program planning. By carefully examining areas of relatively low participation, the AIC team can begin to determine the best approach to increase participation in those areas.
- **Key Finding #4.** AIC customers reported that they are willing to provide a \$25 to <\$100 co-payment for an audit. However, trade allies were dubious about customers' willingness and ability to provide a co-payment.
 - **Recommendation.** We recommend that if AIC introduces a co-pay, that it is less than \$100. Further, AIC may want to customize the co-pay amount on a sliding scale from \$25 to <\$100 so that households of less means receive the assistance that they need.
- **Key Finding #5.** Per our ex post savings calculations, the evaluation team identified several discrepancies in savings assumptions between the ex ante and ex post savings calculations.
 - **Recommendation.** To increase the accuracy of tracked savings (and improve realization rates), we recommend that the HEIQ Program adopt the ex post assumptions and savings calculations used by the evaluation team.
- **Key Finding #6.** The evaluation team found a few discrepancies in ex ante calculations where per-measure savings were used in place of the total ex ante savings or different variable assumptions were used instead of what was planned.
 - **Recommendation.** We recommend reviewing the syntax language to verify that all algorithms and variable assumptions are referenced correctly.
- **Key Finding #7.** The evaluation team identified some instances where data across the program-tracking database did not agree. For example, measure labels that indicate heating fuel types do not

always match the heating fuel type provided in the database, heating and cooling HVAC equipment are not always aligned, pre- and post-installation R-values for insulation measures are sometimes reversed, and data were provided that did not accurately reflect characteristics of the installed measures (such as actual pre- and post-insulation R-values in the PY8 program-tracking database).

- **Recommendation.** We recommend reviewing the program-tracking databases prior to submitting to the evaluation team to minimize these types of discrepancies.

4.7 Residential ENERGY STAR® New Homes

During PY8, Leidos administered the ENERGY STAR® New Homes Program and CLEAResult implemented it. The program offered builders training, technical information, and financial incentives for the construction of single-family homes and duplexes that achieved a Home Energy Rating System (HERS) index of 65 or lower (a lower HERS index indicates a more efficient home). Participating builders hired a HERS rater to verify savings achieved through energy-efficient practices and equipment. AIC discontinued incentives for newly constructed multifamily properties (i.e., three units or more), during the prior program year (PY7) and ended the ENERGY STAR New Homes Program at the conclusion of PY8 (June 1, 2016).

To assess PY8 performance, the evaluation team conducted in-depth interviews with program staff and participating builders, reviewed building simulation models (REM/Rate) predicting energy savings using specific home characteristics compared to baseline homes, and analyzed the tracking database. Based on AIC's PY8 implementation plan, expected program savings made up 0.1% of the overall PY8 portfolio electric savings and 1.8% of PY8 portfolio natural gas savings.

Program Impacts

Table 12 summarizes the electric and gas savings from the PY8 ENERGY STAR New Homes Program. The evaluation team calculated ex post gross savings by verifying building simulation model runs for participating homes in the program. The program achieved ex ante gross savings of 697 MWh and 62,494 therms and ex post gross savings of 532 MWh and 113,214 therms. As in previous years, compared to planning assumptions, more savings were achieved through gas measures than electricity measures. Ex post gross electric and demand impacts fell short of ex ante planning estimates with realization rates of 76% and 79%, respectively. However, the natural gas realization rate was 181%. While this was due to multiple factors, including home size and changing market conditions, the most important was the high occurrence of gas savings measures applied to gas-heated homes, which increased the ex post savings. In gas-heated homes, over 90% of the energy savings was gas savings. The most common measures applied to gas-heated homes were high efficiency furnaces and tank-less water heaters, both of which offer significant energy savings over federal minimum requirements. In contrast, ex ante savings based on implementer-assumed energy usage¹⁹ and adjusted savings ratios for the 2012 energy code, assumed an equal proportion of gas and electric energy savings within each home. The ex post gross savings were then multiplied by the SAG-approved NTGR of 1.01 to produce the net energy and demand impacts.

¹⁹ Program ex ante energy savings are a deemed savings value based on an assumed energy usage of a HERS 100 home adjusted to the baseline and target HERS score using a percentage reduction of the assumed energy usage values.

Table 12. PY8 ENERGY STAR New Homes Program Net Savings

	Ex Ante Gross	Realization Rate	Ex Post Gross	NTGR	Ex Post Net
Energy Savings (MWh)					
Total MWh	697	0.76	532	1.011	538
Demand Savings (MW)					
Total MW	0.196	0.79	0.154	1.011	0.156
Therms Savings					
Total Therms	62,494	1.81	113,214	1.006	113,893

Note: realization rate = ex post gross savings ÷ ex ante gross savings.

In January 2016, the State of Illinois implemented the 2015 Illinois Energy Conservation Code (IECC), effectively raising the program’s baseline. In June 1, 2016, AIC discontinued the program because it was no longer cost-effective given the changes in the home performance baseline to IECC 2015.

Key Findings and Recommendations

The PY8 ENERGY STAR New Homes Program delivered 577 single-family homes, achieving 125% of its goal and a 38% increase over single-family homes completed in PY7. The program also achieved an increase in the number of completed homes that achieved a higher-efficiency HERS rating of 46–55 (62%) compared to PY7 (43%). Of the 577 homes that qualified for program incentives, 107 (18%) achieved ENERGY STAR certification, a slight increase from PY7 (15%). As in PY7, builders continued to report high satisfaction levels with the program. Builders said homebuyers’ interest in energy efficiency have increased slightly over the past year, though customers still seldom ask about it.

