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PY8 Evaluation Plan for the Ameren Illinois Company Electric and Natural Gas Residential and Commercial and Industrial Energy Efficiency Programs

August 10, 2016

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1. Introduction

Ameren Illinois Company (AIC) hired the team of Opinion Dynamics, The Cadmus Group, Navigant Consulting, and Michaels Energy to perform impact and process evaluations for AIC's portfolio of energy efficiency programs implemented between June 2015 and May 2016 (Program Year 8 [PY8]). This is the second year in the 3-year Plan 3 period, which began on June 1, 2014, and will continue until May 31, 2017.

As part of the PY8 evaluation effort, the team will assess the following programs (referred to as 8-103 and 8-104 programs per Order 13-0498):

- Residential
  - Heating and Cooling (HVAC)
  - Home Energy Reports (Behavioral Modification)[1]
  - Appliance Recycling
  - Multifamily In-Unit[2]
  - Home Efficiency Standard (HES)
  - Home Efficiency Income Qualified (HEIQ)
  - ENERGY STAR® New Homes
  - School Kits
- Commercial and Industrial (C&I)
  - Standard
  - Custom
  - Retro-Commissioning (RCx)

This document provides detailed evaluation plans for each of the 11 programs and serves as the evaluation framework to guide the effective evaluation of programs for impacts and program improvements. The overarching evaluation objectives are to determine gross and net energy and demand savings associated with the AIC portfolio and to suggest improvements in the design and implementation of existing and future programs. For context on the evaluation of these programs over time, **Error! Reference source not found.** provides a summary of completed and planned evaluation activities for the Plan 3 period (PY7-PY9).

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

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

Table 1. Plan 3 Evaluation Activities

Activity	Year	Residential								Business		
		HVAC	Behavioral Modification	HES	Appliance Recycling	Multifamily In-Unit	HEIQ	School Kits	ES New Homes	Standard	Custom	RCx
Program Material Review	PY7	Every Year and Every Program										
	PY8											
	PY9											
Program Manager and Implementer Interviews	PY7	Every Year and Every Program										
	PY8											
	PY9											
Energy Advisor or Key Account Executive Interviews	PY7											
	PY8									●	●	
	PY9											
Market Actor/Program Ally/Subject Matter Experts/Retailer Interviews	PY7	●		●	●	●	●		●			●
	PY8						●		●	●	●	
	PY9											●
Participant Survey	PY7		●			●				●		●
	PY8	●	●		●	●	●	●		●	●	
	PY9									●		●
Non-Participant Survey*	PY7	●	●	●	●	●	●	●	●	●	●	●
	PY8		●									
	PY9			●								
On-Site Data Collection	PY7									●	●	●
	PY8	●									●	●
	PY9	●								●	●	●
Additional Research to Update TRM	PY7	●								●		
	PY8	●				●	●			●		
	PY9	●										

Note: In PY7, the evaluation team conducted residential and C&I general population surveys as such all programs were touched.

Overarching Evaluation Approach

As outlined within the program-specific plans in this document, we will evaluate the portfolio using a number of different data collection strategies and analytic techniques to support the process and impact analyses. In addition, there are a number of overarching resources and directives guiding our work:

- **Statewide Technical Reference Manual (TRM).** The evaluation team will use the Illinois Statewide TRM for Energy Efficiency Version 4.0 (effective June 1, 2015) (IL-TRM) for its gross impact evaluation efforts, where appropriate.[3] For development of net-to-gross ratios (NTGRs) for prospective application, the evaluation team will follow the IL-TRM V5.0 protocol (effective June 1, 2016) for estimating free-ridership and participant spillover.[4]

- **Precision Targets.** Unless explicitly mentioned, quantitative evaluation activities target 10% relative precision at 90% level of confidence (90/10) or better.

- **Net-To-Gross Ratios.** As specified in each program-specific plan, the evaluation team will apply NTGRs by program as outlined in the team's net-to-gross (NTG) Recommendations to the Stakeholder Advisory Group (SAG) to estimate net impacts for PY8. The evaluation team will provide its initial NTG recommendations for PY9 by November 1, 2016, and updated recommendations by December 1, 2016.

- **Evaluation, Measurement, and Verification (EM&V) Coordination.** Consistent with prior years, the evaluation team is in ongoing communication with other Illinois evaluators to discuss evaluation approaches planned for PY8. These discussions ensure that, where appropriate, the evaluation approach is consistent.

[3] *Illinois Statewide Technical Reference Manual for Energy Efficiency Version 4.0*. February 24, 2015.

[4] *Illinois Statewide Technical Reference Manual for Energy Efficiency Version 5.0*. Volume 4: Cross-Cutting Measures and Attachments. February 11, 2016.

2. Program-Specific Evaluation Plans

2.1 Residential Heating and Cooling (HVAC)

2.1.1 Program Description

Through the Residential HVAC Program, AIC offers incentives for the purchase of high-efficiency air-source heat pumps (ASHPs), central air conditioners (CACs), and high-efficiency blower motors (when installed with a new Air-Conditioning, Heating, and Refrigeration Institute [AHRI]-rated furnace). An HVAC-registered program ally must install the program equipment, and incentive levels vary according to equipment types and efficiency levels, appearing as a line-item deduction on contractors' installation invoices. By offering these incentives, AIC seeks to persuade customers to purchase higher-efficiency equipment than they might otherwise purchase.

AIC pays a higher incentive for ASHP and CAC installations that replace existing and functional systems with a seasonal energy efficiency ratio (SEER) rating of 10 or less (i.e., early replacement [ER]). To be considered early replacements, the unit being replaced must "function," meaning the unit operates and provides sufficient space conditioning (i.e., heat exchanger, compressors, and pumps work effectively) and/or repairs to have the unit functioning well cost less than 20% of the new baseline replacement cost. Through this offering, the program encourages customers to retire equipment for newer, more-efficient units.

Leidos, the program implementer, and CLEAResult (Leidos's implementation subcontractor formerly known as Conservation Services Group) deliver this electric-only program on behalf of AIC. According to the PY8 Implementation Plan, the expected savings from this program are 3% of the AIC PY8 portfolio's electric savings (including both residential and commercial programs).

2.1.2 Research Objectives

The PY8 impact evaluation will address the following questions regarding the HVAC Program:

1. What were the program's estimated gross energy and demand impacts?
2. What were the program's estimated net energy and demand impacts?

In addition, the evaluation team plans to answer the following process-related questions:

3. Did program implementation change compared to PY7? If so, how and why was this change made and was this change advantageous?
4. Did the number of participants meet expectations? If not, how and why did it differ from expectations?
5. What were participants' characteristics? How many HVAC units did they install and at what SEER levels? How did the percentage of replacements differ between early replacement and replace-on-burnout? Did those ratios change from PY7?
6. What were the incremental costs associated with high-efficiency HVAC equipment?

2.1.3 Methodology

The following sections summarize methods planned for the PY8 HVAC Program evaluation.

Data Sources

Impact Analysis

To estimate PY8 ex post gross savings for the HVAC Program, the evaluation team will use appropriate IL-TRM V4.0 savings algorithms to estimate gross savings for each measure. The team will derive inputs for the algorithm primarily from the program tracking database (SEER level, climate zone, etc.). When input data are unavailable from the database, the team will use deemed inputs from the IL-TRM V4.0. The team will multiply gross savings by each measure installed, as tracked through the participant database. To estimate net savings, the team will apply SAG-approved NTGRs for PY8.

Process Analysis

To review PY8 program processes and challenges, the team will collect and use data from in-depth interviews conducted with program and implementation staff. The AIC and implementation staff interviews will provide the team with a comprehensive understanding of the program, including changes in program staffing and processes, as well as challenges and successes over the program year.

Sampling Plan

Impact Analysis

The evaluation team will review all of the data in the PY8 tracking database to support estimation of gross impacts for the HVAC Program. The team also will verify up to 70 HVAC measure installations by reviewing all available project documents (e.g., invoices, AHRI numbers) and comparing the resulting findings to the tracking database.

Metering Studies

Evaluation activities for PY8 include metering of multi-speed CACs and heat pumps (HPs) to understand actual seasonal operating efficiency, as well as metering of standard furnace fans for comparison to available data on electronically commutated motor (ECM) furnace fans. The evaluation team requested PY8 participation data (through December 31, 2015) from implementation staff to select a random sample of participants to fulfill the planned metering studies' research objectives. Using this list, the team sent letters to a sample of HVAC Program participants in January 2016, aiding recruitments for meter installation. The team conducted the site visits and installed meters in February and March 2016. Table 2 shows meter installation targets by study type.

Table 2. HVAC Program PY8 Metering Sample

Study Description	Recruitment Letters	Targeted Participation
Multi-Speed HP/CAC Metering	100	33
Non-ECM Metering	120	33
Total	**220**	**66**

Incremental Cost Analysis

To supplement PY7 incremental cost research, the evaluation team will interview a random sample of 10 Illinois HVAC distributors[5] that are most active in AIC territory and will request copies of specification sheets and prices for all of the distributor-listed CACs, ductless mini-split heat pumps (DMSHPs), and ASHPs between 2 and 5 tons, with SEER levels between 13 and 18. If we are unable to collect enough data to produce meaningful results, we will review recent secondary research to determine if updates can be made based on other studies.

The team will use the interviewed distributors' specification sheets to create a database that includes information pertaining to each equipment type, size, SEER level, price, and additional features. After cleaning and analyzing the data, the team will develop a statistical hedonic price model that isolates and estimates the relative influence of various product features on observed final prices. Table 3 lists the targeted number of products we expect to characterize to achieve 90/10 precision by measure type, and their associated coefficients of variation (CV).[6]

Table 3. HVAC Program Hedonic Modeling Sample

Measure Description	Estimated CV	Target Sample Size
ASHPs	0.93	232
DMSHPs	0.54	79
CACs	0.93	232

Analysis Plan

Gross Impacts

In PY8, the evaluation team will determine gross impacts by multiplying the number of verified participants for each measure by per-unit savings, determined through the appropriate savings algorithms specified in the IL-TRM V4.0. The team will compare ex post gross savings to the ex ante savings drawn from the tracking database.

Net Impacts

To estimate net savings, the evaluation team will use the NTGRs—agreed on by the SAG for PY8—shown in Table 4.

[5] Since the evaluation team requires information about a wide variety of equipment, the team will target distributors with the largest sales volumes to the extent needed to narrow the sample.

[6] The team based this on results from a similar hedonic analysis study that can be found at http://www.calmac.org/publications/2010-2012_WO017_Ex_Ante_Measure_Cost_Study_-_Final_Report.pdf.

Table 4. HVAC Program PY8 NTGRs

Measure Description	Electric NTGR
<SEER 16 CAC/HP (Replace on burnout [RB])	0.601
SEER 16+ CAC/HP (RB)	0.641
<SEER 16 CAC/HP (Early replacement [ER])	0.631
SEER 16+ CAC/HP (ER)	0.761
Brushless Motors	0.761

Process Findings

For the process evaluation, the evaluation team will summarize information gathered from the program and implementation staff interviews, as well as from a review of program materials and marketing documents.

2.1.4 Tasks

We plan to perform the following tasks in support of the PY8 evaluation.

Task 1: Request and Review Program Materials and Database

The evaluation team will review all program materials and tracking data, including program rebate forms, implementer reports, program manuals, and program ally communications, as well as extracts from the program tracking database. The team will randomly select equipment invoices for 70 installations, verifying the measures through comparisons to the program tracking database.

In June 2016, the team will request program materials; communications will continue with AIC and its implementation staff at Leidos and CLEAResult regarding data needs. At a minimum, the team will request subsequent materials at the close of PY8 (June 2016) and upon database finalization for the year (typically occurring in August 2016).

Deliverable: Data request *Deliverable Date:* June 2016 and August 2016

Task 2: Program and Implementation Staff Interviews

The evaluation team will perform up to three in-depth interviews with AIC program and implementation staff. These interviews will focus on assessing goal achievement, design/delivery modifications and sources of change, implementation challenges and successes, and plans for the program's future.

Deliverable: Conducted interviews *Deliverable Date:* June 2016

Task 3: Multi-Speed HP/CAC Metering

During early 2016, the evaluation team installed meters on multi-speed (or variable speed) CACs and HPs, seeking data to aid in understanding the actual seasonal operating efficiency for the region. CAC and HP metering studies typically focus on qualifying average participant systems (for example, SEER 14.5 units are treated the same as multi-speed, high-efficiency units [e.g., 18+ SEER]). The operating efficiency of these SEER 18+ units can be very high when the unit operates in low speed, and overall seasonal efficiency could greatly differ from the nameplate-rated efficiency (SEER), which the TRM relies on to estimate savings. We will use the results to suggest possible modifications for the IL-TRM. The team expects to meter at least 15 CAC and 15 ASHP systems to measure heating and cooling energy consumption capacity across indoor heat

exchangers. Indoor units installed with these systems use an ECM fan. The team will meter fan runtimes and energy consumption of indoor fans in heating mode, cooling mode, and circulation mode to inform the ECM savings analysis (discussed in more detail in Task 4). The team plans to remove the meters in October 2016.

Deliverable: Analysis provided in annual report — *Deliverable Date:* November 2016

Deliverable: Memo with recommendations for TRM update — *Deliverable Date:* December 2016

Task 4: Non-ECM System Metering

During early 2016, the evaluation team installed meters on a sample of standard furnace fans for comparisons with data collected for ECM fans installed through the Multi-Speed HP/CAC metering study and ECM meter data from previous metering studies (PY4 and PY5). We will use the results to compare ECM savings between different SEER-level HPs, as well as in comparison to standard furnace fans to ensure an ECM in a multi-speed system operates similarly to other types of ECM installations. This will provide AIC with specific data to inform the TRM on ECM savings.

To develop a sample of non-ECM installations, the team used AHRI certificate numbers from PY8 participation data to identify HVAC installations that appear to include a standard (non-ECM) fan. Typically, lower-efficiency installations (14.5 SEER) include a non-ECM fan. To identify potential candidates for this research, the team sent letters to the HVAC Program's Tier 1 participants. The team then called these participants to determine their willingness to participate and to confirm that their system did not have an ECM fan. In March 2016, the team performed site visits and installed sensors to meter heating and cooling capacity, fan energy consumption, and HVAC energy consumption. The team plans to remove the meters in October 2016.

Deliverable: Analysis provided in annual report — *Deliverable Date:* November 2016

Deliverable: Memo with recommendations for TRM update — *Deliverable Date:* December 2016

Task 5: Incremental Cost Analysis (PY7 Task Expansion)

During the PY7 evaluation of the HVAC Program and the All-Electric Homes Program, the evaluation team analyzed total installation costs and incremental costs from standard efficiency systems for residential CAC, ASHP, and DMSHP systems. To supplement this research, the team will interview 10 Illinois HVAC distributors active in AIC territory and will request copies of specification sheets and prices for CAC, DMSHP, and ASHP equipment between 2 and 5 tons, with SEER levels between 13 and 18. The team will also request specification sheets that identify all equipment features. Further, the team will interview distributors about volume discounts they provide. The team will offer each distributor a $500 incentive to provide the data, assuming the team will receive at least 20 specification sheets from each distributor (as the data provision could involve significant time and potential resistance). The team will then use the specification sheets to create a database for each equipment type, size, SEER level, price, and additional features.

After the evaluation team has cleaned and analyzed the data, the team will develop a statistical hedonic price model to isolate and estimate the relative influence of various product features, including SEER level, on the final observed price. This model will be incorporated into the assessment of the incremental prices associated with SEER levels above 13. Note that this task is covered under the PY7 evaluation budget, but is included here given that we will provide the results in the PY8 report.

Additionally, the evaluation team will research ECM retrofit prices and installation costs through online product searches and informal discussions with contractors and distributors. The evaluation team will analyze this

data and provide AIC with an incremental cost recommendation to use for future cost-effectiveness calculations.

Deliverable: Analysis provided in final report *Deliverable Date:* November 2016

Task 6: Impact Analysis

The evaluation team will analyze the program tracking database using the IL-TRM V4.0 to calculate HVAC Program impacts, applying the agreed-upon NTGRs to determine PY8 net impacts.