As noted above, at the end of PY8, AIC decided not to pursue the program in the future. As the evaluation team has seen in other parts of the country, new homes programs must find a balance between ever-increasing building codes and standards and cost-effectively incenting builders to build significantly above the baseline to capture additional energy savings (which can be expensive and difficult for builders to recover in a new home’s sale price). Additionally, the intent of the IECC is to require the installation of cost-effective energy upgrades—leaving little room for AIC to incent builders to exceed the IECC.

Despite the ENERGY STAR New Homes Program’s discontinuation in PY9, the evaluation team offers the following program conclusions and recommendations to assist AIC if it considers revising and restoring the program in future years.

- **Key Finding #1.** Program incentives alone are not driving builders to build well above the IECC. Rather, it appears to be the incentives in conjunction with the ever more stringent energy codes that are driving builders to reach the higher incentive tiers. Builders typically build new homes with direct venting for heating and water heating equipment because those systems provide greater design flexibility. However, while the equipment is more expensive, the total cost²⁰ can be lower than older atmospheric venting systems. Direct venting (and condensing) heating and hot water heating equipment are inherently more fuel efficient than the federal minimum efficiency standards. With the adoption of

²⁰Atmospherically vented gas equipment requires a well-designed venting system since it relies on gravity and the lower density of the hot exhaust to properly vent the combustion gasses. While many factors can be considered when builders and architects choose the type of venting systems, the flexibility and simplicity of direct venting systems make these more preferable.

IECC 2015, most envelope improvement measures that go beyond the code do not prove cost-effective for builders. Nevertheless, incremental efficiency increases in heating and water heating equipment are less expensive than envelope improvements and therefore become attractive measures for meeting program HERS requirements.

- **Recommendation.** Inform builders they can still qualify for Heating and Cooling Program rebates, even though the ENERGY STAR New Homes program is ending. Additionally, as the price of ductless heat pumps decreases and availability becomes more available, explore incentives for these systems, specifically with homebuilders. Multi-zone ductless systems continue to become increasingly popular for efficient homes, especially when the energy code requires a very well-insulated envelope. This means a home’s heating demands can become sufficiently low to make high-efficiency ductless systems a viable option.²¹ Additionally, as builders favor high-efficiency water heating systems, explore this option as a possible addition to existing programs.
- **Key Finding #2.** Cadmus’ experience evaluating new homes programs and the AIC builder interviews found that homebuyers do not make purchasing decisions based on energy efficiency since they do not perceive the added value of program-homes and assume all new homes are energy-efficient. Builders need AIC’s support to educate the public and distinguish the value of their program homes.
- **Recommendation.** Should the program become cost effective in the future, increase program advertising and consider developing public education and awareness programs that encourage home buyers to look for and ask about energy efficiency features beyond ENERGY STAR appliances.

4.8 School Kits

Through the Residential Energy Efficiency School Kits (School Kits) Program, AIC distributes kits (containing energy-efficient items) during on-site presentations to fifth through eighth grade students. Beginning in PY8, Leidos contracted with AIC to provide program oversight. Leidos subcontracts with CLEARResult to implement the program and Energy Federation Incorporated (EFI) to compile and deliver kits to schools. The program seeks to increase sales and awareness of ENERGY STAR®-qualified lighting products, along with other AIC energy efficiency offerings. The School Kits Program provided energy efficiency kits to 7,539 students in PY8 (June 1, 2015–May 31, 2016).

As shown in Table 13, the kits contained CFLs, faucet aerators, and shower heads, along with instruction materials explaining how to properly set water heater temperatures. School Kits Program materials also asked student participants to complete a (program-administered) web-based student participant survey to verify the installation of energy-efficient items based on an activity worksheet that they take home to complete with the assistance of their parent or guardian.²²

Table 13. PY8 School Kits Products

Product	Quantity per Kit
13-Watt CFL	2
1.0 Gallons per Minute (GPM) Bath Faucet Aerator	1

²¹ <http://www.greenbuildingadvisor.com/blogs/dept/musings/just-two-minisplits-heat-and-cool-whole-house>

²² For the remainder of this report, “parent” will be used to refer to either “parent” or “guardian.”

Product	Quantity per Kit
2.0 GPM Kitchen Faucet Aerator	1
1.75 GPM High-Efficiency Shower Head	1
Hot Water Temperature Card Thermometer	1
Instructional Materials	N/A

Leidos’ implementation plan assumed energy savings of 235 annual net kWh and 9.55 annual net therms per kit, for a combined 7,500-kit net savings goal of 1,763 MWh and 71,625 therms.²³ The plan specified the following program objectives:

- Increase awareness of energy efficiency and conservation
- Increase energy efficiency for targeted students and their families through simple home energy efficiency tools and measures

Program Impacts

Table 14 summarizes the PY8 School Kits Program’s net energy and demand savings of 728 MWh, 0.135 MW, and 24,518 therms. To determine gross savings and net realization rates, the evaluation team applied deemed per-unit gross savings inputs set forth in the Illinois Statewide Technical Reference Manual (IL-TRM) V4.0, in combination with the following:

- PY8 School Kits Program installation rates and water heater fuel saturations (derived from the implementer-administered web-based student participant survey results)²⁴ for program measures
- Application of the Stakeholder Advisory Group’s (SAG) approved net-to-gross ratio (NTGR) for this program
- Additionally for PY8,²⁵ the evaluation team included net savings for delayed CFL installations attributed to the PY7 School Kits Program.

As a result, the program achieved the gross and net savings shown in Table 14. The low gross realization rates for non-CFL measures are primarily because the ex ante installation rates are considerably higher than the ex post installation rates, which are based on evaluated results (from PY7).

²³ Program Year Eight Implementation Plan, “School Kits Program Plan.” Received July 27, 2016. Page 1.

²⁴ Except CFLs, where the evaluation team applied the prescribed 61% first-year installation rate from IL-TRM V4.0.

²⁵ Delayed 13-watt installations by PY7 School Kits Program participants, estimated as installed during the PY8 program year (in accordance with IL-TRM V3.0), were credited to the final PY8 School Kits Program net impacts.

Table 14. PY8 Net School Kits Program Impacts

	Ex Ante Gross	Realization Rate	Ex Post Gross	NTGR	Initial PY8 Ex Post Net	PY7 Ex Post CFL Net Savings Realized in PY8	PY8 Ex Post Net
Energy Savings (MWh)							
Total MWh	1,163	64%	745	0.98	728	54	782
Demand Savings (MW)							
Total MW	0.207	65%	0.135	1.01	0.135	0.006	0.141
Energy Savings (Therms)							
Total therms	40,252	59%	23,592	1.04	24,518	0	24,518

Key Findings and Recommendations

The PY8 School Kits Program delivered 7,539 kits to students, exceeding its PY8 goal by 1%. In its third year, nearly half of the program’s participating schools (31 of 66) also participated during PY7, and most teachers completing the implementer’s teacher survey expressed interest in participating in the PY9 program. AIC, Leidos, and CLEAResult program staff coordinated planning and implementation efforts, frequently communicating throughout the program year.

During the evaluation team’s process review, utility and implementation staff reported that they were highly satisfied with PY8 program performance. These stakeholders reported that the program was successful and that they do not plan to change the program for PY9. Stakeholders also reported that operations ran smoothly, without significant issues.

Based on this research, the evaluation team provides the following key findings and recommendations:

- **Key Finding #1.** While the implementer-administered web-based student participant survey response rate increased to 33% in PY8 (from 23% in PY7), this remains lower than the 55% response rate for PY6 and lower in comparison with other similar Midwestern programs. Student response rates typically depend on teachers’ encouragement levels and associated completion requirements. As student survey data directly inform program impacts (e.g., installation rates and water heater saturations), increased response rates will lead to more-accurate savings calculations.
- **Recommendation.** Consider revising incentives for student survey completions. Instead of providing incentives to schools with the best response rates, provide incentives to individual teachers whose classroom (i.e., students) meets a minimum response rate. For teachers who have participated in the past, consider offering incentives for improved response rates. A tiered incentive (e.g., \$20 for returning any surveys, \$50 for returning 50% of a classroom’s surveys, and \$100 for returning 80% of a classroom’s surveys) may encourage teachers to emphasize the importance of student survey completion.
- **Recommendation.** Program staff could revise delivery tactics to increase response rates (e.g., emailing teachers directly to remind them to complete the student survey activity or encouraging teachers to consider using the activity worksheet and installations as homework assignments).
- **Key Finding #2.** Implementation staff struggled with recruiting new schools, particularly in the territory’s underserved regions (i.e., rural schools). Teachers in rural areas may not attend the teacher conferences used to recruit schools, and difficulties arise in cost-effectively reaching rural schools (with fewer students) and schools bordering the service territory.

- **Recommendation.** Develop participation targets to focus program staff on reaching new, underserved markets.
- **Recommendation.** Consider conducting special, direct outreach with rural school administrators to target new schools in underserved regions.
- **Key Finding #3.** As recommended in the PY6 and PY7 evaluation reports, the program implementer updated the implementer-administered web-based student participant survey to collect water heater saturation and demographic data for PY9. However, the revised student survey does not include all information useful in assessing program free-ridership, such as parents' likelihood to change water heater temperature settings or purchase the kit's contents in the absence of the program. Cadmus developed parent postcards to obtain permission to collect this information, but few parents have returned the postcards to date.
 - **Recommendation.** To evaluate program free-ridership, consider including a request in the parent letter to return the postcard. Stress to teachers the importance of collecting the parent postcard in order to evaluate the program's energy savings.
- **Key Finding #4.** The low gross realization rates for shower heads and hot water temperature card thermometers are primarily because the ex ante installation rates are considerably higher than the ex post installation rates. The evaluation team used installation rates derived from the PY8 School Kits Program implementer-administered web-based student participant survey, in accordance with the PY8 Evaluation Plan, to calculate ex post savings.
 - **Recommendation.** Calculate future ex ante savings using the ex post installation rates from this evaluation report or the most current relevant evaluation.
- **Key Finding #5.** The implementer did not calculate separate savings estimates for different aerator types and used IL-TRM V4.0 inputs associated with an "Unknown" aerator type, thus overestimating bath faucet aerator savings and underestimating kitchen faucet aerator savings.
 - **Recommendation.** Calculate separate ex ante per-unit savings for bath faucet aerators and kitchen faucet aerators.

4.9 C&I Standard

According to the PY8 Implementation Plan, AIC expected savings from Commercial and Industrial (C&I) Standard Program for electric and gas energy efficiency (referred to as the Standard Program) to account for 37% of the overall portfolio electric savings and 30% of overall portfolio therm savings (including both residential and commercial programs).

The Standard Program offers AIC business customers fixed incentives for the installation of specific energy efficiency measures. The Core Program covers lighting, variable frequency drives (VFDs), HVAC equipment, refrigeration/grocery equipment, commercial kitchen equipment, steam traps, and other measures. Leidos is the main program implementer.

Additionally, the Standard Program includes the Ameren Illinois Business Customer Online Store (Online Store) offering that is available to all electric business customers. The Online Store, maintained by Energy Federation, Inc. (EFI), offers a variety of energy-saving lighting products, including CFLs, LEDs, and occupancy sensors, as well as smart power strips. The program also continued its Green Nozzle initiative in PY8, which is a relatively small offering that provides free efficient water nozzles to gas customers and to customers in the food service

sector who use electric or natural gas water heating. Finally, in PY8, the program expanded its midstream lighting pilot program (introduced in PY7) into a full Instant Incentives offering, providing incentives to customers purchasing lighting at lighting distributor retail locations to help increase the market share of efficient lighting products.