Deliverable: Analysis provided in final report *Deliverable Date:* September–October 2016

Task 7: Reporting

The evaluation team will draft a report of findings, including the process and impact evaluation results and the conclusions from the preceding evaluation tasks. After AIC and other stakeholders review the document, the team will deliver a final report that incorporates respondent comments.

Deliverable: Draft report *Deliverable Date:* November 2016

Deliverable: Final report *Deliverable Date:* December 2016

2.1.5 Budget and Schedule

Figure 1 and Table 5 summarize the timing of each evaluation activity. Table 5 also lists the budget associated with each task. The total budget for the PY8 Residential HVAC Program evaluation is $243,000.

Figure 1. HVAC Program PY8 Evaluation Timeline

Task	Evaluation Activity	2016									
		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	Request and Review Program Materials and Database										
2	Program and Implementation Staff Interviews										
3	Multi-Speed HP/CAC Metering										
4	Non-ECM System Metering										
5	Incremental Cost Analysis										
6	Impact Analysis										
7	Reporting										

Data Request
Create Data Collection Instruments
Collect Data
Analyze Data
Milestone Deliverables

Table 5. HVAC Program PY8 Evaluation Budget

Task	Evaluation Activity	Deliverable Date	Cost by Task
1	Request and Review Program Materials and Database	June 2016 and August 2016	$2,000
2	Program and Implementation Staff Interviews	June 2016	$3,000
3	Multi-Speed HP/CAC Metering	November 2016 and December 2016	$125,000
4	Non-ECM System Metering	November 2016 and December 2016	$70,000
5	Incremental Cost Analysis	November 2016	$0*
6	Impact Analysis	September–October 2016	$5,000
7	Reporting	November 2016 and December 2016	$38,000
		Total Cost	**$243,000**

* As noted above, this task is covered under the PY7 evaluation budget, but will be included in the PY8 report.

2.2 Residential Home Energy Reports (Behavioral Modification)

2.2.1 Program Description

AIC developed the Behavioral Modification program to reduce its residential customers' energy consumption. Leidos and OPower implement the program, which launched in August 2010. The program is offered jointly through AIC (8-103/8-104) and the IPA. This evaluation plan discusses the evaluation of the gas portion of the program, offered under AIC's portfolio. Overall, the program 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

In PY7, the program offered two treatment types: a hard-copy home energy report (HER) mailed to the customer's home and an online portal that customers could access to view the same report along with additional information. In PY8, the program will also deliver electronic Home Energy Reports (eHERs) on a monthly basis to all customers with email addresses.

The Behavioral Modification Program reached about a third of AIC's approximately 1 million residential customers in PY8. Nearly 320,000 participants received reports in PY8 (including both dual-fuel and gas-only customers), the majority of whom are in their fifth year with the program (see Table 6).

Table 6. Approximate Behavioral Modification Program Participation in PY8

Cohort Name	Fuel Type	Number of Treated Customers in PY8	Start Date	Program Year
Original Cohort	Dual-Fuel	37,243	August 2010	6th year in the program
Expansion Cohort 1	Dual-Fuel	56,788	April 2011	5th year in the program
Expansion Cohort 2	Dual-Fuel	85,893	November 2011	5th year in the program
Expansion Cohort 3	Gas-Only	13,621	November 2011	5th year in the program*
Expansion Cohort 4	Dual-Fuel	25,506	June 2013	3rd year in the program
Expansion Cohort 5	Dual-Fuel	62,996	September 2014	2nd year in the program
Expansion Cohort 6	Dual-Fuel	37,800	April 2015	2nd year in the program
	Total	319,847		

* Expansion Cohort 3 (the gas-only cohort) stopped receiving program offerings in April 2012 and resumed receiving reports in April 2013. This cohort continued receiving treatment in PY6 through PY8.

According to the PY8 Implementation Plan, the expected savings are 30% of the planned PY8 portfolio therm savings.

2.2.2 Research Objectives

As part of the most recent evaluation, the evaluation team completed an assessment of energy impacts (including equivalency analysis, adjustment for double-counted savings, and review of program participation over time) coupled with a survey of treatment and control customers. In addition, we conducted a multi-level modeling analysis to identify high, medium, and negative savers. Our evaluation approach for PY8 will build on prior evaluation findings, provide additional insights regarding program effects, and address key questions regarding the benefits of offering behavioral programs over time.

The PY8 Behavioral Modification Program impact evaluation is structured to answer the following general research questions:

1. Were the new treatment and control groups equivalent?
2. What were the estimated therm savings from this program for all cohorts in PY8?
3. Did the program achieve savings year-over-year for each of the cohorts?
4. Did estimated program savings need to be adjusted due to the treated population's participation in other AIC programs? If yes, how much savings should be removed from the program?
5. What research design would be needed to assess persistence?

The PY8 process evaluation will explore the following research questions:

6. What were the characteristics of the various savings groups (very positive, positive, neutral, negative, and very negative savers) identified through the PY7 multi-level modeling analysis?
7. Can we identify top-tier savers and lower-tier savers based on customer segmentation schemes and survey data to better understand engagement with reports and participant household energy practices?
8. How satisfied were participants with the program and with AIC?

2.2.3 Methodology

The following sections outline the proposed methodological approach for the PY8 Behavioral Modification Program evaluation.

Data Sources

Impact Analysis

The primary method used to determine program impacts is a billing analysis. Given the experimental design, the estimated savings are considered to be net savings. We will utilize treatment and control group monthly billing data to estimate net savings per household over the program period.

Given that the evaluation team did not assign the customers to treatment and control groups in the new Expansion Cohorts 6 and 7, we will conduct an equivalency analysis to ensure that the treatment and control groups are comparable. This review will strengthen the internal validity and defensibility of the research design. To assess equivalency, we will utilize Experian data that have been merged with the treatment and control groups' monthly usage data.

Data sources for the PY8 impact evaluation include:

- Program tracking databases for all AIC residential programs from June 2015 to May 2016
- For all customer treatment and control groups, gas consumption/billing data from June 2013 to May 2016
- Experian data (including demographic data, housing characteristics, and psychographic data)

Process Analysis

The process evaluation will utilize data from our impact efforts, as well as three additional data collection activities: a review of program data (including customer segmentation), in-depth interviews with program and implementation staff, and an internet survey with program participants. We plan to build on our PY7 multi-level billing analysis to separate the customer savings into savings categories (very positive, positive, neutral, negative, and very negative savers) and analyze the correlation of these categories with customer segmentation characteristics, as well as customer survey responses to support future program delivery. In-depth interviews with AIC, Leidos, and OPower implementation staff will provide the evaluation team with a comprehensive understanding of the program and its implementation.

Program data used for the PY8 process evaluation will include:

- Email contact information, where available, for all customer treatment and control groups
- HERs sent to cohorts in PY8, including tips provided to customers in the treatment group; this should tie the specific savings tips to specific customers so that we can assess how different the tips are across customers
- Customer segmentation information

- Target Rank campaign[7] recipients
- Aclara web portal visitors who also receive HERs

Sampling Plan

Billing Analysis

The billing analysis will include all cohorts. For the new Expansion Cohorts 6 and 7, we will look at consumption as well as demographics, housing, and psychographic characteristics across the treatment and control populations to be sure that the treatment and control groups are relatively comparable. If the populations are equivalent, no sampling will occur for the billing analysis, and we will include all available data in our analysis. However, if the treatment and control groups are found to be dissimilar, we will select two matched samples from the population of treatment and control group members for this analysis.

For the cohorts previously evaluated—Original Cohort and Expansion Cohorts 1 through 5—the treatment and control groups have been verified as essentially equal. However, some attrition might have occurred. Therefore, we will compare the treatment and control groups on usage only to ensure continued equivalence.

Internet Survey

We will recruit a sample of treatment customers for whom email addresses are available to participate in an internet survey. We anticipate using a stratified sampling approach based on savings group developed from PY7's multi-level modeling effort (very positive, positive, neutral, negative, and very negative savers) to better understand core differences either demographically, attitudinally, or in terms of knowledge and engagement with the HER. This design will allow us to make inferences about differences between savings groups on key questions of interest. Depending on the incidence of Target Rank campaign customers and Aclara web portal visitors, we may include these groups within our sample frame.

This effort is an exploratory study that seeks to better understand opportunities to enhance and optimize program delivery. However, we acknowledge that our proposed sampling approach may be limited by the following factors:

- **External Validity:** Because our approach will sample from customers who provided email addresses, our results may not be generalizable to those customers who have not provided their email address to AIC. In PY7, the evaluation team used a similar approach and fielded a survey to a sample of all treatment and control group customers with an email address. This sample frame reflected approximately half of the customers in the program. Our review found that customers with no email address on file are much older, more likely to be retired, and less likely to have a child living in the house than those with an email address. These two groups vary to a lesser extent on many other demographic and psychographic characteristics.
- **Internal Validity:** Recruiting a sample of participants means that, as with any sample, there will be sampling error. However, there might also be some degree of non-response bias. In particular, the respondents might be systematically different from non-respondents as some customers might be more willing to complete the survey than others.

Prior to fielding the survey, we will assess whether there is any potential for bias across the savings groups in terms of their incidence of email addresses. If there are, our team will work to address these biases using

[7] OPower fielded a Target Rank campaign to very high users with low savings that offered a revised report and messaging in PY7.

post-stratification methods. Post-stratification can also support our ability to generalize survey results to program participants. After the survey is completed, we will check for non-response predictors that may be different for the five savings groups. If we find differences, we will seek to assess the extent to which non-response bias may limit internal validity. To the extent possible, we will control statistically for differences that we find.

Analysis Plan

Net Impacts

The main objective of the impact evaluation is to estimate the net energy savings impacts of each of the cohorts within the Behavioral Modification Program. To address this, we will conduct four primary evaluation tasks.

Equivalency Analysis

We will compare the Expansion Cohorts 6 and 7 treatment customers to controls on demographic and other variables obtained from Experian. This will ensure that the random assignment of customers to treatment and control groups led to relatively comparable groups. An energy usage-only check will be performed on the earlier cohorts.

Below we detail some sample data points that we will use for the equivalency check.

Demographic Characteristics

Age	Education
Dwelling type	Homeowner/renter indicator
Estimated household income	Number of adults
Occupation group	Number of children

Household Characteristics

Building square footage	Year built

Psychographic characteristics

Behavior bank (Social causes and concerns, e.g., the environment)	Behavior bank (e.g., computers – internet/online subscriber or use internet services)

Estimate Net Impacts

The evaluation team will use an approach for PY8 that builds on the PY7 approach. We will estimate savings using a difference-in-differences (DID) approach, which uses fixed-effects regression analysis of the monthly gas bills of treatment and control group customers, focusing on the savings period from June 2015 through May 2016 (i.e., the PY8 period) compared to usage occurring in the 2014–2015 period. The DID refers to the model's implicit comparison of consumption before and after treatment of both treatment and control group customers. The model includes customer-specific intercepts (i.e., fixed effects) to capture unobserved differences between customers that do not change over time and that affect customers' energy use. We will report savings from two different models to aid comparisons to previous evaluations:

1. A simple overall model (Equation 1), which is consistent with previous years' evaluations
2. An overall model with the addition of weather adjustments (Equation 2), which allows direct year-to-year savings comparison
3. An overall model that incorporates post-period only (consistent with vendor modeling) (Equation 3)
4. An overall model that incorporates standard weather years (consistent with proposed TRM framework) (Equation 4)

We will run four overall models to calculate energy impacts associated with the program, as well as to report comparisons of savings across program years and to vendor-stated impacts.

Equation 1: Overall Model

Equation 1. Overall Model Estimating Equation

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

Where:

ADC_{it} = Average daily consumption (therms) for household *i* at time *t*

α_i = Household-specific intercept

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

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

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

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

ε_{it} = Error

Equation 2: Weather-Adjusted Model

To enable accurate comparisons across program years, we will incorporate weather terms. This also improves the precision in the modeled results by accounting for possible differences in weather experienced by the analyzed population. Specifically, we will control for weather by entering heating degree days (HDD) and cooling degree days (CDD), using a base of 65 degrees Fahrenheit for HDD and 75 degrees Fahrenheit for CDD.

Equation 2. Weather-Adjusted Model Estimating Equation

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

Where:

ADC_{it} = Average daily consumption (therms) for household *i* at time *t*

α_i = Household-specific intercept

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

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

β_3 = Coefficient for HDD

β_4 = Coefficient for CDD

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

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

HDD_{it} = Sum of HDD (base 65 degrees Fahrenheit)

CDD_{it} = Sum of CDD (base 75 degrees Fahrenheit)

ε_{it} = Error

Equation 3: Post-Only Model

In order to enable comparisons with vendor supported models (i.e., OPower – the program implementer's estimates), we will also estimate a lagged dependent variable (LDV) model. A LDV model differs from the LFER model in that only data from the post-period is used in estimating the model. Information from the pre-period comes in as the pre-usage variables. Following last year's evaluation, we will use three levels of pre-period usage for each customer: overall, pre-period ADC, summer pre-period ADC, and winter pre-period ADC. The LDV model uses the control group in just the same way as the LFER model, in that the treatment effect is corrected for control group ADC so that the coefficient of the treatment variable is the average treatment effect on the treated (ATT). We will employ the following estimating equation. This model can also be used for year-to-year comparison.

Equation 3. Post-Only Model Estimating Equation

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

Where:

ADC_{it} = Average daily consumption (therms) for household *i* at time *t*

α = Intercept

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

β_2 = Coefficient for the average daily usage across household *i* available pre-treatment meter reads

β_3 = Coefficient for the average daily usage over the months of December, January, February, and March across household *i* available pre-treatment meter reads

β_4 = Coefficient for the average daily usage over the months of June, July, August, and September across household *i* available pre-treatment meter reads

β_5 = Vector of coefficients for month-year dummies

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

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

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

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

$MonthYear_t$ = Vector of month-year dummies

$PreUsage_i$ = Average daily usage for household *i* over the entire pre-period.

$PreWinter_i$ = Average daily usage for household *i* over the pre-participation months of December, January, February, and March

$PreSummer_i$ = Average daily usage for household *i* over the pre-participation months of June, July, August, and September

ε_{it} = Error

Model 4: Standard Weather-Year-Adjusted Model

To enable accurate comparisons across program years, we will adjust for weather influences over years. This improves the precision in the modeled results by accounting for possible differences in weather experienced by the analyzed population. Specifically, we will control for weather by entering HDD and CDD, using a base of 65 degrees Fahrenheit for HDD and 75 degrees Fahrenheit for CDD for standard weather years leveraging the TRM.

Equation 4. Standard Weather-Year-Adjusted Model Estimating Equation

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

Where:

ADC_{it} = Average daily consumption (therms) for household *i* at time *t*

α_i = Household-specific intercept

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

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

β_3 = Coefficient for HDD for standard weather year

β_4 = Coefficient for CDD for standard weather year

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

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

HDD_{it}= Sum of HDD (base 65 degrees Fahrenheit) for standard weather year

CDD_{it}= Sum of CDD (base 75 degrees Fahrenheit) for standard weather year

ε_{it} = Error

Channeling Analysis

We will calculate a savings adjustment to account for the portion of net savings estimated from the billing analysis that has been claimed by other AIC programs. Savings from the Behavioral Modification Program reflect both non-purchase behavioral changes, such as turning off lights in unoccupied rooms and adjusting thermostat settings, and investments in energy-saving equipment, such as high-efficiency furnaces and CFLs, or other purchase behaviors. Savings from measures that were rebated through AIC's energy efficiency

programs appear in both the Behavioral Modification Program and the rebate programs, and thus would be double-counted if an adjustment were not made. This piece of the savings will be subtracted from the savings estimated by billing analysis.