Our evaluation of the Standard Program included impact and process assessments. We reviewed program materials and program-tracking data, interviewed program administrators and implementation staff, interviewed a variety of Standard Program partners (Energy Advisors, Program Allies, and Instant Incentives distributors), and conducted other research. Our quantitative research included surveys of customers who purchased lighting through the Instant Incentives program and the Online Store. We also collected and analyzed data to support updated net-to-gross ratios (NTGRs) for prospective application to the Online Store and the first NTGR of the Instant Incentives offering, also for prospective application.

Below we present the key findings of the PY8 evaluation.

Program Impacts

Our participant verification activities showed that AIC is accurately tracking the measures installed. As shown in Table 15, the electric and gas gross realization rates for all program components are close to 100%. As outlined in the evaluation plan, the team applied Illinois Stakeholder Advisory Group (SAG)-approved NTGRs to the program's gross savings to develop estimates of net savings. Table 15 also provides the PY8 Standard Program gross and net impacts. The PY8 Standard Program achieved 75,850 MWh and 11.782 MW in net electric savings and 3,058,659 therms in net gas savings. This level of savings enabled the program to meet its internal PY8 electric goals and greatly exceed its internal gas goals.

Table 15. Standard Program Impact Summary

Savings Category	Ex Ante Gross	Realization Rate	Ex Post Gross	NTGR	Ex Post Net
Energy Savings (MWh)					
Core Program	88,560	100.1%	88,638	0.78	69,400
Instant Incentives	6,207	81.5%	5,060	0.77	3,888
Online Store	2,934	105.0%	3,081	0.83	2,557
Green Nozzle	5	100.0%	5	0.92	4
Total MWh Savings	97,706	99.1%	96,784	N/A	75,850
Demand Savings (MW)					
Core Program	13.281	100.0%	13.286	0.78	10.376
Instant Incentives	1.208	81.6%	0.985	0.77	0.757
Online Store	0.712	109.8%	0.781	0.83	0.648
Green Nozzle	0	N/A	0	N/A	0
Total MW Savings	15.200	99.0%	15.052	N/A	11.782
Gas Savings (Therms)					
Core Program	3,406,745	100.0%	3,406,423	0.90	3,058,060
Instant Incentives	0	N/A	0	N/A	0
Online Store	0	N/A	0	N/A	0
Green Nozzle	673	100.0%	673	0.89	599
Total Therm Savings	3,407,418	100.0%	3,407,096	N/A	3,058,659

Note: Due to rounding, not all totals sum to 100.

Key Findings and Recommendations

AIC successfully implemented the Standard Program in PY8 and met both its electric and gas savings goals. Although program participation decreased by 16% relative to PY7, the program’s gross energy savings increased by 13%; growth in energy savings continues trends of the past few years. The program’s measure mix remained similar to past years; namely, lighting projects represented around three-quarters of all projects completed through the program, and the Core Program represented the vast majority of all Standard Program savings. AIC made only a few minor adjustments to the Standard Program during PY8. The most notable change was expanding the midstream Instant Incentives program from a pilot to a full offering.

Program stakeholders with whom we spoke as part of this evaluation reported few barriers to participation or problems with program processes. AIC received positive feedback from key program support stakeholders including the Standard Program’s Program Allies, Energy Advisors, and midstream lighting distributors that distributed the Instant Incentives offering. Participating lighting distributors interviewed as part of this evaluation were supportive of the full-scale offering overall, but did offer several minor adjustments that AIC could make to streamline delivery as the offering matures. Customers who purchased lighting through the midstream Instant Incentives offering were also satisfied with their experiences overall. In terms of the Online Store, AIC received positive feedback from business customers who purchased lighting online, as it has in past years. Overall, the high customer and stakeholder satisfaction levels, combined with savings realization rates near 100%, indicate that the AIC Standard Program is running smoothly.

Based on our research, we provide the following recommendations for the program:

- **Finding #1.** Our impact evaluation found electric and gas gross realization rates of 100% or nearly 100% for the program, indicating that the program is tracking its savings and projects carefully. However, we continue to find minor discrepancies in the database (detailed in the impact section) including wattage assumptions that do not reflect the latest TRM updates and incorrect formulas used for some measures.
 - **Recommendation.** While these issues remained very minor, we recommend incorporating all Illinois Statewide Technical Reference Manual Version 4.0 (IL-TRM V4.0) updates and applying the correct measure assumptions consistently across all measures to ensure AIC continues achieving high realization rates moving forward.
- **Finding #2.** Participants learn about the program in a variety of ways, including through contractors; AIC key account executives (KAEs); the program website; or through direct marketing, such as emails or bill inserts. Energy Advisors noted how opportunities may be lost if marketing efforts do not reach the right audience or marketing materials do not make it into the hands of decision makers.
 - **Recommendation.** The program should continue to diversify its marketing and outreach efforts to ensure that it is reaching all types of businesses and the decision makers within those businesses.
- **Finding #3.** Program Allies are generally satisfied with their participation in the program, including the process of participating, the measures, the incentives, and program staff interactions. According to Program Allies, the program has not had a significant impact on their business practices, although a few interviewed allies noted that they have seen a positive increase in their sales since becoming a Program Ally.
- **Finding #4.** The first full year of the Instant Incentives offering went relatively smoothly, with overall high levels of satisfaction from participating lighting distributors and customers. In-depth interviews with about 33% of the PY8 distributors (n=27) and a web survey of 131 end-users and contractors who purchased lighting through the program identified several opportunities for AIC to streamline the offering moving forward. Key improvements, in the eyes of distributors, relate to the approved product list, as this aspect posed the biggest hurdle to seamless participation during PY8. Individual suggestions related to the processes of approving new products throughout the program year, improving the way AIC communicates changes to the approved product list to distributors, and switching to a sortable product list format for enhanced ease of use.
 - **Recommendation.** To improve lighting distributors' ease of participating in the Instant Incentives offering, AIC should consider how it can enhance the approved product list and streamline the process for updating it throughout the program year. First, we recommend providing distributors with a spreadsheet-based approved product list that enables sorting by product SKU, product type, and other attributes. Further, to the extent possible, we recommend AIC consider how it can streamline the processes of approving new products throughout the program year, and what type of product list update schedule could balance distributors' needs for predictability and adaptability.
- **Finding #5.** As it has in the past, the Online Store is working smoothly and is reaching its intended audience of small business customers. PY8 participants primarily identified themselves as relatively "small" or "medium" sized businesses for their industry. Participants considered the Online Store a convenient way to access discounted lighting products, were generally happy with their shopping experiences, and often expressed interest in using the Online Store again in the future. While AIC uses

the Online Store to expose customers to information about other savings opportunities (e.g. Instant Incentives distributors), PY8 participants expressed a low likelihood of participating in other AIC programs. Among the small number who had participated in another offering, few indicated that their Online Store participation played a role in their decision to do so. While this may point to an opportunity for the program to provide more active cross-program channeling, it is also possible, as suggested by survey responses, that the Online Store captures a different market segment than the Core Program.

- **Recommendation.** If AIC wishes to provide more active cross-program channeling, it could provide more-targeted marketing, such as suggesting other programs based on the customers' interaction with the website, e.g., promoting the Instant Incentives offering to customers who attempt to purchase quantities of lighting products in excess of the Online Store's purchasing limits.
- **Finding #6.** While not a major source of participant dissatisfaction, Energy Advisors suggested that the application process may be further streamlined.
- **Recommendation.** Suggestions to improve the application process included allowing customers to enter information online once so that it does not need to be entered repeatedly for multiple applications, thereby increasing the speed of the review process.

4.10 C&I Custom

In PY8, AIC expected the Custom Program to account for 45% of the overall portfolio electric savings and 13% of portfolio therm savings.²⁶ Savings from the Custom Program come from the core Custom Program, the Competitive Large Incentive Project (CLIP) offering, and New Construction Lighting.²⁷ The Custom Program also provides several special program offerings (Staffing Grants, Feasibility Studies, Strategic Energy Management, and the Metering and Monitoring Pilot) but the program does not claim direct savings for these offerings.

To support the process evaluation, we interviewed Staffing Grant, Competitive Large Incentive Project (CLIP) incentive recipients and participants in the Metering & Monitoring Pilot, as well as Energy Advisors²⁸, program allies, and program staff. We also reviewed program implementation and marketing materials. Impact evaluation research efforts included on-site visits to verify custom equipment performance and interviews with recipients of CLIP incentives and Staffing Grants. Additionally, the evaluation team conducted computer-aided telephone interviews (CATI) with PY8 participants of the Custom Program to support both the impact and process analyses. Below, we present the key findings from the PY8 evaluation.

²⁶ Based on the PY8 Implementation Plan.

²⁷ While AIC processes small-scale new construction projects through the Standard Program, lighting and large-scale HVAC projects are processed through the Electric 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.

²⁸ The AIC Business Program has seven regional Energy Advisors who market and support energy efficiency projects to AIC commercial and industrial customers. The Energy Advisors help customers identify and address opportunities for energy efficiency through participation in the Standard, Custom, and Retro-Commissioning programs.

Impact Results

Overall, the Custom Program performed well in PY8. As shown in Table 16 below, the program achieved 109,884 MWh in ex post gross electric savings and 948,719 therms in ex post gross gas savings.²⁹ The program achieved realization rates of close to 100% in PY8, which is an improvement from PY7.

Table 16 also provides the PY8 Custom Program ex post net impacts. As outlined in the evaluation plan, the team estimated net savings by applying Illinois Stakeholder Advisory Group (SAG)-approved net-to-gross ratios (NTGRs) to ex post gross savings for all of the program’s components, except those performed by CLIP and Staffing Grant participants, for which we developed project-specific NTGRs. The Custom Program achieved 89,456 MWh in net electric savings and 807,973 therms in net gas savings in PY8. This level of savings enabled the program to exceed both its PY8 electric and gas goals.³⁰

Table 16. Custom Program Impact Summary

Savings	Ex Ante Gross	Realization Rate	Ex Post Gross	NTGR ^a	Ex Post Net
Energy Savings (MWh)					
Total MWh	111,289	99%	109,884	0.813	89,456
Demand Savings (MW)					
Total MW	12.5	97%	12.1	0.814	9.8
Gas Savings (Therms)					
Total Therms	806,747	118%	948,719	0.852	807,973

^a Blended NTGR based on SAG-approved NTGR values (0.751 for electric and 0.830 for gas) for all Custom Program projects except those completed through the CLIP and Staffing Grant initiatives, for which a project-specific NTGR was applied retrospectively to PY8 CLIP and Staffing Grant projects based on PY8 research.

While the program realized somewhat lower MWh and therm savings in PY8 compared to PY7, this is largely due to the unusually high level of savings claimed in PY7 and a certain level of year-to-year variation can be expected due to the large, unique projects characteristic of a Custom C&I program.

Process Results

Now in its eighth year, the program’s structure and implementation has remained relatively stable with several changes to special offerings and some small adjustments to the general electric and gas programs. Satisfaction with the program remains very high, with participant survey respondents providing an average overall program satisfaction rating of 8.7 on a scale of 0 to 10, with 0 meaning very dissatisfied and 10 meaning very satisfied. Interviews with participants of the CLIP, Staffing Grant, and Metering and Monitoring offerings provided similarly high levels of satisfaction with all elements of program participation.