Customers in the treatment and control groups are assumed to receive the same treatment from the utility for the program promoting Measure A (i.e., they face the same marketing and incentives). Because customers were randomly assigned to the treatment and control groups, any difference between the groups in the installation of Measure A can be attributed to the Behavioral Modification Program. We will base the savings associated with participation in other AIC programs on the deemed savings values associated with the measures other programs have claimed in PY7. As such, we will conduct a participation lift and channeling analysis (incorporating historical trend analysis) to assess trends in program participation over time and adjusted net savings estimates. This analysis will also account for and remove channeling savings for current participants from prior program years (PY3–PY8).

Process Findings

The main objectives of the process evaluation are to understand the program and the changes that may have occurred in PY8 and how participation affects satisfaction and self-efficacy and to identify characteristics of high savers and negative savers. To address these issues, we will conduct four primary evaluation tasks.

Analysis of Program and Implementation Staff Interviews

Analysis of program and implementation staff interviews and review of program data and materials will help explore program changes, successes, and challenges, and identify potential areas for program improvement. In addition, these interviews will help formulate appropriate questions for the treatment and control group surveys.

Survey Analysis

Simple crosstabs and comparisons of means from the internet survey described above will help identify the characteristics of high and negative savers. Further, a comparison of treatment savings groups on their average satisfaction with AIC and participants' satisfaction with the program will allow us to gain insight into whether the program increases customer satisfaction.

Customer Segmentation Analysis

The evaluation team will leverage results from our PY7 multi-level model that estimated individual savings for each participant. We plan to augment impact results by incorporating data collected through AIC customer segmentation profiles, Experian, and our survey, allowing further differentiation of participants in the savings groups.

2.2.4 Tasks

We plan to perform the following tasks in support of the PY8 evaluation.

Task 1: Review Program Materials and Database

The evaluation team will review the program tracking database and any available program materials, including the PY8 HERs. We will review these materials to determine if there are any data gaps and to inform our research efforts. This will include requesting and reviewing customer segmentation data.

Deliverable: Data request *Deliverable Date:* June 2016

Deliverable: Findings included in annual report *Deliverable Date:* September 2016

Task 2: Program Staff Interviews

We will conduct telephone interviews with key program staff from AIC, Leidos, and OPower. The purpose of these interviews is to learn about any changes to the program in PY8, and to uncover areas of success and challenges. The interviews will provide a rich source of key insights into the daily workings of the program.

Deliverable: Conducted interviews *Deliverable Date:* June 2016

Task 3: Participant Survey

The evaluation team will gather data through the internet survey with customers from the treatment group. In particular, we will seek to assess if there are key differences between "very positive" and "very negative" savings groups in terms of their engagement with the report, responsiveness to messaging, attitudes, and suggestions for enhancing the reports. Further, where feasible, we will ask customers about their participation and satisfaction with the Target Rank campaign and will provide a set of brief questions addressing engagement and potential sources of confusion for HER treatment customers who also engage with the Aclara web portal (should there be a sufficient number of overlapping customers).

Deliverable: Draft and final survey instrument *Deliverable Date:* June 2016

Deliverable: Results provided in annual report *Deliverable Date:* September 2016

Task 4: Equivalency Analysis

For the new Expansion Cohorts 6 and 7 added to the program in PY8, we will evaluate the equivalency of the treatment and control groups. This analysis will entail statistical comparison of baseline household energy consumption and household characteristics. For this analysis, the evaluation team will purchase customer data—including demographic, household, and psychographic information—and, through the review of these data, we will be able to understand whether there are any key differences between the treatment and control groups. If differences do exist, appropriate adjustments will be made in the billing analysis to account for them.

Deliverable: Initial data requests *Deliverable Date:* June 2016

Deliverable: Results provided in annual report *Deliverable Date:* September 2016

Task 5: Billing Analysis

This task accurately estimates net savings. We will clean data and run the four models specified above within this task.

Deliverable: Data request *Deliverable Date:* June 2016

Deliverable: Results provided in annual report *Deliverable Date:* September 2016

Task 6: Channeling Analysis

This task calculates a savings adjustment to account for the portion of net savings estimated from the billing analysis that has been claimed by other AIC programs.

Deliverable: Data request *Deliverable Date:* June 2016

Deliverable: Results provided in annual report *Deliverable Date:* September 2016

Task 7: Reporting

The evaluation team will compose a draft report of findings for AIC and Illinois Commerce Commission (ICC) staff review. We will then deliver a final report that incorporates any comments from the review. In addition, we will provide a memo prior to September 2016 outlining the research design required to assess persistence.

Deliverable: Draft report *Deliverable Date:* October 2016

Deliverable: Final report *Deliverable Date:* November 2016

2.2.5 Budget and Schedule

Figure 2 and Table 7 summarize the timing of each evaluation activity. Table 7 also lists the budget associated with each task. In total, the PY8 budget for the Behavioral Modification Program is $50,600. Note that all evaluation activities are conducted in conjunction with the IPA Behavioral Modification Program.

Figure 2. Behavioral Modification Program PY8 Evaluation Timeline

Task	Evaluation Activity	2016									
		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	Review Program Materials and Database										
2	Program Staff Interviews										
3	Participant Survey										
4	Equivalency Analysis										
5	Billing Analysis										
6	Channeling Analysis										
7	Reporting										

Data Request
Create Data Collection Instruments
Collect Data
Analyze Data
Milestone Deliverables

Table 7. Behavioral Modification Program PY8 Evaluation Budget

Task	Evaluation Activity	Deliverable Date	Cost by Task
1	Review Program Materials and Database	September 2016	$1,500
2	Program Staff Interviews	June 2016	$700
3	Participant Survey	September 2016	$18,200
4	Equivalency Analysis	September 2016	$6,900
5	Billing Analysis	September 2016	$6,000
6	Channeling Analysis	September 2016	$5,000
7	Reporting	September 2016	$12,300
		Total Cost	$50,600

2.3 Residential Appliance Recycling

2.3.1 Program Description

The Appliance Recycling Program (ARP) is an electric-only program that promotes the retirement and recycling of AIC electric households' inefficient refrigerators and freezers (primary and secondary units between 10 and 27 cubic feet). AIC offers a program turn-in incentive and free pickup of working equipment, as well as information and education on the cost of keeping inefficient units in operation. The program has been in place for 7 years.

According to the PY8 Implementation Plan, the expected savings from this program are 2% of the AIC PY8 portfolio's electric savings (including both residential and commercial programs).

2.3.2 Research Objectives

The PY8 ARP evaluation seeks to provide estimates of gross and net electric savings associated with the program. The PY8 impact evaluation will answer the following questions:

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

The evaluation team will also explore limited process-related research questions for the PY8 evaluation, including the following:

5. Did the program implementation change since PY7? If so, how and why, and was this change advantageous?
6. What non-program options are available to AIC customers for the recycling of appliances?
7. In jurisdictions where appliance recycling programs do not exist, do utilities offer customers information concerning what secondary refrigerator recycling options are available while conveying energy saving benefits of such recycling?
8. Are there any lessons learned for how to minimize customer and market confusion from other jurisdictions where an appliance recycling program was offered and then discontinued?

The PY8 evaluation will build on research the evaluation team conducted in previous evaluations. The team will apply the IL-TRM V4.0 algorithm to calculate gross savings and will apply SAG-approved NTGRs to determine net savings.

2.3.3 Methodology

Data Sources

Impact Analysis

The evaluation team will use the program tracking database to estimate the program's PY8 ex post gross savings. The database contains relevant physical characteristics of appliances recycled through the program, including capacity (in cubic feet), year of manufacture, and unit configuration (all inputs to the algorithm for calculating gross savings). The team will review all data in the program tracking database, apply the IL-TRM V4.0 to estimate gross savings, and apply deemed NTGRs to participants.

Process Analysis

The evaluation team will interview AIC program management and implementation staff, seeking to determine perspectives on how the program performed in PY8, challenges encountered in implementing the program, and upcoming changes to the program's design. A literature review (including select interviews with other utility program managers where a program has been discontinued) will focus on how other jurisdictions are managing the transition away from utility-sponsored appliance recycling programs.

Sampling Plan

Impact Analysis

The team will analyze a census of records provided in the program tracking database to determine inputs for the IL-TRM V4.0 gross savings algorithm.

Analysis Plan

The evaluation team will conduct impact and process evaluations of the ARP, using the analysis plan outlined below.

Gross Savings

The team will apply a verification rate based on self-report responses from the PY8 participant surveys, combined with a review of the program tracking data for the percentage of picked-up appliances that meet the program's requirements.

In PY8, the team will determine gross ARP impacts by multiplying the sample-based verification rate for each measure (determined by assessing PY8 program tracking data and PY8 participant survey responses) by unit savings estimated by applying the IL-TRM V4.0 algorithm.

Net Savings

To determine net savings, the team will use the SAG-approved NTGRs for PY8, as shown in Table 8.

Table 8. ARP PY8 NTGRs

Measure Description	Electric NTGR
Refrigerator	0.51
Freezer	0.59

Process Findings

For the process evaluation, the team will interview stakeholders regarding their perception of program performance in PY8 and opportunities for improvements. We will identify key lessons learned by other utilities when transitioning away from appliance recycling programs.

2.3.4 Tasks

This section describes the evaluation team's planned tasks in assessing the PY8 ARP.

Task 1: Request and Review Data from Utility

The evaluation team will conduct a review of all program materials and tracking data. This will include program marketing and implementation plans, as well as the program tracking database. The team will rely on tracking database participant data that includes contact information necessary to field the PY8 participant survey (Task 3) and relevant data required to estimate gross savings using the IL-TRM V4.0 algorithm. The tracking data also contain measure data, including ex ante savings and incentives.

The team will also request program materials, including marketing materials and information regarding the program process. These materials will inform the team's design of interview instruments. The team will make an initial data request in June 2016, with subsequent requests in August 2016 to obtain the final program tracking database.

Deliverable: Data request *Deliverable Date:* June 2016 and August 2016

Task 2: Program and Implementation Staff Interviews

The evaluation team will conduct up to two interviews with program managers and implementers. The questions in these interviews will focus on changes in the program's design or marketing strategy since PY7, specific marketing tactics and perceived results, and the success of program performance. Interviews will also provide stakeholders with an opportunity to ensure that the team achieves an up-to-date understanding of program operations in PY8 and program plans for the near future.

Deliverable: Conducted interviews *Deliverable Date:* June 2016

Task 3: Literature Review and Select Utility Interviews

The evaluation team will conduct a literature review to determine how utility sponsors are managing to phase appliance recycling programs out of energy efficiency portfolios in other jurisdictions. This effort will involve a review of program delivery documentation, market assessments, evaluation reports, and other relevant documentation of utility-sponsored appliance recycling programs. We will further conduct up to five brief telephone interviews with program managers of other suspended appliance recycling programs to understand how other jurisdictions are navigating the changing marketplace. In addition to gleaning information about

market transition, we will examine how other program administrators are educating customers about secondary appliance recycling in absence of a utility-sponsored program.

Deliverable: Analysis provided in final report *Deliverable Date:* September 2016

Task 4: Impact Analysis

To estimate PY8 gross savings, the evaluation team will analyze program tracking data and self-response data from participant surveys. The team will apply inputs gathered from these sources (e.g., appliance vintage, primary vs. secondary use, etc.) to the gross savings algorithms indicated in the IL-TRM V4.0.

Deliverable: Analysis provided in final report *Deliverable Date:* September–October 2016

Task 5: Reporting

The evaluation team will write a draft report of findings for stakeholder's review, followed by delivery of a final report that incorporates updates from those reviews.

Deliverable: Draft report *Deliverable Date:* November 2016

Deliverable: Final report *Deliverable Date:* December 2016

2.3.5 Budget and Schedule

Figure 3 and Table 9 summarize the timing of each evaluation activity. Table 9 provides budgets associated with each task. The total budget for the PY8 ARP evaluation is $55,000.

Figure 3. ARP PY8 Evaluation Timeline

Task	Evaluation Activity	2016									
		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	Request and Review Data from Utility										
2	Program and Implementation Staff Interviews										
3	Literature Review and Utility Interviews										
4	Impact Analysis										
5	Reporting										

Data Request
Create Data Collection Instruments
Collect Data
Analyze Data
Milestone Deliverables

Table 9. ARP PY8 Evaluation Budget

Task	Evaluation Activity	Deliverable Date	Cost by Task
1	Request and Review Data from Utility	June 2016 and August 2016	$2,000
2	Program and Implementation Staff Interviews	June 2016	$3,500
3	Literature Review and Utility Interviews	August 2016	$12,000
4	Impact Analysis	September–October 2016	$9,000
5	Reporting	November 2016 and December 2016	$28,500
		Total Cost	**$55,000**

2.4 Residential Multifamily In-Unit

2.4.1 Program Description

The AIC Multifamily Program offers incentives and services that enable energy savings and lower operating costs in market-rate multifamily housing. Program administrators deliver direct installation and major measures using a hybrid approach that leverages program implementation staff from CLEAResult, as well as program allies[8]:

- **Direct install measures:** Program staff offer the direct installation of energy-saving measures for multifamily properties' common areas and tenant units. The implementation contractor conducts outreach, recruits in-unit direct install participants, performs audits to identify installation opportunities, and provides a variety of measures free of charge.
  - **In-unit:** Program offerings for tenant units include CFLs, low-flow showerheads, faucet aerators, and programmable thermostats. The implementer is responsible for installing most of the in-unit and common area measures; the exception is programmable thermostats, which the implementer provides to participating customers for installation by the customer's own staff.
  - **Common areas:** The offerings for common areas under the AIC Multifamily Program include light bulb replacements. The implementer offers properties medium screw-based standard and specialty CFL upgrades for incandescent or halogen lamps in interior and exterior settings. The implementation contractor conducts outreach, recruits participants, and installs common area lighting upgrades.
- **Major measures:** Program staff within the AIC Multifamily Program offer insulation and air sealing to customers with gas heating. Program allies are responsible for generating leads, bringing customers into the major measures component, and performing all major measure installations.

According to the PY8 Implementation Plan, the expected savings from this program are 5% of the AIC PY8 portfolio's electric savings and 3% of overall portfolio therm savings (including both residential and commercial programs).

[8] There is also a Multifamily Program offered through the IPA. It focuses on common areas and major measures (see the IPA Plan). The IPA program's common area lighting component includes a different measure mix than the AIC Multifamily Program (LED exit signs, modular CFLs, T8 lights for common areas, and, where appropriate, occupancy sensors), whereas its major measures program offers the same types of measures as the AIC program, but to customers with electric heat rather than gas heat.

2.4.2 Research Objectives

The objective of the PY8 Multifamily Program evaluation is to provide estimates of gross and net electric and gas savings associated with the program. In particular, the PY8 impact evaluation will answer the following questions:

1. What were the estimated gross energy and demand impacts from this program?
2. What were the estimated net energy and demand impacts from this program?
3. What was the estimated NTGR for in-unit direct install measures, common area direct install measures, and major measures to be applied starting in PY10?

The evaluation team will also explore a number of process-related research questions as part of the PY8 evaluation.[9] Through these questions, we will explore key changes to the program, as well as the remaining market potential for the program in future years.

4. Program Participation
    a. How many projects were completed? By how many different customers? What types of projects?
    b. Did customer participation meet expectations? If not, how different was it and why?
    c. How many customers participated in more than one component?
5. Program Design and Implementation
    a. Did the program implementation change compared to PY7? If so, how and why and was this an advantageous change?
    b. What implementation challenges occurred in PY8, and how did the program overcome them?
6. Opportunities for Program Improvement
    a. What changes could the program make to improve the customer experience?
    b. What additional measures could the program offer to generate additional program savings? Which of these measures provide a relatively greater savings opportunity? Which are of greatest interest to participants?

We will explore each of the questions through the activities described throughout this evaluation plan.

2.4.3 Methodology

Below we provide a summary of the methods planned for the PY8 Multifamily Program evaluation.

[9] The evaluation team will conduct these activities in conjunction with the IPA Multifamily Program.

Data Sources

Impact Analysis

The team will estimate ex post gross impacts by reviewing program tracking data and confirming correct application of the IL-TRM V4.0. We will calculate PY8 net savings by applying SAG-approved NTGRs to ex post gross savings.