²⁹ “Ex post” refers to the estimated impact found by the evaluation team.

³⁰ 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.

In an effort to meet its savings and participation goals as well as to ensure positive participant experience, AIC continues to fine tune the program. The program has expanded its offerings in recent years to better serve different types of customers and to facilitate consistent levels of participation and savings over time.

Conclusions and Recommendations

Our research found that PY8 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.** The program achieved ex ante to ex post gross realization rates of close to 100% in PY8, which is an improvement from PY7. The majority of significant adjustments to ex ante gross savings were made to small, not large, projects. In order to maintain high realization rates in the future, we recommend the following:
 - **Recommendation.** The program may consider an additional incentive or rebate for ensuring controls are properly commissioned. This can help ensure that controls are not left to be set by customers without the expertise needed to properly commission the system.
 - **Recommendation.** Whenever possible, we suggest utilizing kW metering for any pre- or post-project measurement and verification (M&V) completed. This will reduce any instances of incorrectly assumed power factors. In the event that kW cannot be directly metered, the program should obtain careful measurements of the power factor during the site visit. Additionally, when using measured amp data, the loading of the metered motor must be examined so that power factors can be adjusted if the motor is under lower loading conditions.
 - **Recommendation.** We recommend reviewing the gas usage of the entire facility carefully to separate out any constant loads from space heating loads. This will ensure that the proper loads are utilized in space heating calculations for boiler efficiency projects.
- **Finding #2.** Participants learn about the Custom Program in a variety of ways, including through contractors, AIC key account executives, or through direct marketing such as emails or bill inserts. Both Energy Advisors and program participants noted how opportunities may be lost if marketing efforts do not reach the right audience or marketing materials do not reach decision makers.
 - **Recommendation.** The program should continue to diversify its marketing and outreach efforts to ensure that it is reaching all types of businesses and the decision makers within those businesses.
- **Finding #3.** All participants of the metering and monitoring pilot expressed high satisfaction with the pilot and expressed interest in seeing the program expanded. Participants would like to see the program expanded so that they can add more sub-meters and further isolate savings opportunities, or expand their metering and monitoring program to other facilities within their organizations.
 - **Recommendation.** The metering and monitoring pilot offers an opportunity for repeat participants to identify new savings opportunities as the most obvious improvements may have already been made. AIC could consider providing a bonus incentive for analytic software as a component of the pilot as one method of helping to maximize potential savings.
- **Finding #4.** The Business Program offers a variety of initiatives and, as a result, some participants noted difficulty coordinating between the different offerings. For example, one Staffing Grant participant had to first receive confirmation of the Staffing Grant funds before they could pursue other

Business Program offerings for the same projects, which led to some uncertainty about the project's funding and timing.

- **Recommendation.** To the extent possible, the program should be aware of common crossover points within the Custom Program and other Business programs and provide guidance to customers participating in multiple offerings to ensure smooth participation as well as to maximize savings.
- **Finding #5.** While not a major source of dissatisfaction, both participants and Energy Advisors suggested that the application process could be further streamlined.
- **Recommendation.** Suggestions to improve the application process included the ability for customers to pre-populate parts of the online application so that it does not need to be entered repeatedly for multiple applications and increasing the speed of the review process.

4.11 C&I Retro-Commissioning

The Retro-Commissioning Program is one of three in AIC's C&I portfolio, which also includes the Custom and the Standard programs. PY8 ran from June 1, 2015 through May 31, 2016. The Retro-Commissioning Program helps AIC business customers evaluate their existing mechanical equipment, energy management, and industrial compressed air systems to identify no-cost and low-cost efficiency measures to optimize energy systems. Customers contract with preapproved Retro-Commissioning Service Providers (RSPs) to perform an energy survey, resulting in a written report detailing the savings opportunities. Following verified implementation of measures with a payback of less than 12 months, AIC pays an incentive that covers 70%–80% of the energy survey cost, based on the project type. A further implementation incentive is paid to the customer based on the energy saved, and a bonus is paid to the RSP based on timely measure implementation and energy saved.

For PY8, AIC planned to garner 5% of portfolio electric energy savings and 5% of portfolio therm savings from this program. The program had a net electric savings goal of 8,441 MWh and a net gas savings goal of 333,359 therms. The program achieved 9,854 MWh in ex post net electric savings and 413,492 therms in ex post net gas savings, easily meeting both its electric and therm goals in PY8.

A secondary goal of the Retro-Commissioning Program is the identification of retrofit and capital improvement projects that can be channeled to the Standard and Custom incentive programs offered by AIC. AIC offers an additional bonus to customers who complete a Custom project within a year of having completed a retro-commissioning study.

The PY8 evaluation includes gross impact results plus a limited process assessment. Our quantitative impact research included engineering reviews of a census of PY8 retro-commissioning projects plus on-site inspection and verification of measures for a sample of projects.

The process evaluation involved reviewing program materials and program-tracking data and interviewing program managers and two experts experienced with comparable retro-commissioning programs in other jurisdictions.

Below we present the key findings of the PY8 evaluation.