Process Analysis

We will collect a variety of primary and secondary data to support the process analyses. Main activities are interviews with program staff, a survey of participating property owners/managers, a survey of tenants residing in units that received direct install measures through the program, and a review of secondary documents and data (e.g., program implementation plans, marketing plans, AIC's recent potential study, and recent reports presenting recently-estimated NTGRs for LEDs). The collective goals of these activities are to document program design, implementation, and participation and to explore opportunities for program improvement. Details of each activity are provided in the Sampling Plan and Analysis Plan sections, below.

NTGR Updates

We will develop updated estimates of free-ridership and participant spillover for the Multifamily Program using self-reported data from quantitative surveys of property owner/managers and tenants living in units that received program measures. These values will be applied prospectively in PY10.

Sampling Plan

Participating Property Manager/Owner Survey

We will conduct a telephone survey with property managers/owners who participated in the Multifamily Program. The survey will be designed to collect a variety of data needed for updating NTGRs for direct install measures and major measures (to be applied starting in PY10) and completing process research activities.

We will attempt a census of all property managers/owners who participated during PY8, based on our knowledge of program participation and anticipated response rates. For budgeting purposes, we assume that the census attempt will result in 70 completed interviews across both the AIC and IPA Multifamily programs. Based on the breakdown of PY7 participants across IPA and AIC programs (76% participated in the AIC program or both the AIC and IPA programs), we expect that the majority of respondents will have completed upgrades through the AIC program.

Participating Tenant Survey

We will field an internet survey with a sample of tenants. The PY8 tenant survey is designed to gather data related to water usage characteristics, as well as LED adoption, including information about tenants' recent lighting purchases, installations, and replacement behaviors.[10]

We will interview a random sample of tenants for the survey by mailing a letter offering them a $25 incentive for completing the online survey. Each letter will contain a link to the survey, as well as a unique PIN that will

[10] Starting in PY10, AIC plans to offer in-unit LEDs instead of in-unit CFLs. Therefore, we will not collect data to estimate an in-unit CFL NTGR because that effort would provide little long-term utility for program planning and evaluation.

allow us to track respondents. The survey will be available for approximately 2 weeks from the date that the tenant receives the invitation, during which we will send one reminder postcard to each tenant who has not yet responded.

The size of our sample will depend on the number of tenant units in which program staff installed measures during PY8 and the portion that have access to the Internet. We are aiming to complete at least 70 tenant surveys, which is sufficiently large to achieve the 90/10 level of confidence and precision for process research questions, assuming a coefficient of variation (CV) of 0.50.

Once we select a random sample of tenant addresses from the program database, we will split the eligible sample into two equal parts and will send invitation letters in two waves. This will allow us to monitor the response rate and coefficient of variation of the first wave. Depending on the response rate and CV of the first wave, we may increase or decrease the number of invitations sent during the second wave. For planning purposes, we expect to send out 700 survey invitations (in two waves of 350 invitations each), with an expected response rate of 10%.

Analysis Plan

The PY8 evaluation will include a gross and net impact evaluation, as well as a targeted process assessment for the Multifamily Program. Our analysis plan for key evaluation activities is described below.

Gross Impacts

To determine gross impacts associated with the Multifamily Program, we plan to review contents of the program tracking database to identify database errors and duplicate records and to ensure that the implementer correctly applied savings algorithms and assumptions stated in the IL-TRM V4.0. We will resolve any discrepancies found in the database, report on findings, and provide details related to any gross savings adjustments. We will apply the algorithms and assumptions provided in the IL-TRM V4.0 while using the actual data from the database. We will also provide detailed algorithms and assumptions used to calculate ex post gross energy and demand impacts by measure type.

As per our contract, we must verify participation each year. For this program, we will verify measure installation through a review of all projects in the program database, supplemented with installation verification information from the property owner/manager participant survey.

Net Impacts

We will calculate PY8 ex post net savings by applying SAG-approved NTGRs to ex post gross electric and gas savings. Table 10 presents the NTGRs that we will apply to PY8 savings, by measure.

Table 10. Multifamily Program PY8 NTGRs

Measure Description	Electric NTGR	Gas NTGR
In-Unit – CFLs	0.95	—
In-Unit – Programmable Thermostat	1.04	0.98
In-Unit – Faucet Aerators	1.06	1.00
In-Unit – Showerheads	1.00	0.94
Major Measures – Insulation	0.88	0.75
Major Measures – Air Sealing	0.96	0.81

We will use self-reported data from the participating property manager/owner to estimate free-ridership and spillover among Multifamily Program participants. We plan to estimate measure-specific NTGRs (except for in-unit CFLs, as discussed below), but this approach is contingent on the number of participants who install each measure. For example, if very few property owners/managers complete specific measures, sample sizes may not support estimation of measure-specific NTGRs and instead we will report NTGRs by program component (major measure, common area direct install, and in-unit direct install). The resulting NTGRs will be recommended for prospective application starting in PY10.

In PY10, AIC plans to switch to an LED-based in-unit lighting offering; thus, an in-unit CFL NTGR estimated in PY8 is unlikely to be of use in evaluating program impacts in the future. Thus, we will not estimate a NRGR for in-unit CFLs, but will instead synthesize findings of a brief literature review to provide AIC with the current range of LED NTGR that are applied for similar programs and in similar service territories. Based on our findings, we will recommend a single NTGR for in-unit LEDs for prospective application starting in PY10.

Process Research

For the process analysis, we will combine a variety of data, including program materials, databases, and survey research. Data sources will be combined in the following ways:

- We will evaluate ways that the program can maintain or enhance the customer experience using feedback from the participating property manager/owner surveys. Generally, we plan to present survey data using descriptive statistics.
- We will assess the potential for new measures using several analytical steps. First, we will conduct program staff interviews to gain a preliminary sense of what types of measures may be of interest. We will then conduct a review of secondary materials (e.g., program implementation plans, marketing plans, and AIC's recent potential study) to better understand which measures of interest to program staff are feasible given the program design, and the relative potential of each measure to increase the program's savings. Finally, we will also use the participating property owner/manager survey to gauge customers' level of interest in receiving various additional types of common area or major measures through the program. We expect to present thematic findings about program measure mix in terms of both the level of interest among typical participants and the degree of program savings potential.
- Database review activities completed during the impact analysis and in preparation for the participant survey will provide a limited study of issues related to cross-program implementation and participation

(i.e., across AIC and IPA). We will present summary statistics based on these steps to summarize property managers' experiences participating across the AIC and IPA programs.

2.4.4 Tasks

We plan to perform the following tasks in support of the PY8 evaluation.

Task 1: Review Program Tracking Data and Materials

The team will conduct a comprehensive review of all program materials and tracking data. This includes program marketing and implementation plans, customer and program ally communications, and extracts from the program tracking database. We will review all program materials to document the design and implementation of the PY8 program.

Deliverable: Data request *Deliverable Date:* June 2016

Task 2: Program and Implementation Staff Interviews

We conducted a brief interview with AIC, Leidos and CLEAResult program staff in March 2016 to understand the Multifamily Program design and implementation in PY8 and to discuss the evaluation priorities of program and implementation staff. As in past years, we also plan to complete a more detailed interview with program staff closer to the end of the program year to get staff perspective on program performance and detailed information on program marketing. In total, we expect to complete two interviews with AIC and CLEAResult program staff.

Deliverable: Conducted interviews *Deliverable Date:* June 2016

Task 3: Tenant Survey

We will field an internet survey with tenants living in units that received direct install measures through the program. The survey will collect data relevant to household water use to help assess whether future evaluations should collect primary data for faucet aerators. In addition, the evaluation team will use the survey to gather information on the awareness and purchase of LEDs, which the program will begin offering in PY10. We will combine survey findings with the review of secondary data to identify reasonable NTGR for LEDs.

We will target approximately 70 completed surveys, and will adjust this target as necessary to achieve the 90/10 level of confidence and precision for process research results.

Deliverable: Draft and final survey instrument *Deliverable Date:* July 2016

Deliverable: Results provided in annual report *Deliverable Date:* October 2016

Task 4: Participating Property Manager/Owner Survey

We plan to complete approximately 70 interviews with participating multifamily property managers/owners in AIC's service territory. In preparing the sample, we will analyze participation trends across the AIC and IPA programs and direct install and major measures. The interviews will collect data needed to update direct install and major measure NTGRs and will explore the experiences of property managers and owners with the program and their interest in receiving additional energy efficiency measures.

We will combine survey findings with the review of program tracking data and materials, in-depth interviews with program staff, and other resources as needed, to identify opportunities to generate additional savings by adding new measures to the program offerings.

Deliverable: Draft and final survey instrument *Deliverable Date:* July 2016

Deliverable: Results provided in annual report *Deliverable Date:* October 2016

Task 5: Impact Analysis

The team will use the IL-TRM V4.0 to calculate ex post gross savings associated with the measures installed through the program in PY8. For net impacts, we will apply the NTGRs listed in Table 10. We anticipate conducting this analysis in September 2016 based on the expected timing of the final program tracking data.

Deliverable: Results provided in annual report *Deliverable Date:* October 2016

Task 6: Reporting

The team will provide an integrated annual evaluation report containing process and impact results for the Multifamily Program.

Deliverable: Draft report *Deliverable Date:* October 2016

Deliverable: Final report *Deliverable Date:* November 2016

2.4.5 Budget and Schedule

Figure 4 and Table 11 summarize the timing of each evaluation activity. Table 11 also lists the budget associated with each task. In total, the PY8 budget for the Multifamily Program evaluation is $77,400.

Figure 4. Multifamily Program PY8 Evaluation Timeline

Task	Evaluation Activity	2016									
		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	Review Program Tracking Data and Materials										
2	Program and Implementation Staff Interviews										
3	Tenant Survey										
4	Participating Property Manager/Owner Survey										
5	Impact Analysis										
6	Reporting										

Data Request
Create Data Collection Instruments
Collect Data
Analyze Data
Milestone Deliverables

Table 11. Multifamily Program PY8 Evaluation Budget

Task	Evaluation Activity	Deliverable Date	Cost by Task
1	Review Program Tracking Data and Materials*	June 2016	$1,700
2	Program and Implementation Staff Interviews*	October 2016	$1,900
3	Tenant Survey	July 2016 and October 2016	$30,100
4	Participating Property Manager/Owner Survey*	July 2016 and October 2016	$21,000
5	Impact Analysis*	October 2016	$5,900
6	Reporting*	October 2016 and November 2016	$16,800
		Total Cost	$77,400

* Note: These activities are conducted in conjunction with the IPA Multifamily Program.

2.5 Residential Home Efficiency Standard Program

2.5.1 Program Description

The Home Efficiency Standard Program[11] is a home energy diagnostic and retrofit program that offers customers a home audit, direct install measures, and incentives for additional energy efficiency opportunities. The program also educates homeowners on cost-effective energy-savings strategies that they can apply throughout their home.

Starting in PY7, customers could access the program through three channels: 1) receiving an audit from an Energy Advisor, 2) contacting a program ally to make shell measure improvements such as insulation, or 3) receiving a solicitation to make improvements from a program ally. For those customers receiving an energy audit, an Energy Advisor produces a custom report with a set of recommended energy efficiency improvements. Energy Advisors also provide direct install measures, such as CFLs, faucet aerators, and low-flow showerheads, during the home visit. Customers are encouraged to make recommended installations using the network of program allies. Customers who use program allies are also eligible for the program insulation and air sealing incentives if the measures meet program guidelines and are properly reported. All projects are subject to program quality assurance (QA) inspections.

CLEAResult implements the Home Efficiency Standard Program and reports to Leidos, who manages all of AIC's commercial and residential programs.

According to the PY8 Implementation Plan, the expected savings from this program are 1% of the AIC PY8 portfolio's electric savings and 7% of overall portfolio therm savings (including both residential and commercial programs). Per the Home Efficiency Standard Program Implementation Plan, AIC estimates that it will perform 2,000 audits in PY8, with 1,400 homes receiving retrofits.

[11] This program was known as the Home Performance with ENERGY STAR (HPwES) Program in past program years.

2.5.2 Research Objectives

This evaluation addresses the program's performance in PY8. The objective of the PY8 Home Efficiency Standard Program evaluation is to provide estimates of gross and net electric and gas savings associated with the program. In particular, the PY8 impact evaluation will answer the following questions:

1. What were the estimated gross energy and demand impacts from this program?
2. What were the estimated net energy and demand impacts from this program?
3. Did the program meet its energy and demand goals? If not, why?

The evaluation team will also explore a limited number of process-related research questions as part of the PY8 evaluation. These questions are aimed at documenting program implementation processes and participation given that the program will not be offered in PY9.

4. Program Design and Implementation Effectiveness
    a. Was the program implemented according to design?
    b. What were the program marketing and outreach efforts?
    c. What implementation challenges occurred in PY8 and how were they overcome?
5. Program Participation
    a. How many homes received audits? How many homes received shell measures? Has participation met expectations? If not, why?
    b. What were the barriers to installation of incentivized shell measures after receiving an audit?

We will explore each of the questions through the activities described in this evaluation plan.

2.5.3 Methodology

Below we provide a summary of the methods planned for the PY8 Home Efficiency Standard Program evaluation.

Data Sources

Impact Analysis

The team will estimate ex post gross impacts by reviewing program tracking data and confirming correct application of the IL-TRM V4.0. We will use a telephone survey with program participants to verify measure installation. To calculate ex post net impacts, we will apply SAG-approved NTGRs to ex post gross savings (see Analysis Plan section below).

As part of this evaluation, we will also develop estimates of free-ridership and participant spillover for the program (for prospective application in PY10). We will base this analysis on data collected in the participant survey.

Process Analysis

The process analysis will utilize data from two data collection efforts: 1) a review of program data and materials, and 2) in-depth interviews with program and implementation staff. In-depth interviews with program staff and a review of program materials will provide the evaluation team with a comprehensive understanding of program implementation and marketing efforts. A review of program tracking database will allow the evaluation team to assess program participation.

Analysis Plan

The PY8 evaluation will include gross and net impact estimates, as well as a targeted process assessment for the Home Efficiency Standard Program. Our analysis plan for key evaluation activities is described below.

Gross Impacts

The impact evaluation team will use savings algorithms from the IL-TRM V4.0 and data inputs from the program tracking database to estimate ex post gross savings.

Net Impacts

We will calculate PY8 net savings by applying SAG-approved NTGRs to ex post gross electric and gas savings. Table 12 presents the NTGRs by measure.

Table 12. Home Efficiency Standard Program PY8 NTGRs

Measure Description	Electric NTGR	Gas NTGR
CFLs	0.82	—
Faucet Aerators	0.92	0.94
Showerheads	0.86	0.91
Air Sealing	0.71	0.72
Insulation	0.78	0.78
Programmable Thermostat	0.87	0.87

The team will also conduct new NTGR research for prospective application in PY10.

Process Findings

The main objectives of the process evaluation are to document the program implementation process and participation. We will present process-related findings based on our analysis of the program materials, databases, and program and implementation staff interviews.

2.5.4 Tasks

This section outlines the planned evaluation tasks for our PY8 assessment of the Home Efficiency Standard Program.

Task 1: Program Material Review

The evaluation team will review program materials, including program implementation plans, marketing plans and collateral, and program tracking databases, to assess program implementation and provide

recommendations for improvement, where applicable. The evaluation team will also review the program tracking database to assess program participation as an input to the impact evaluation and survey sample development.

Deliverable: Data request *Deliverable Date:* July 2016

Task 2: Program Staff Interviews

We will conduct interviews with the AIC program managers and Leidos and CLEAResult implementation staff to understand changes to program design, implementation, and evaluation priorities. We anticipate conducting two to three interviews.

Deliverable: Conducted interviews *Deliverable Date:* July 2016

Task 3: Impact Analysis

As noted throughout the plan, the team will use the IL-TRM V4.0 in combination with data from the program-tracking database to calculate ex post gross savings associated with the measures installed through the program. To estimate net savings, the team will apply SAG-approved NTGRs to the adjusted gross savings.

Deliverable: Results provided in annual report *Deliverable Date:* October 2016

Task 4: Reporting

The team will provide an integrated annual evaluation report containing process and impact results for the Home Efficiency Standard Program.