Program Impacts

Table 17 summarizes reported and verified program participation. A total of 19 projects were completed in the PY8 program, a small increase from a total of 16 in PY7. Among the 19 projects, there were 18 unique customers, with one customer completing two healthcare projects. Two projects saved both electricity and gas at a given site – one at a healthcare facility and one at an industrial facility. Two other projects were gas-only. All other projects completed in PY8 were industrial customers saving only electricity. Five customers took steps to begin participation in the program with initial assessments to determine retro-commissioning feasibility, and AIC paid the RSP a small incentive, referred to as a “stipend,” for this task. Since stipend costs occurred in PY8, they will be included in program cost-benefit analysis, although there are no projects or impacts associated with these sites in PY8.³¹

Table 17. PY8 Retro-Commissioning Program Participation Summary

Program Component	Unique Customers	Unique Projects	Ex Ante Gross Electric Savings		Ex Ante Gross Gas Savings	
			MWh	%	Therms	%
Compressed Air	15	15	10,619	87%	0	—
Industrial Refrigeration	0	0	0	—	0	—
Large Facility	3	4	1,520	13%	514,070	100%
<i>Healthcare</i>	2	3	1,032	9%	423,428	82%
<i>Commercial</i>	1	1	488	4%	90,642	18%
Grocery	0	0	0	—	0	—
Total	18	19	12,139	—	514,070	—

The evaluation team performed an engineering desk review of all 19 projects (including both healthcare projects with gas savings), as well as on-site visits for six projects, to obtain gross realization rates for the program savings. The evaluation team modified the program ex ante gross savings for several reasons, although ultimately the gross realization rates were relatively high (88% for MWh savings, 100% for MW savings, and 88% for therm savings).

The evaluation team applied net-to-gross ratios (NTGRs) approved by the Illinois Stakeholder Advisory Group (SAG) to the gross savings estimates to calculate program net impacts. Table 18 summarizes PY8 gross and net impacts.

Table 18. PY8 Retro-Commissioning Program Gross and Net Impacts

	Ex Ante Gross	Realization Rate	Ex Post Gross	NTGR	Ex Post Net
Energy Savings (MWh)					
Total MWh	12,139	0.88	10,714	0.92	9,857
Demand Savings (MW)					
Total MW	1.24	1.00	1.25	0.92	1.15
Energy Savings (Therms)					
Total Therms	514,070	0.88	454,387	0.91	413,492

³¹ The customers may choose to implement study-recommended measures in PY9 or later.

Key Findings and Recommendations

Based on our research, the evaluation team makes the following impact recommendations for the program:

- **Require RSPs to better document baseline conditions.** This could be aided by encouraging RSPs to use more-transparent and documented calculations, like spreadsheets, and/or by requiring the submission of electronic versions of calculations and simulations to ensure that evaluators understand how the RSPs obtain ex ante results. Calculation inputs should have notes for whether inputs are measured, based on design conditions, or assumed by the RSPs. It would also be useful for the program to require more pre-implementation documentation of as-found conditions to confirm the baselines used in calculations. For example, if the report claims a fan runs continuously, inclusion of a graph or screenshot of a week of operating data or a control schedule would allow for easier baseline verification.
 - Consider issuing template calculators for common measures.
 - Consider issuing standardized assumptions for key inputs to calculations, if they are not measured. For example, require using 70% of nameplate motor loading if actual loads are not measured.
- **Continue to improve documentation of post-installation inspections.** Though inspection documentation is much improved from prior years, some gaps still exist. Try to document measures with data or representational verification (photos, graphs, etc.). Clearly annotate which measures the verification is supposed to show. Some measures are hard to represent in this manner and some small measures may not merit large effort. A savings magnitude threshold (gross kWh or % of project savings) might be used to prioritize effort.
 - Frequently, the only verification for compressed air leak repairs is a hand-annotated list of leaks. If additional post-installation trend data are available for compressed air projects, they should be included in verification documentation.
- **Correct errors in compressed air savings calculations.** Correcting for inappropriate use of average compressor efficiency rather than marginal efficiency, assuming year-round operation without any down-time, and accurately accounting for plant air pressure in savings estimates will produce more-accurate ex ante savings estimates, resulting in higher realization rates for the program.
- **Encourage implementation of more savings and measures in addition to leak repair.** For example, require implementation of bundled measures that meet a payback threshold — 12 months, for example — in order to receive the study subsidy incentive. All savings from PY8 sampled compressed air projects derive from leak repairs. No other low-cost measures were implemented through the program. While the savings from leak repairs is significant and cost-effective, the RSPs should spend more effort investigating and encouraging implementation of other short-payback measures, including, for example, no-loss drains, elimination of inappropriate uses, storage, better staging of multiple compressors, and cycling driers. Compressed air retro-commissioning is more than leak repair.
- **Implement a stronger review regimen through the implementation contractor.** Positively confirm operating hours, plant pressures, production pressures, and compressor part-load performance.

Based on our interviews with retro-commissioning experts, the evaluation team makes the following process recommendations for program improvement:

- **Consider more clearly delineating the Large Facilities offering from the Compressed Air and Industrial Refrigeration offerings.** In PY7, the evaluation team found that the retro-commissioning proposition is not fully understood by the market and that market actors and customers have an inconsistent understanding of what retro-commissioning is. As a result, the team recommends more clearly defining what retro-commissioning is to aid customer understanding of the program.

One change that could be made to aid in this goal would be to break out the Large Facilities offering more clearly from the other program offerings, as is done in some other jurisdictions. This could be done by simply changing a program name and marketing materials. There is essentially no overlap between customers likely to participate in the Compressed Air and Industrial Refrigeration offerings vs. customers likely to participate in the Large Facilities offering, and the packaging together of these two very different groups of offerings could potentially be causing some confusion in the marketplace.

- **Continue to increase program staff marketing efforts and customer involvement.** Based on our PY7 research, as well as interviews with retro-commissioning experts in PY8, we continue to recommend increased non-RSP-dependent marketing efforts and engagement for the Retro-Commissioning Program. Information from the program's implementation plan and our process evaluation activities indicate that, while market penetration of the Retro-Commissioning Program is relatively high, there are potential projects remaining in the market, especially in non-Compressed Air segments. Increased involvement by program staff, especially for the Large Facilities offering, could pay dividends. We recommend increased marketing activity by program Energy Advisors and Ameren Key Account Executives, who are the staff likely to have the detailed understanding of customer facilities required to understand if a customer is an ideal candidate for retro-commissioning. These staff are a crucial entry point for future projects into the program.
- Additionally, increased involvement by staff could help identify natural breaks when energy-using equipment is shut down at industrial sites and other large facilities that could be an ideal time to conduct retro-commissioning activities.