Deliverable: Draft report *Deliverable Date:* October 2016

Deliverable: Final report *Deliverable Date:* November 2016

2.5.5 Budget and Schedule

Figure 5 and Table 13 summarize the timing of each evaluation activity. Table 13 also lists the budget associated with each task. In total, the PY8 budget for the Home Efficiency Standard Program is $31,000.

Figure 5. Home Efficiency Standard Program PY8 Evaluation Timeline

Task	Evaluation Activity	2016									
		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	Program Material Review										
2	Program Staff Interviews										
3	Impact Analysis										
4	Reporting										

Data Request
Create Data Collection Instruments
Collect Data
Analyze Data
Milestone Deliverables

Table 13. Home Efficiency Standard Program PY8 Evaluation Budget

Task	Evaluation Activity	Deliverable Date	Cost by Task
1	Program Material Review	July 2016	$4,600
2	Program Staff Interviews	July 2016	$3,800
3	Impact Analysis	August 2016 and September 2016	$11,200
4	Reporting	October 2016 and November 2016	$11,400
		Total Cost	**$31,000**

2.6 Residential Home Efficiency Income Qualified Program

2.6.1 Program Description

The Home Efficiency Income Qualified Program[12] is a home energy diagnostic and whole-house retrofit program that began as a pilot in PY3 and is in its fifth year of implementation. The target market for the Home Efficiency Income Qualified Program is existing homes heated by a fuel source (electricity or natural gas) provided by AIC and owned by customers with a household income up to 300% of federal poverty guidelines for household size. Through this program, customers can have a variety of measures installed to their homes including CFLs, showerhead and faucet aerators, ceiling, wall and crawlspace insulation, programmable thermostats, furnaces and boilers. In PY8, the program will continue to expand its geographic reach to include Champaign and Vermillion counties.

CLEAResult implements the Home Efficiency Income Qualified Program, reporting to Leidos, who manages all of AIC's commercial and residential programs. Starting in PY7, customers could access the program through three channels: 1) submit an application for pre-approval of income for a free audit, 2) be directed to the program through a Home Efficiency Standard Program audit referral, or 3) apply to the program directly through a program ally.

[12] This program was previously referred to as the Moderate Income Program.

According to the PY8 Implementation Plan, the expected savings from this program are 2% of the AIC PY8 portfolio's electric savings and 10% of overall portfolio therm savings (including both residential and commercial programs), which represents a significant increase over prior program years.

2.6.2 Research Objectives

This evaluation addresses the program's performance in PY8. The objective of the PY8 Home Efficiency Income Qualified Program evaluation is to provide estimates of gross and net electric and gas savings associated with the program. In particular, the PY8 impact evaluation will answer the following questions:

1. What were the estimated gross energy and demand impacts from this program?
2. What were the estimated net energy and demand impacts from this program?
3. Did the program meet its energy and demand goals? If not, why?

The evaluation team will also explore a number of process-related research questions as part of the PY8 evaluation. These questions are aimed at exploring key changes to the program, as well as participant experience and satisfaction with the program.

4. Program Design and Implementation Effectiveness
    a. Was the program implemented according to design?
    b. What were the program marketing and outreach efforts?
    c. What implementation challenges occurred in PY8 and how were they overcome?
5. Program Participation
    a. Which geographic areas have seen the most participation in the program to date? Are there areas that the program should consider targeting more heavily in the future?
    b. How many homes received audits? How many homes received shell measures? Has participation met expectations? If not, why?
    c. What were the barriers to installation of incentivized shell measures after receiving an audit?
6. Participant Experience and Satisfaction
    a. Were customers satisfied with aspects of the program processes in which they have been involved?
    b. Were customers satisfied with the participation process and program measures?
    c. Are there any particular program measures offered that were important drivers for customers in their decision to participate in the program?
7. Opportunities for Program Improvement
    a. Did program changes/enhancements from PY7 to PY8 achieve their intended outcomes? What areas for improvement exist from PY8 to PY9? What additional measures could the program offer to generate additional program savings? Which of these measures provide a relatively greater savings opportunity? Which are of greatest interest to participants?

b. Are moderate income customers able to provide a co-pay for the home audit? If so, what amount are they able to pay?

We will explore each of the questions through the activities described in this evaluation plan.

2.6.3 Methodology

Below we provide a summary of the methods planned for the PY8 Home Efficiency Income Qualified Program evaluation.

Data Sources

Impact Analysis

The team will estimate ex post gross impacts by reviewing program tracking data and confirming correct application of the IL-TRM V4.0. We will use a quantitative telephone survey with program participants to verify measure installation. In addition, the evaluation team will apply the SAG-approved NTGR of 1.0. This approach is the result of discussions between AIC and the evaluation team.

Process Analysis

The process analysis will utilize data from six sources: (1) a review of program data and materials; (2) an analysis of program tracking data spanning PY1-8, from which the evaluation team will map program delivery over time; (3) in-depth interviews with program and implementation staff, which will provide the evaluation team with a comprehensive understanding of the program; (4) a survey with program participants to assess customer satisfaction and to learn about their paths to participation; (5) a general population survey to assess awareness of the program and familiarity with program marketing and outreach efforts; and (6) interviews with participating trade allies about measure offerings and customer decision-making, the participation process, and ways in which the program could be improved for PY9.

Sampling Plan

Participant Survey

The evaluation team will conduct a telephone survey with program participants. To increase the reliability of measure-level findings, we will draw a simple random sample of participants for each of the primary measures installed through the program. For participants who receive three or more measure types, we will randomly select up to two measures to ask about in the survey. We will gather data from 100 respondents in order to achieve 90/10 precision in terms of sampling error for both responses to survey scales (e.g., program satisfaction) as well as reported installation rates.

General Population Survey

In addition to the participant survey, the evaluation team will conduct a general population web survey of moderate income households within the target regions. The sample for this survey effort will come from the list of those targeted by AIC's Behavioral Modification Program, which includes income-qualified customers. We will gather survey data from approximately 200 respondents (100 known to be income qualified and 100 that may be income qualified based on census data) in order to achieve 90/10 precision in terms of sampling error for select process questions.

Trade Ally In-Depth Interviews

From PY7 to PY8, the number of participating trade allies increased substantially. Moreover, trade allies served as a primary channel for marketing of the program to customers. Given the central role that trade allies play in the implementation of the program, they are a key data source for this evaluation. As such, the evaluation team will conduct interviews with returning, as well as newly recruited trade allies. Specifically, we will explore: (1) the extent to which the program was responsive to their feedback in PY7 (for returning trade allies); (2) satisfaction with the program and suggestions for improvement; and (3) customer willingness to participate in the program at varying incentive levels. We anticipate conducting in-depth interviews with approximately 30 trade allies randomly selected from the population of returning (n=15) and new participants (n=15).

Analysis Plan

The PY8 evaluation will include gross and net impact estimates, as well as a targeted process assessment for the Home Efficiency Income Qualified Program. Our analysis plan for key evaluation activities is described below.

Gross Impacts

The evaluation team will use savings algorithms from the IL-TRM V4.0 and data inputs from the program tracking database to estimate ex post gross savings. In addition, we will draw on installation rate information from the participant survey.

Net Impacts

The evaluation team will apply the SAG-approved NTGR of 1.0 to calculate net savings.

Process Findings

The main objectives of the process evaluation are to assess the effectiveness of program design, marketing, and implementation, explore barriers to conversion of audit participants, identify opportunities for program improvement, and examine how, if at all, changes to measure incentive levels and inclusion of a co-pay for the home audit could affect future participation. To assess the effectiveness of program design and implementation, the evaluation team will interview program and implementation staff and review all relevant program data and materials. This effort will help explore program changes, successes, and challenges, and identify potential areas for program improvement. To identify opportunities for program improvement, assess the effectiveness of marketing, and explore how changes to the program could affect future participation the evaluation team will analyze quantitative survey data from a participant survey and general population survey. Further, the evaluation team will conduct in-depth qualitative interviews with participating trade allies to gain a deeper understanding of how they serve as a means of informal marketing of the program to customers and their perspectives on changes to measure level incentives and the inclusion of a co-pay for the in-home audit.

We will present process-related findings based on our analysis of the program materials, databases, in-depth interviews, and survey research. Survey data will generally be presented using descriptive statistics.

2.6.4 Tasks

We plan to perform the following tasks in support of the PY8 evaluation.

Task 1: Program Material Review

The evaluation team will review program materials, including program implementation and marketing plans and program databases, to assess program implementation and provide recommendations for improvement, where applicable. The evaluation team will also review the program tracking database to assess program participation as an input to the impact evaluation and survey sample development.

Deliverable: Data request *Deliverable Date:* July 2016

Task 2: Program Staff Interviews

We will conduct interviews with the AIC program manager, as well as Leidos and CLEAResult implementation staff, to understand changes to program design, implementation, and evaluation priorities for PY8. We anticipate conducting two to three interviews.

Deliverable: Conducted interviews *Deliverable Date:* July 2016

Task 3: Participant Survey

The evaluation team will field a participant survey to a random sample of program participants in PY8. The survey will gather information regarding satisfaction, drivers of participation, actions taken, key demographics, and number of measures received and installed. It will also gather information to inform future program design and implementation, such as new measure offerings that may be of interest to customers and how much customers would be willing to provide as a co-pay for an audit.

Deliverable: Draft and final survey instrument *Deliverable Date:* August 2016

Task 4: General Population Survey

The evaluation team will leverage a survey planned for the Behavioral Modification Program to contact customers in the program's target population. The survey will gather information regarding program awareness, the effectiveness of marketing and outreach efforts, and interest in alternative program designs. Similar to the participant survey, this survey will also be used as a means for gathering data to inform future program design and implementation, specifically around interest in new measure offerings, and their willingness and ability to provide a co-pay to receive an audit.

Deliverable: Draft and final question batteries *Deliverable Date:* August 2016

Task 5: Trade Ally Interviews

To understand the ever-expanding role of the trade allies in both program marketing and implementation, the evaluation team will conduct interviews with approximately 30 program trade allies. These interviews will gather information about the programs' responsiveness to trade allies' feedback in PY7, other potential areas for improvement (e.g., inclusion of new measures), and what trade allies see as the main barriers to conversion for customers. We will also solicit trade allies' perspectives on how requiring a co-pay for the audit and how changes to measure incentive levels could affect participation.

Deliverable: Draft and final interview guide *Deliverable Date*: August 2016

Task 6: Database Aggregation and Mapping

Using tracking data from PY1-8, the evaluation team will create a database that includes information on program participation to date. Using this database, the evaluation team will create a map of program participation overlaid with census data germane to program targeting. This will allow us to illustrate the geographic areas where the program has been implemented and areas where the program could be more heavily promoted in the future.

Deliverable: Results in final report *Deliverable Date:* October 2016

Task 7: Impact Analysis

To estimate ex post gross savings, the evaluation team will rely on the telephone survey (described above) to verify that the measures listed in the database were in fact installed. We will use these data as inputs to the savings algorithms in the IL-TRM V4.0 to estimate ex post gross savings. To estimate net savings, the team will apply the SAG-approved NTGR of 1.00 to the adjusted gross savings.

Deliverable: Results provided in annual report *Deliverable Date:* October 2016

Task 8: Reporting

The team will provide an integrated annual evaluation report containing process and impact results for the Home Efficiency Income Qualified Program.

Deliverable: Draft report *Deliverable Date:* October 2016

Deliverable: Final report *Deliverable Date:* November 2016

2.6.5 Budget and Schedule

Figure 6 and Table 14 summarize the timing of each evaluation activity. Table 14 also lists the budget associated with each task. In total, the PY8 budget for the Home Efficiency Income Qualified Program is $98,200.

Figure 6. Home Efficiency Income Qualified Program PY8 Evaluation Timeline

Task	Evaluation Activity	2016									
		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	Program Material Review										
2	Program Staff Interviews										
3	Participant Survey										
4	General Population Survey										
5	Trade Ally Interviews										
6	Database Aggregation and Mapping										
7	Impact Analysis										
8	Reporting										

Data Request
Create Data Collection Instruments
Collect Data
Analyze Data
Milestone Deliverables

Table 14. Home Efficiency Income Qualified Program PY8 Evaluation Budget

Task	Evaluation Activity	Deliverable Date	Cost by Task
1	Program Material Review	July 2016	$4,200
2	Program Staff Interviews	July 2016	$4,300
3	Participant Survey	August 2016	$20,900
4	General Population Survey	August 2016	$12,300
5	Trade Ally Interviews	August 2016	$13,700
6	Database Aggregation and Mapping	October 2016	$5,700
7	Impact Analysis	October 2016	$9,400
8	Reporting	October 2016 and November 2016	$27,700
		Total Cost	**$98,200**

2.7 Residential ENERGY STAR® New Homes

2.7.1 Program Description

The Residential ENERGY STAR® New Homes Program (New Homes Program) works with Home Energy Rating System (HERS) raters to target builders with a package of services. These include training, technical information, marketing assistance, and incentives for the construction of ENERGY STAR new homes, built to a specified maximum HERS rating. The program incentive intends to defray costs of the required home energy

ratings and additional costs of energy-efficient equipment and materials. In addition, the program provides cooperative marketing support for builders.

The program, delivered by CLEAResult with oversight from the program implementer (Leidos), targets builders of new, single-family homes, heated with a fuel (natural gas or electricity) provided by AIC. The program uses a tiered incentive structure: Builders may qualify for additional financial incentives by achieving higher efficiency levels in their new homes.

According to the PY8 Implementation Plan, the expected savings from this program are less than 1% of the AIC PY8 portfolio's electric savings and 1% of overall portfolio therm savings (including both residential and commercial programs).

2.7.2 Research Objectives

The New Homes Program PY8 evaluation seeks to provide estimates of gross and net electric and gas savings associated with the program.

The PY8 impact evaluation will answer the following questions:

8. What were the program's estimated gross and net energy and demand impacts?
9. What was the appropriate baseline for estimating program savings?
10. What was the program's estimated NTGR for future planning purposes?

The evaluation team will also explore process-related research questions for the PY8 evaluation. These questions focus on program design and implementation changes between PY7 and PY8 and on any insights gained from the PY7 evaluation that warrant follow-up. Additionally, the process evaluation will gather data to inform the following: NTGR and spillover, participant builders' experience, and customers' energy efficiency awareness. The team will specifically design the process evaluation to answer the following questions:

11. Program Design and Implementation
    a. How many homes were built to program standards in PY8?
    b. What changes occurred in PY8, and what are the impacts of these changes?
    c. How well did the program's processes work, and what opportunities existed for improvements?
12. Builder Experience and Satisfaction
    a. What motivated builders to participate in the program?
    b. How satisfied were builders with the program?
    c. What were the barriers to increased builder participation?

2.7.3 Methodology

Data Sources

Impact Analysis

The evaluation team will use REM/Rate files as the primary data source to estimate savings associated with each program home. After inspecting a home during construction, HERS raters use REM/Rate software to create an energy analysis model for estimating whether the home meets the energy savings qualifications to receive program incentives. For PY8, the team will use REM/Rate to predict savings for these homes, employing the reference home for comparison to the code enforced by a jurisdiction (whether IECC 2012 or an earlier code). Additionally, the team will compare data from the program tracking database to the results of our modeling review to determine program gross realization rates.

The team will develop sets of baselines based on information gathered from secondary research and previous evaluation results.[13] The team will compare these data to submitted REM/Rate files using the User Defined Reference Home feature in REM/Rate.

Process Analysis

For the process analysis, the evaluation team will use in-depth interviews with program management and implementation staff, interviews with participant builders, and a review of program operational and marketing materials in order to assess participant experience and satisfaction as well as program design and delivery.

Sampling Plan

REM/Rate Review

The team will review inputs to the REM/Rate models to ensure homes adhere to program requirements. The review will include a sample of up to 70 homes and associated REM/Rate files. If overall participation remains relatively low, the team will sample a number needed to achieve the 90/10 level of confidence and precision. Stratifying the sample by HERS rating levels will ensure representation at all savings levels and improve the efficiency of the sample design.

Builder Surveys

To supplement research from PY6, the evaluation team will conduct a more robust NTGR analysis, interviewing up to 20 participant PY7 builders. Table 15 lists the population source and target completes for the survey effort. The evaluation team will randomly sample participant builders from a list of PY7 participants, provided by program implementation staff.

[13] Although Illinois adopted IECC 2015 (with amendments) on January 1, 2016, the evaluation team will not assess program impacts per this baseline. In previous evaluations, we found that local building department adoption of these codes is not consistent statewide.

Table 15. New Homes Program PY8 Builder Survey Sampling Method, Source, and Target

Data Collection Method	Population Source	Targeted Completes
Participant builder surveys	Implementation staff	20

Analysis Plan

Gross Impacts

The PY8 impact evaluation will consist of reviewing program records and a sample of up to 70 REM/Rate files prepared by the HERS raters to estimate energy savings. The evaluation team first will compare program tracking records against the documented characteristics in REM/Rate models to verify participation and appropriate incentive levels. The team will then utilize REM/Rate model-predicted savings to compute gross program electricity and gas energy savings. For PY8, REM/Rate will predict savings for these homes in comparison to local enforced code. These savings, in comparison to the program's ex ante savings, will be used to calculate the realization rates that we apply to the rest of the program homes.

Net Impacts

To determine net savings, the evaluation team will use the deemed NTGRs, which the SAG agreed on for PY8 (shown in Table 16).

Table 16. New Homes Program PY8 NTGRs

Measure Description	Electric NTGR	Gas NTGR
Single-family only	1.011	1.006

Process Findings

For the process analysis, the evaluation team will summarize information gathered from program staff interviews and from participant builder surveys.

2.7.4 Tasks

This section describes the evaluation team's planned tasks for the New Homes Program PY8 evaluation.

Task 1: Request and Review Data from Utility

The evaluation team will conduct a comprehensive review of all program materials and program tracking data, including program marketing and implementation plans, participant builder contact information, REM/Rate files, and the program tracking database. The team will make an initial data request in June 2016, with subsequent requests in August 2016 to obtain the final program tracking database.

Deliverable: Data request *Deliverable Dates:* June 2016 and August 2016

Task 2: Program Manager and Implementer Interviews

The team will conduct up to two telephone interviews with program managers from AIC and its program implementers. These interviews will address such topics as program changes and delivery, communication, budget and data tracking, and customer feedback.

Deliverable: Conducted interviews *Deliverable Date:* May 2016

Task 3: Participant Builder Surveys

The evaluation team plans to conduct up to 20 telephone surveys with PY7 participants to reassess the program's NTGR for prospective application in PY10. The surveys will build on research conducted in PY6, collecting data addressing free-ridership, spillover, and program experience. The NTGR questions will follow the IL-TRM V5.0 protocol.

Deliverable: Draft and final survey instruments *Deliverable Date:* March 2016

Task 4: REM/Rate Review and Impact Analysis

The evaluation team will request a random sample of up to 70 REM/Rate files from AIC for comparison to the program tracking database. For these 70 files, the team will define the baseline of the local building code to simulate energy and demand savings for each home compared to that baseline (typically IECC 2012 or local code in effect during PY8). These savings will represent the realization rates that we apply to the rest of the program homes. This will allow the team to verify participants and to ensure that savings remain consistent with rating results.

Deliverable: Analysis provided in final report *Deliverable Date:* October 2016

Task 5: Reporting

The evaluation team will incorporate the outcome of the data collection and analysis tasks into a draft evaluation report for AIC and stakeholder review. The team will incorporate resulting comments into the final report.

Deliverable: Draft report *Deliverable Date:* November 2016

Deliverable: Final report *Deliverable Date:* December 2016

2.7.5 Budget and Schedule

Figure 7 and Table 17 summarize the timing of each evaluation activity. Table 17 also lists the budget associated with each task. The total budget for the New Homes Program PY8 evaluation is $56,000.

Figure 7. New Homes Program PY8 Evaluation Timeline

Task	Evaluation Activity	2016									
		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	Request and Review Data from Utility										
2	Program Manager and Implementer Interviews										
3	Participant Builder Surveys										
4	REM/Rate Review and Impact Analysis										
5	Reporting										

Data Request
Create Data Collection Instruments
Collect Data
Analyze Data
Milestone Deliverables

Table 17. New Homes Program PY8 Evaluation Budget

Task	Evaluation Activity	Deliverable Date	Cost by Task
1	Request and Review Data from Utility	June 2016 and August 2016	$2,500
2	Program Manager and Implementer Interviews	May 2016	$2,500
3	Participant Builder Surveys	March 2016	$23,000
4	REM/Rate Review and Impact Analysis	October 2016	$6,000
5	Reporting	November 2016 and December 2016	$22,000
		Total Cost	**$56,000**

2.8 Residential School Kits

2.8.1 Program Description

In PY6, the Residential Energy Efficiency Schools Kits (School Kits) Program was implemented for the first time as one of five IPA programs. Starting in PY7, the School Kits Program became a part of AIC's portfolio of energy efficiency programs. Through the program, AIC distributes kits containing energy-efficient items (i.e., high efficiency light bulbs, faucet aerators, a showerhead, and a hot water temperature card thermometer) to fifth- through eighth-grade students. The program seeks to increase sales and awareness of ENERGY STAR-qualified lighting products, along with other AIC energy efficiency offerings intended to reduce energy consumption.

AIC uses Leidos, CLEAResult, and EFI to deliver the program and to achieve program energy-savings goals. Leidos implements the program, CLEAResult develops the curriculum and presents the program to students in eligible schools, and EFI mails branded kits and marketing materials directly to participating teachers for distribution to their students. Using web-based student surveys, Leidos also verifies kit item installations and collects home characteristics.

According to the PY8 Implementation Plan, the expected savings from this program are less than 1% of the AIC PY8 portfolio's electric and gas savings (including both residential and commercial programs).

2.8.2 Research Objectives

For the PY8 School Kits Program evaluation, the team will seek to estimate program gross and net electric and natural gas savings. The team will design the PY8 impact evaluation to answer the following questions:

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

The evaluation team will also conduct a process evaluation to explore how the program performed during in its third year. The evaluation will seek to address the following process-related questions:

3. Program Participation
    a. How many kits were distributed to participants?
    b. What were the installation rates for each measure?
4. Program Design and Implementation
    a. Did AIC make any program changes since PY7? How did these changes affect program performance or delivery?
    b. What implementation challenges occurred in PY8?
    c. What changes could AIC make to improve future program effectiveness?

2.8.3 Methodology

A summary follows that presents the team's planned methods for conducting the PY8 School Kits Program evaluation.

Data Sources

Impact Analysis

The evaluation team will use the IL-TRM V4.0 to estimate PY8 ex post gross savings for the School Kits Program. This will include reviewing all data in the program tracking database (to verify participation) and applying deemed unit savings values provided in the TRM. The team will determine electric water heater saturations (to appropriately attribute electric savings to AIC) and installation rates, using results from the implementer's web-based student survey.[14] The team will determine net savings using SAG-approved NTGRs.

Process Analysis

The team will use additional data sources in conducting the process evaluation, including interviews with program management and implementation staff, to understand program changes since PY7 and program

[14] If these data are unavailable, the evaluation team will adjust for this using deemed values indicated in the TRM V4.0.

strengths and weaknesses in PY8. Additionally, the results of the web-based student surveys conducted by the implementer will provide information about participant satisfaction with the measures installed.

Sampling Plan

Participant Survey

To capture data relevant to estimate the program's future planning NTGR, the evaluation team will conduct a telephone survey with participating student households. In collecting appropriate contact data for this effort, the evaluation team will work with the implementer to develop a parent contact postcard for distribution along with the PY8 energy efficiency kits. The postcard will request participating parents' and guardians' contact information and permission to contact these participants for follow-up research. The team will use the resulting parent contact information to construct the survey sample frame.

All schools receiving kits between April 2016 and December 2016 will receive the parent contact postcards. The target sample, consisting of 70 PY8 participants should be sufficient to achieve the 90/10 level of confidence and precision.

Impact Analysis

The team will analyze a census of records provided in the program tracking database, as well as web-based student survey results provided by the program implementer.

Analysis Plan

The evaluation team will conduct impact and process evaluations of the School Kits Program. An outline of the analysis plan follows.

Installation Rates

The team will analyze a census of the implementer's web-based student surveys to assess measure installation rates (i.e., the numbers of measures received and installed).[15]

Gross Impacts

Following use of the program tracking database to verify program participation, the team will apply the IL-TRM V4.0 to estimate gross savings. The team will calculate gross impacts by multiplying the number of verified measures by the deemed unit savings, electric water heater saturation, and installation rate for each measure.

Net Impacts

As shown in Table 18, the team will use SAG-approved NTGRs to estimate net program savings. We will multiply the gross savings for each measure by the NTGR values shown in Table 18.

[15] Per the IL-TRM V4.0, we will apply deemed installation rates to all CFL measures.

Table 18. School Kits Program PY8 NTGRs

Measure Description	Electric NTGR	Gas NTGR
CFLs	0.83	—
Showerheads	1.05	1.05
Faucet Aerators	1.04	1.04
Water Heater Setback	1.00	1.00

Process Findings

For the process analysis, the team will summarize information gathered from program staff interviews and will analyze satisfaction results from the web-based student surveys provided by the implementer.

2.8.4 Tasks

This section describes the evaluation team's planned tasks for the PY8 evaluation of the School Kits Program.

Task 1: Review Implementer Survey

The team plans to review the web-based survey that the implementer uses to collect data from participants. The review will concentrate on providing recommendations to change the student questionnaire, enabling the online survey to collect necessary data to estimate the NTGR and electric water heater saturations for application in future years.

Deliverable: Survey question recommendations *Deliverable Date:* January 2016

Task 2: Request and Review Data from Utility

The evaluation team will review critical program documentation, including records of marketing and outreach efforts, instructional materials, web-based student survey results, and all other paperwork. To do so, the team will request specific data or information, such as the following:

- Program tracking database (all available data)
- Verification, installation rate, and measure satisfaction results from the web-based student surveys
- Specification sheets for each item included in the energy efficiency kits
- Program instructional materials
- All program marketing materials
- Any documentation of implementation processes

The team will make an initial data request in June 2016, with subsequent requests in August 2016 to obtain the final program tracking database.

Deliverable: Data requests *Deliverable Dates:* June 2016 and August 2016

Task 3: Program and Implementation Staff Interviews

The evaluation team will perform up to three in-depth interviews with AIC staff and program implementation contractors, focusing on assessing program goals and progress toward meeting these goals. Additionally, the evaluation team will explore the following:

- Program changes since PY7
- Program design and implementation
- Program strengths and weaknesses
- Outreach and marketing

Deliverable: Conducted interviews *Deliverable Date:* June 2016

Task 4: Participating Student Household Survey

The evaluation team will design a participant telephone survey to assess free-ridership, spillover, and the program participation process. Process-related issues examined will include participant awareness, decision making, and satisfaction. The team will use data collected through parent contact postcards to develop the survey sample. Given the use of this data source, the evaluation team will need to monitor submission of the parent contact postcards to determine when sufficient sample is available for survey fielding. We anticipate fielding the survey in January 2017 after the end of the fall semester. As a result, the updated NTGR will not be available by the December 1 deadline specific in the Three Year Evaluation Plan. However, we will work with AIC and ICC staff to determine if the value can be submitted as part of the PY10 NTGR recommendations process.

Deliverable: Draft and final survey instruments *Deliverable Date:* August 2016

Task 5: Impact Analysis

The evaluation team will conduct the following tasks to determine gross and net savings:

- Analyze the program tracking database at the end of PY8 to verify participation
- Apply installation rates for all measures and, for electric water heaters, the percent saturation, derived from the implementer's web-based surveys
- Apply IL-TRM V4.0 unit savings to verified participation numbers to determine gross savings
- Apply the deemed NTGR by measure to calculate net savings

Deliverable: Analysis provided in final report *Deliverable Date:* September–October 2016

Task 6: Reporting

The evaluation team will summarize and report PY8 evaluation activity results and provide a draft report for AIC's and stakeholders' review. The final report will address resulting comments.

Deliverable: Draft report *Deliverable Date:* November 2016

Deliverable: Final report *Deliverable Date:* December 2016

2.8.5 Budget and Schedule

Figure 8 and Table 19 summarize the timing of each evaluation activity. Table 19 also shows the budget associated with each evaluation task. The total budget for the PY8 School Kits Program evaluation is $36,500.

Figure 8. School Kits Program PY8 Evaluation Timeline

Task	Evaluation Activity	2016											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	Review Implementer Survey												
2	Request and Review Data from Utility												
3	Program and Implementation Staff Interviews												
4	Participating Student Household Survey												
5	Impact Analysis												
6	Reporting												

Data Request
Create Data Collection Instruments
Collect Data
Analyze Data
Milestone Deliverables

Table 19. School Kits Program PY8 Evaluation Budget

Task	Evaluation Activity	Deliverable Date	Cost by Task
1	Review Implementer Survey	January 2016	$1,000
2	Request and Review Data from Utility	June 2016 and August 2016	$1,500
3	Program and Implementation Staff Interviews	June 2016	$2,500
4	Participating Student Household Survey	August 2016	$16,000
5	Impact Analysis	September–October 2016	$5,000
6	Reporting	November 2016 and December 2016	$10,500
		Total Cost	**$36,500**

2.9 Commercial and Industrial Standard

2.9.1 Program Description

The C&I Standard Program offers AIC business customers fixed incentives for the installation of specific energy efficiency measures. The program covers lighting, variable frequency drives (VFDs), HVAC, refrigeration/ grocery equipment, steam traps, and other measures. Within the Standard Program, lighting and steam trap projects have traditionally generated the largest amount of electric and gas savings, and early program tracking data show similar participation and savings levels in PY8.

Table 20 summarizes program activity, by program offering (Core Program, Online Store, Instant Incentives, and Green Nozzles) and, for the Core Program, by end use, through April 5, 2016.[16]

Table 20. C&I Standard Program Ex Ante Gross kWh and Therm Savings (as of April 5, 2016)

Projects	Number of Projects	Ex Ante kWh Savings	Percent of Total kWh	Ex Ante Therm Savings	Percent of Total Therms
Lighting	514	29,540,098	66%	–	–
VFD	22	8,403,018	19%	–	–
Specialty Equipment	93	1,273,358	3%	4,018	<1%
HVAC	56	1,008,932	2%	60,107	3%
Leak Survey and Repair	2	414,502	1%	–	–
Steam Trap	20	–	–	1,712,194	96%
Core Total	*707*	*40,639,907*	*91%*	*1,776,319*	*100%*
Online Store	1,400	2,600,067	6%	–	–
Instant Incentives	74	1,420,796	3%	–	–
Green Nozzles	3	4,575	<1%	471	<1%
Total	**2,184**	**44,665,344**	**100%**	**1,776,790**	**100%**

Note: Columns may not sum due to rounding.

The implementation of the Standard Program remains similar to PY7, with the only major change being the ramp-up of the Instant Incentives offering from a pilot to a full offering. According to the PY8 Implementation Plan, the expected savings from the Standard Program in PY8 are also similar to the previous program year, making up 37% of the AIC PY8 portfolio's electric savings and 15% of overall portfolio therm savings (including both residential and commercial programs).

2.9.2 Research Objectives

This evaluation addresses the program's performance in PY8. The primary objective of the PY8 Standard Program evaluation is to provide estimates of gross and net electric and gas savings associated with the program. In particular, the PY8 impact evaluation will answer the following questions:

1. What were the estimated gross energy and demand impacts from this program?
2. What were the estimated net energy and demand impacts from this program?
3. What was the level of participant free-ridership and spillover for the Online Store offering (for prospective application)?
4. What was the level of participant free-ridership and spillover for the Instant Incentives offering (for prospective application)?

In addition, we will conduct a targeted process assessment, with an emphasis on the Instant Incentives and Online Store offerings.