Appendix A. PY8 Detailed Ex Post Savings Results

The following table provides detailed ex post savings results by program. We also provide an Excel version following the table.

AIC PY8 Programs	Realization Rate	Verified Ex Post Gross			Deemed / Used	Verified Ex Post Net					Actual	Evaluation Estimate (Where Available)	Participation		Weighted Average Measure Life
	Energy Savings (Ex Ante Gross / Ex Post Gross)	First Year Annual Energy Savings	First Year Peak Demand Savings	Lifetime Savings	Net-to-Gross Ratio	First Year Annual Savings	First Year Peak Demand Savings	Lifetime Savings	First Year Cost per First Year Annual Savings	First Year Cost per Lifetime Savings	Program Costs	Net-to-Gross Ratio	# Units	Units Definition	Years
	%	MWh/Therms	MW	MWh/Therms	%	MWh/Therms	MW	MWh/Therms	\$/MWh or \$/Therms	\$/MWh or \$/Therms	\$	%			
Residential Programs															
Residential Lighting (PY6 & PY7 Carryover)	N/A	34,874	4.36	174,828	47%	16,391	2.03	82,168	N/A	N/A	\$ -	No research	N/A	N/A	5.0
Behavior Modification (Gas)	N/A	N/A	-	N/A	N/A	1,389,206	-	1,389,206	\$ 0.78	\$ 0.78	\$ 1,090,020	N/A	298,881	Customers treated	1.0
Appliance Recycling (Electric)	102%	7,325	0.90	58,595	52%	3,844	0.47	30,749	\$ 328.18	\$ 41.03	\$ 1,261,514	No research	7,953	Participants	8.0
HVAC (Electric)	99%	5,928	2.19	111,146	73%	4,302	1.55	80,659	\$ 638.26	\$ 34.04	\$ 2,745,811	No research	7,024	Program measures	18.7
Multifamily (Electric)	105%	6,306	1.25	51,062	98%	6,173	1.21	49,985	\$ 442.04	\$ 54.59	\$ 2,728,730	76% to 86% (varies)	1,128	Projects	8.1
Multifamily (Gas)	129%	335,926	-	5,937,165	83%	279,047	-	4,931,884	\$ 2.75	\$ 0.16	\$ 767,017	71% to 100% (varies)	1,128	Projects	17.7
Home Efficiency Standard (Electric)	91%	1,540	0.51	23,154	76%	1,174	0.37	17,652	\$ 2,400.40	\$ 159.65	\$ 2,818,065	No research	1,777	Participants	15.0
Home Efficiency Standard (Gas)	97%	241,534	-	4,738,950	75%	181,178	-	3,554,752	\$ 5.21	\$ 0.27	\$ 944,738	No research	1,777	Participants	19.6
Home Efficiency Income Qualified (Electric)	98%	3,047	1.29	41,174	100%	3,047	1.29	41,174	\$ 2,342.28	\$ 173.34	\$ 7,136,914	No research	1,019	Participants	13.5
Home Efficiency Income Qualified (Gas)	99%	568,483	-	9,189,824	100%	568,483	-	9,189,824	\$ 4.53	\$ 0.28	\$ 2,573,410	No research	1,019	Participants	16.2
ENERGY STAR New Homes (Electric)	76%	532	0.15	15,428	101%	538	0.16	15,602	\$ 1,635.36	\$ 56.39	\$ 879,825	57%	577	Participants	29.0
ENERGY STAR New Homes (Gas)	181%	113,214	-	3,283,206	101%	113,893	-	3,302,897	\$ 3.60	\$ 0.12	\$ 409,784	54%	577	Participants	29.0
School Kits (Electric)	64%	745	0.14	5,564	105%	782	0.14	5,840	\$ 149.30	\$ 19.99	\$ 116,754	No research	7,539	Kits	7.5
School Kits (Gas)	59%	23,592	-	181,604	104%	24,518	-	188,732	\$ 5.42	\$ 0.70	\$ 132,983	No research	7,539	Kits	7.7
Business Programs															
Standard (Electric)	99%	96,784	15.05	984,427	78%	75,850	11.78	771,499	\$ 128.26	\$ 12.61	\$ 9,728,262	83.1% (OLS) & 79.1% (II)	2,625	Projects	10.2
Standard (Gas)	100%	3,407,096	-	18,724,398	90%	3,058,659	-	16,809,490	\$ 0.57	\$ 0.10	\$ 1,752,244	No research	80	Projects	5.5
Custom (Electric)	99%	109,884	12.10	1,410,821	81%	89,456	9.85	1,148,542	\$ 90.20	\$ 7.03	\$ 8,069,105	82.2%	192	Projects	12.8
Custom (Gas)	118%	948,719	-	12,333,347	85%	807,973	-	10,503,649	\$ 1.88	\$ 0.14	\$ 1,516,556	93.9%	38	Projects	13.0
Retro-Commissioning (Electric)	88%	10,714	1.25	53,570	92%	9,857	1.15	49,285	\$ 81.99	\$ 16.40	\$ 808,168	No research	17	Projects	5.0
Retro-Commissioning (Gas)	88%	454,387	-	2,271,935	91%	413,492	-	2,067,460	\$ 1.76	\$ 0.35	\$ 729,723	No research	4	Projects	5.0



Appendix A_PY8 Detailed Ex Post Sav

Appendix B. PY8 Program Evaluation Reports

Provided under a separate cover.

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