5. Program Participation

[16] We included only projects with application statuses of "Check Queued," "Check Sent," and "Sent to Check Processor" in this summary.

a. What were the characteristics of participating customers? How many projects were completed? By how many different customers? What types of projects?

b. Did customer participation meet expectations? If not, how different was it and why?

6. Program Design and Implementation

   a. Did the program as implemented change compared to PY7? If so, how and why and was this an advantageous change?

   b. How did Energy Advisors interact with customers and key account executives? Were Energy Advisors successful in bringing projects into the C&I portfolio and into initiatives such as Staffing Grants?

   c. What, if any, implementation challenges occurred in PY8, and how were they overcome?

   d. What changes could the program make to improve the customer experience and generate greater energy savings?

7. Program Allies

   a. How satisfied were program allies with their participation in the program?

   b. What was the impact of program participation on their business and practices?

   c. What changes would Program Allies suggest to improve the program?

8. Offering-Specific Research

   a. Instant Incentives

      i. How satisfied were customers participating in the Instant Incentives offering with different aspects of the program?

      ii. What changes would customers suggest to improve the offering?

      iii. How satisfied were distributors participating in the Instant Incentives offering with different aspects of the program?

      iv. What changes would distributors suggest to improve the offering?

   b. Online Store

      i. Why did Online Store participants choose to use the Online Store? Are they likely to use the Online Store again in the future? Are they likely to participate in other AIC programs?

      ii. How satisfied were Online Store participants with their shopping experience?

We will explore each of these questions through the activities described in this evaluation plan.

2.9.3 Methodology

Below we provide a summary of the data sources and analytical approaches planned for the PY8 Standard Program evaluation.

Data Sources

Impact Analysis

The team will estimate ex post gross impacts by reviewing program tracking data and confirming correct application of the IL-TRM V4.0. We will utilize a quantitative telephone survey to verify measure installation and installed measure characteristics for a sample of participants in the Instant Incentives program. We will also conduct a quantitative internet survey to verify measure installation for Online Store participants.

We will calculate PY8 net savings by applying SAG-approved NTGRs to gross savings (see Analysis Plan section below).

As part of this evaluation, we will also develop estimates of free-ridership and participant spillover for the Instant Incentives and Online Store offerings (for prospective application in PY10). We will base these analyses on data collected in the participant surveys conducted for each offering.

Process Analysis

The process analysis will utilize data from a number of data sources: program tracking data, in-depth interviews with program staff, Energy Advisors, and distributors participating in the Instant Incentives offering, and surveys with participants in the Instant Incentives and Online Store offerings. In-depth interviews with AIC and Leidos implementation staff will provide the evaluation team with a comprehensive understanding of the program. The distributor interviews and participant surveys will provide insights into the participant experience with the Online Store and Instant Incentives offerings, while interviews with Energy Advisors and trade allies will provide an understanding of the general program implementation.

Sampling Plan

Energy Advisor Interviews

The evaluation team will attempt to interview all Energy Advisors active in PY8.

Online Store Participant Survey

The evaluation team will conduct a quantitative internet survey with PY8 participants in the Online Store offering. We will finalize our sampling plan based on final PY8 participant information. We will attempt a census of program participants. The participant survey will include questions designed to address free-ridership and spillover. By conducting a census of program participants, we will remove the possibility of sampling error in our NTGR estimates.

Instant Incentives Distributor Interviews

We plan to complete ten interviews with lighting distributors participating in the Instant Incentives offering. The evaluation team will determine the sampling strategy for the in-depth interviews with participating Instant Incentives distributors after a review of final PY8 data, but we expect to select a purposive sample, including a mix of distributors who began participating in the offering in its pilot phase and distributors who have entered the offering more recently.

Instant Incentives Participant Survey

The evaluation team will conduct a quantitative internet survey with customers who participated in the Instant Incentives program in PY8. The participant survey will include questions designed to address free-ridership and spillover, as well as questions designed to assess program processes and participant satisfaction.

Based on an initial review of the program tracking data, we anticipate attempting a census of program participants with email addresses. If needed, we may supplement these survey completes with a small number of phone survey completes to ensure complete coverage of program participants. We will design our final sampling strategy to achieve the 90/10 level of confidence and precision. Given that this will be the first year in which we evaluate this offering, we will finalize our sampling plan after reviewing final program tracking data.

Analysis Plan

The evaluation team will conduct gross impact, net impact, and process evaluations for the Standard Program in PY8. Our analysis plan for key impact- and process-related evaluation activities is described below.

Gross Impacts

Prescriptive measures incented through the Core Program during PY8 include lighting, HVAC, VFDs, steam traps, and other measures. In general, where available, we will use the IL-TRM V4.0 and program tracking data to estimate ex post gross impacts.[17] In particular, we will verify that the correct savings value has been applied for each measure or product type, to ensure that the database is providing correct information. We will also assess the database to ensure that project data have been recorded sufficiently and correctly. We will resolve any discrepancies found in the database and report on findings.

We will report savings by energy source using the following criteria. For single-fuel customers receiving an incentive through the program, we will report the savings associated with the fuel type they receive from AIC. For example, the team will count gas savings associated with any gas incentive paid to a gas-only customer by AIC. For dual-fuel customers, we will report both the gas and electric savings associated with measures installed through the program, regardless of whether the customer received a gas or electric incentive.

As per our contract, we must verify participation each year. For this program, we will verify measure installation through a detailed review of all projects in the program database, supplemented with installation verification information from the Online Store and Instant Incentives participant surveys. Installation verification information from these surveys will be used in development of the gross realization rate used to produce ex post gross impacts.

Net Impacts

We will estimate PY8 net savings by applying SAG-approved NTGRs to gross electric and gas savings.[18]

Approved NTGRs vary by measure type; Table 21 presents the NTGRs by measure. The team will also conduct new NTGR research for the Online Store and Instant Incentives offerings for prospective application in PY10.

[17] While not expected, if measures are installed during PY8 that are not included in the IL-TRM V4.0, we will perform an engineering analysis for those measures.

[18] There is one exception to this approach. For projects associated with a Staffing Grant, we may apply a Staffing Grant-specific NTGR. For further detail on this approach please see Section 2.10.3.

Table 21. C&I Standard Program PY8 NTGRs

Measure Description	Electric NTGR	Gas NTGR
Lighting	0.78	—
VFD	0.81	—
HVAC	0.44	0.80
Specialty	0.83	0.90
Steam Trap	—	0.90
Online Store	0.83	—
Green Nozzles	0.92	0.89
Instant Incentives - CFLs	0.68	—
Instant Incentives - LEDs	0.77	—
Leak Survey[a]	0.62	—
Staffing Grant Projects	Retrospective research	

[a] Note that the evaluation team did not submit a distinct NTGR recommendation for this measure. As such, we plan to apply the ex ante NTGR for this measure based on our professional judgement that this value is appropriate in the absence of specific primary research.

Process Findings

We will present process-related findings based on our analysis of the program materials; databases; participant survey research; and in-depth interviews with program staff, Energy Advisors, and Instant Incentives distributors. We will generally present survey data using descriptive statistics, such as frequency distribution and measures of central tendency (i.e., mean, median and mode) and dispersion (i.e., standard deviations and standard errors).

2.9.4 Tasks

This section outlines the planned tasks for the PY8 evaluation of the Standard Program. Data requests and some of the planned data collection activities will overlap with the Custom Program and with the other C&I programs in AIC's portfolio. We will coordinate data requests, sampling, and data collection across the various C&I programs, as necessary.

Task 1: Review Utility Data and Program Materials

The team will conduct a comprehensive review of all program materials and tracking data. This includes program marketing and implementation plans, customer and program ally communications, and extracts from the program tracking database. We requested a preliminary Amplify[19] extract in March 2016, to support planning and survey sampling, and will continue to communicate with AIC and Leidos about data needs. At a minimum, we will make subsequent requests at the close of PY8 (June 2016) and then again in August 2016, when the database is typically finalized for the previous program year. In addition, we will make a request for other program materials in May of 2016. Table 22 provides a general summary of when we expect to make these requests.

[19] Amplify is the program-tracking database for the C&I Standard, C&I Custom, and C&I Retro-Commissioning Programs.

Table 22. C&I Standard Program Summary of Expected Data Requests

Items Requested	Timeline
Program Materials	May 2016 and ongoing as necessary
Preliminary Amplify Extract	March 2016
Year-End Amplify Extract	June 2016
Final Amplify Extract	August 2016

We will use the program tracking database as the sample frame for our internet and telephone surveys described below. As needed (e.g., for the Instant Incentives offering), we will supplement the primary program tracking database extract with other offering-specific extracts supplied by Leidos.

Deliverable: Data requests *Deliverable Date:* Ongoing

Task 2: Program and Implementation Staff Interviews

We conducted a brief interview with AIC and Leidos program staff in March 2016 to understand changes made to the program in PY8 and to discuss the evaluation priorities of program and implementation staff. As in past years, we also plan to complete more-detailed interviews with program staff closer to the end of the program year to get staff perspective on program performance and additional information on program marketing. In total, we plan to complete up to four interviews.

Deliverable: Conducted interviews *Deliverable Date:* June 2016

Task 3: Energy Advisor Interviews

We will conduct interviews with the C&I programs' Energy Advisors. The interviews will cover such topics as Energy Advisors' perceptions of customer interest in the program, interactions with customers, program processes for coordination between the Energy Advisors and Key Account Executives, success bringing projects into the program, and suggestions for program improvement. This activity will be conducted in tandem with the Custom Program evaluation. For budgeting purposes, we assume we will conduct seven interviews.

Deliverable: Draft and final interview guides *Deliverable Date:* June 2016

Task 4: Program Ally Interviews

In November/December 2015, we interviewed trade allies to investigate such topics as program participation processes, trade ally and participant satisfaction, barriers to participation, and impacts of program participation on trade ally business and practices. Of particular interest was the exploration of the effectiveness of bonuses and trade allies' perceptions of recent changes in the AIC portfolio (e.g., new implementers in the IPA C&I portfolio) and any resulting confusion in the marketplace. A stand-alone findings memo was delivered to AIC in February 2016. This activity was conducted in tandem with the Custom Program evaluation.

Deliverable: Draft and final interview guides *Deliverable Date:* November 2015

Deliverable: Program ally research memo *Deliverable Date:* February 2016

Task 5: Online Store Participant Survey

The evaluation team will conduct a quantitative internet survey with customers who have purchased products through the online store in PY8. The survey will focus on verifying measure installation and assessing free-ridership and spillover. We will also ask questions to support a limited assessment of program processes and participant satisfaction. We expect to attempt a census with all participating customers in AIC's database. The free-ridership and spillover questions will be used to develop a NTGR value for the Online Store for prospective application in PY10.

Deliverable: Draft and final participant survey instrument *Deliverable Date:* June 2016

Task 6: Instant Incentives Distributor Interviews

The evaluation team will conduct in-depth interviews with distributors participating in the Instant Incentives offering to provide AIC with early insight into distributors' experience with the offering and any barriers limiting participation. The interviews will also be used as a supplementary source of data to estimate a number of gross and net impact parameters, including free-ridership and spillover. For budgeting purposes, we plan to conduct ten distributor interviews.

Deliverable: Draft and final distributor interview guides *Deliverable Date:* June 2016

Task 7: Instant Incentives Participant Survey

The evaluation team will conduct a quantitative internet survey with customers who have participated in the Instant Incentives offering in PY8. The survey will focus on verifying measure installation and assessing free-ridership and spillover. Additionally, the survey will explore participant satisfaction and include questions to support a limited assessment of participants' perspective on program processes. We will attempt a census of program participants with email addresses and supplement with phone interviews if necessary. The free-ridership and spillover questions will be used to develop a NTGR value for the Instant Incentives offering for prospective application in PY10.

The final sample design will be chosen to support the gross and net impact analysis, and will target the 90/10 level of confidence and precision for the verification and NTGR values used in the impact analysis.

Deliverable: Draft and final participant survey instruments *Deliverable Date:* June 2016

Task 8: Gross Impact Analysis

The team will use the IL-TRM V4.0 to calculate ex post gross savings associated with the measures installed through the program.

Deliverable: Results provided in annual report *Deliverable Date:* November 2016

Task 9: Net Impact Analysis

For PY8 net savings, the team will apply SAG-approved NTGRs from PY4 and PY5 research (depending on end use) to PY8 gross savings. Through research detailed above, the team will also develop new NTGRs for the Online Store and Incentive Incentives offerings for prospective application in PY10.

Deliverable: Results provided in annual report *Deliverable Date:* November 2016

Task 10: Reporting

The team will provide an integrated annual evaluation report containing process and impact results for the Standard Program.

Deliverable: Draft report *Deliverable Date:* October 2016

Deliverable: Final report *Deliverable Date:* November 2016

2.9.5 Budget and Schedule

Figure 9 and Table 23 summarize the timing of each evaluation activity. Table 23 also lists the budget associated with each task. In total, the PY8 budget for the Standard Program is $133,400.

Figure 9. C&I Standard Program PY8 Evaluation Timeline

Task	Evaluation Activity	2016									
		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	Review Utility Data and Program Materials										
2	Program and Implementation Staff Interviews										
3	Energy Advisor Interviews										
5	Online Store Participant Survey										
6	Instant Incentives Distributor Interviews										
7	Instant Incentives Participant Survey										
8	Gross Impact Analysis										
9	Net Impact Analysis										
10	Reporting										

Data Request
Create Data Collection Instruments
Collect Data
Analyze Data
Milestone Deliverables

Note: Task 4, Program Ally Interviews, was an early evaluation activity and was completed between November 2015 and February 2016.

Table 23. C&I Standard Program PY8 Evaluation Budget

Task	Evaluation Activity	Deliverable Date	Cost by Task
1	Review Utility Data and Program Materials	Ongoing	$5,000
2	Program and Implementation Staff Interviews	May 2016	$3,500
3	Energy Advisor Interviews	June 2016	$4,000
4	Program Ally Interviews	February 2016	$7,100
5	Online Store Participant Survey	June 2016	$14,900
6	Instant Incentives Distributor Interviews	June 2016	$9,700
7	Instant Incentives Participant Survey	June 2016	$17,300
8	Gross Impact Analysis	November 2016	$27,900
9	Net Impact Analysis	November 2016	$6,000
10	Reporting	October 2016 and November 2016	$38,000
		Total Cost	**$133,400**

2.10 Commercial and Industrial Custom

2.10.1 Program Description

The C&I Custom Program allows AIC business customers to complete energy efficiency projects that involve the installation of equipment not covered through the Standard Program. The availability of this program allows customers to propose additional measures and tailor projects to their facility and equipment needs. Custom incentives are available for electric measures, such as lighting, compressed air, energy management systems (EMS), and industrial process measures, among others. The program also offers gas measures, including heat recovery, process heat, and improvements to steam systems.

Table 24 summarizes program activity through April 5, 2016, by program offering (Core Program, Competitive Large Incentive Project [CLIP], and New Construction Lighting). Note that offerings that do not have associated savings (Feasibility Studies and the Metering & Monitoring Pilot) are not included.

Table 24. C&I Custom Program Ex Ante Gross kWh and Therm Savings

Projects[a]	Number of Projects	Ex Ante kWh Savings	Ex Ante Therm Savings	Percent of Total kWh	Percent of Total Therms
Custom Incentives (Core Program)	89	14,877,363	379,701	53%	100%
CLIP Incentives	4	7,050,078	—	25%	—
New Construction Lighting	47	6,316,726	—	22%	—
Total	**140**	**28,244,167**	**379,701**	**100%**	**100%**

[a] This table does not include offerings with no associated savings: Feasibility Studies and the Metering & Monitoring Pilot.
Note: Columns may not sum due to rounding.

According to the PY8 Implementation Plan, the expected savings from this program are 45% of overall portfolio electric savings and 13% of overall portfolio therm savings (including both residential and commercial programs).

2.10.2 Research Objectives

This evaluation addresses the program's performance in PY8. The primary objective of the PY8 Custom Program evaluation is to provide estimates of gross and net electric and gas savings associated with the program. In particular, the PY8 impact evaluation will answer the following questions:

1. What were the estimated gross energy and demand impacts from this program?
2. What were the estimated net energy and demand impacts from this program?
3. What were the levels of free-ridership and spillover among customers with Staffing Grant and CLIP program participants (for application in PY8)?
4. What was the level of participant free-ridership and spillover for the core offering (for prospective application in PY10)?

The evaluation team will also investigate several of the Custom Program's special initiatives and program components, including CLIP, Staffing Grants, and the Metering & Monitoring Pilot. We will explore a number of process-related research questions outlined below.

5. Program Participation
    a. What were the characteristics of participating customers? How many projects were completed? By how many different customers? What types of projects?
    b. Did customer participation (for the program overall and for its components) meet expectations? If not, how different was it and why?
    c. How can the program increase participation in the Metering & Monitoring Pilot? Can the program leverage successful processes in other initiatives, such as Feasibility Studies, to improve the pilot's participation level?
6. Program Design and Implementation
    a. Did the program's implementation change from PY7? If so, how and why and was this an advantageous change?
    b. Did the program experience any implementation challenges in PY8? If so, what were they and how were they overcome?
    c. What changes could the program make to improve the customer experience and generate greater energy savings?
7. Participant Experience and Satisfaction
    a. How did participants become aware of the program and its components?
    b. Were participants in the special initiatives (CLIP, Staffing Grants, and the Metering & Monitoring Pilot) satisfied with their experiences? What aspects of program design or implementation could AIC change to improve program effectiveness and participant satisfaction?
    c. What barriers to participation existed for these special initiatives? How is the program seeking to overcome them?

We will explore each of these questions through the activities described in this evaluation plan.

2.10.3 Methodology

Below we provide a summary of the data sources and analytical approaches planned for the PY8 Custom Program evaluation.

Data Sources

Impact Analysis

The team will use engineering reviews, engineering modeling, database and hardcopy verification, and onsite measurement and verification (M&V) to estimate PY8 ex post gross savings. For the sample of sites we visit, the team will perform a desk review to compare the inputs provided on the application to the assumptions used in the project analysis, verify consistency in savings estimates throughout the project file, and provide insight into the accuracy of the ex ante energy savings. We plan to accomplish this by reviewing the submitted information and calculations for consistency, accuracy, and correct engineering principles. Additionally, the team will complete site visits and data logging at sampled sites to increase the accuracy of the gross savings estimates.

With two exceptions, we will calculate PY8 net savings by applying SAG-approved NTGRs to gross savings. We will develop program-specific NTGRs for Custom Program projects implemented by CLIP and Staffing Grant participants. For these participants, the team will conduct NTG interviews to develop NTGRs that will be applied retrospectively to those PY8 projects (see Analysis Plan section below).

Additionally, we will conduct a survey with participants in the core offering to support calculation of a new NTGR for prospective application in PY10.

Process Analysis

The process analysis will utilize data from multiple data collection methods and sources: in-depth interviews with AIC and Leidos program staff and program Energy Advisors; a quantitative survey of Core Program participants; Staffing Grant, CLIP, and Metering & Monitoring Pilot participant interviews; and a review of program implementation and marketing materials. The focus of the process analysis in PY8 will be primarily on special initiatives and components of the Custom Program, including CLIP, Staffing Grants, and the Metering & Monitoring Pilot. The full set of primary research topics for the process evaluation will be developed following our in-depth interviews with program and implementation staff.

Sampling Plan

Core Participant Survey

We will conduct a quantitative telephone survey with PY8 Custom Program participants to assess program processes and collect data for development of an updated NTGR. The final sample size associated with this effort will be determined based on program tracking data. However, based on early feedback on participation from Leidos, we anticipate conducting a census of PY8 participants, which means that for PY8 there will be no sampling error around our results.

Site Visits

Similar to prior evaluations, we will conduct 40 site visits with separate samples for gas and electric projects. We expect that this sample size will be sufficient to provide the 90/10 level of confidence and precision for

our ex post gross impact estimates for both electric and gas savings. We will tailor the scope of each audit to the specific measures installed at the site. In attempt to conduct impact research in a more "real time" fashion, we will develop our site visit sample in two waves, using the program tracking database as a sample frame. The first wave will include projects completed between June 1, 2015 and January 31, 2016. The second wave will include projects completed between February 1, 2016 and May 31, 2016. For each wave, we will stratify the Custom Program projects included in the program tracking database by ex ante savings, and select approximately 20 projects.

As in prior years, if we determine that our site-visit sample size is not sufficient to provide the 90/10 level of confidence and precision for our ex post gross impact estimates, we will conduct an engineering desk review of a small sample of applications. We will use the same stratified sample design described above for the site visit effort and will select the largest remaining Custom Program applications for desk review after developing the site-visit sample. We will complete only as many desk reviews as is necessary to provide the required 90/10 target for our impact estimates when combined with our site visit results.

Energy Advisor Interviews

The evaluation team will attempt to interview all seven active program Energy Advisors in PY8.

CLIP Interviews

We will conduct NTG interviews with CLIP participants to develop project-specific NTGRs for the CLIP offering. Given the low number of CLIP projects, we will attempt a census of participants for the offering.

Staffing Grant Interviews

As in prior evaluations, we will interview participants in the Staffing Grant offering. The interviews will be used to assess program processes and NTG. Given the low number of Staffing Grant participants, we will attempt a census of participants for the offering. For budgeting purposes, we assume we will conduct up to 10 interviews.

Analysis Plan

The PY8 Custom Program evaluation will continue to allocate resources to onsite M&V, but will also include detailed process research (including, for the first time, research focused on the Metering & Monitoring Pilot offering), as well as updating program NTGRs.

Gross Impacts

Consistent with prior years, the gross impact analysis for the Custom Program in PY8 is based on site-specific M&V results, which we will use to verify measure installation and savings through the Custom Program. The team will develop site-specific M&V plans for each site evaluated based on project complexity, savings magnitude, and access to critical parameter measurements. Critical parameters include a combination of those that have a significant impact on the savings and/or have a high level of uncertainty. These plans will provide for internal QA and quality control by senior staff, who are licensed professional engineers. In addition, the team will submit formal M&V plans and reports for 10 of the largest Custom Program projects. No other M&V sites will have a written site-specific plan or report.

Within each of the 10 M&V plans, we will describe the International Performance Measurement and Verification Protocol (IPMVP) option that we will use to verify the savings estimates. The IPMVP approach is typically chosen based on the type of project that was completed (new construction or replacement), the technology implemented, the level of savings relative to the billed history, and the information provided in the

project documentation. For example, Option A, retrofit isolation with parameter measurement, may be used for a specific measure, but if the impacts are significant enough such that results should be apparent on billing data, analysis of billing data (Option C) will also be conducted as a cross-check. Similarly, if Option C, whole-building energy billing analysis, is the primary means of M&V, Option A or B may be used as a cross-check to verify savings from specific measures with a significant impact on the total billed savings.

Once onsite, each visit will include a physical inspection of measures and a customer interview to gather information about the project for verification purposes. We will use a standard inspection and interview format so that information gathered from various projects is consistent. The team will use the site-specific M&V plan to guide the collection of these data, including any monitoring data.

For projects that operate mainly at a steady state (i.e., constant load), we will typically record spot measurements of critical parameters, such as amps, kW, temperatures, and flow rates. For projects that operate with significant load fluctuations, to the extent possible, we will use data logging over a period of 1–2 weeks. Data may be logged to determine run times or it may include "interval metering," where the loads are recorded at specific intervals as they vary throughout the day or week.

Based on the results of our onsite sample, we will calculate the savings-weighted realization rate (total ex post gross savings divided by the total ex ante gross savings). This sample-based realization rate will be used to adjust the ex ante savings for the population of custom projects in Amplify. The ratio estimate of Y, the ex post savings for the population of custom projects in Amplify, is:

Equation 5. Ratio Estimate of Population Total[20]

$$\hat{Y}_R = \frac{y}{x}X$$

Where:

y = The total ex post savings for the sample of projects

x = The total ex ante savings for the sample of projects

X = The ex ante savings for the population of projects

We will report savings by energy source using the following criteria. For single-fuel customers receiving an incentive through the program, we will report the savings associated with the fuel type they receive from AIC. For example, the team will count gas savings associated with any gas incentive paid to a gas-only customer by AIC. For dual-fuel customers, we will report both the gas and electric savings associated with measures installed through the program, regardless of whether the customer received a gas or electric incentive.

Net Impacts

With two exceptions, we will calculate PY8 net savings by applying SAG-approved NTGRs to gross savings. Those NTGRs are provided in Table 25. We will develop project-specific NTGRs for the two exceptions: Custom Program projects implemented by CLIP and Staffing Grant participants. For these participants, the team will conduct NTGR interviews to develop NTGRs that will be applied retrospectively to those PY8 projects.[21]

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

[21] For Staffing Grant projects, the evaluation team will use the same NTGR approach as past years. We will compare the NTGR developed through the PY8 interviews with the SAG-approved PY8 NTGRs. The PY8 NTGR will be used as a floor and, if the NTGR developed through the Staffing Grant interviews exceeds the PY8 value, then we will apply the new NTGR to all of the projects

The team will also conduct new NTGR research for the Core Custom offering for prospective application in PY10.

Table 25. C&I Custom Program PY8 NTGRs

Project Description	Electric NTGR	Gas NTGR
Core Offering	0.751	0.830
CLIP Projects	Retrospective research	
Staffing Grant Projects		

Process Findings

We will present process-related findings based on our analysis of the program materials, databases, participant survey research, and in-depth interviews. We will generally present survey data using descriptive statistics, such as frequency distribution and measures of central tendency (i.e., mean, median and mode). and dispersion (i.e., standard deviations and standard errors). We will qualitatively report results from our interviews with program and implementation staff and participants in the CLIP and Staffing Grant parts of the program.

2.10.4 Tasks

This section outlines the planned tasks for our PY8 evaluation of the Custom Program. Data requests and some of the planned data collection activities will overlap with the Standard Program and with the other C&I programs in AIC's portfolio. We will coordinate data requests, sampling, and data collection across the various C&I programs, as necessary.

Task 1: Review Utility Data and Program Materials

The team will conduct a comprehensive review of all program materials and tracking data. This includes program marketing and implementation plans, customer and program ally communications, and extracts from the program tracking database. We requested a preliminary Amplify extract in March 2016, to support planning and survey sampling, and will continue to communicate with AIC and Leidos about data needs. At a minimum, we will make subsequent requests at the close of PY8 (June 2016) and then again in August 2016, when the database is typically finalized for the previous program year. Table 26 provides a general summary of when we expect to make these requests.

Table 26. C&I Custom Program Summary of Expected Data Requests

Items Requested	Timeline
Program Materials	April 2016 and ongoing as necessary
Preliminary Amplify Extract	March 2016
Year-End Amplify Extract	June 2016
Final Amplify Extract	August 2016

We will use the database as the sample frame for the participant surveys described below.

associated with that Staffing Grant. However, if the newly developed NTGR falls below the established PY8 value, we will apply the appropriate PY8 value to each of the participant's projects.

Deliverable: Data requests *Deliverable Date:* Ongoing

Task 2: Program and Implementation Staff Interviews

We conducted a brief interview with AIC and Leidos program staff in March 2016, to understand changes made to the program in PY8 and to discuss the evaluation priorities of program and implementation staff. As in past years, we also plan to complete more-detailed interviews with program staff closer to the end of the program year to get staff perspective on program performance and additional information on program marketing. In total, we plan to complete three or four interviews.

Deliverable: *Conducted interviews* *Deliverable Date:* June 2016

Task 3: Energy Advisor Interviews

We will conduct interviews with the C&I programs' Energy Advisors. The interviews will cover such topics as Energy Advisors' perceptions of customer interest in the program, interactions with customers, program processes for coordination between the Energy Advisors and Key Account Executives, success bringing projects into the program, and suggestions for program improvement. This activity will be conducted in tandem with the Standard Program evaluation. For budgeting purposes, we assume we will conduct seven interviews.

Deliverable: Draft and final interview guides *Deliverable Date:* June 2016

Task 4: Program Ally Interviews

In November/December 2015, we interviewed trade allies to investigate such topics as program participation processes, trade ally and participant satisfaction, barriers to participation, and impacts of program participation on trade ally business and practices. Of particular interest was the exploration of the effectiveness of bonuses and trade allies' perceptions of recent changes in the AIC portfolio (e.g., new implementers in the IPA C&I portfolio) and any resulting confusion in the marketplace. A stand-alone findings memo was delivered to AIC in February 2016. This activity was conducted in tandem with the Standard Program evaluation.

Deliverable: Draft and final interview guides *Deliverable Date:* November 2015

Deliverable: Program ally research memo *Deliverable Date:* February 2016

Task 5: Core Custom Participant Survey

The evaluation team will conduct quantitative telephone interviews with customers who have completed a core Custom project in PY8. These interviews will collect information on NTGR (i.e., 1-free-ridership plus spillover), as well as program processes. The NTGR questions will be used to develop NTGRs for the Custom Program for application in PY10. Based on early feedback on participation from Leidos, we anticipate attempting a census of PY8 participants. However, if a sample must be drawn, the sample size will be sufficiently large to provide 90/10 precision around our parameter estimates. For budgeting purposes, we assume that we will conduct up to 70 interviews.

Deliverable: Draft and final participant survey instrument *Deliverable Date:* June 2016

Task 6: Staffing Grant Participant Interviews

The team will conduct interviews with AIC customers who participated in the Staffing Grant initiative. Analyst staff will conduct the interviews, which will focus on gathering information about the net impacts of this effort.

We will also ask process-related questions about the initiative, including how participants became aware of the initiative, their level of satisfaction, challenges encountered, and recommendations for improvement. The total number of interviews will depend on the final number of participants; we will attempt to interview all Staffing Grant recipients. For budgeting purposes, we assume we will conduct up to 10 interviews.

Deliverable: Draft and final interview guides *Deliverable Date:* June 2016

Task 7: CLIP Participant Interviews

We will conduct approximately 15 interviews with PY8 CLIP participants. Analyst staff will conduct the interviews and focus on gathering NTGR information for each project. The interviews will also investigate ways that CLIP participants' projects differ from other Custom Program projects, and will explore satisfaction, program processes, and areas for program improvement.

Deliverable: Draft and final interview guides *Deliverable Date:* June 2016

Task 8: Metering & Monitoring Pilot Participant Interviews

We will conduct approximately 10 interviews with participants in the Metering & Monitoring Pilot. Analyst staff will conduct the interviews and focus on participants' experience tracking energy and gathering process information to help further develop the pilot. In particular, we will explore ways to increase participation in this pilot by examining how successful processes in other initiatives, such as Feasibility Studies, may be leveraged. The interviews will also explore if any energy savings have occurred as a direct outcome of the Metering & Monitoring Pilot and, if so, the characteristics of the follow-up projects.

Deliverable: Draft and final interview guides *Deliverable Date:* July 2016

Task 9: Site Visits and Gross Impact Analysis

We will conduct onsite data collection to review and verify savings assumptions associated with sampled projects. This may include an examination of existing equipment and/or program M&V measurements. At a minimum, the review engineer will perform the following actions during the site visits:

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

Some sites may require an additional level of effort, which could include monitoring of equipment to gather both real-time data at the time of inspection and trend data over a period of several weeks, if necessary.

As described in the Methodology section, we will conduct onsite data collection in two waves. The anticipated sample design includes separate samples for gas projects and electric projects in each wave. We expect to stratify projects by energy savings and to attempt to visit a census of the largest projects and a sample of all other projects. Based on data available through April 2016, we expect to conduct up to 40 site visits. We will provide formal M&V plans outlining the onsite approach for 10 sites, likely the largest projects in our sample.

The team will share the site visit results with AIC and ICC staff in advance of submitting the draft annual report. The Excel file and 10 Custom Program project site reports provided for review and discussion will feature the ex ante and ex post savings for each site visit project, the resulting realization rate, and the reasons for the realization rate. We will also hold a meeting with AIC and its implementation team, as well as with ICC staff, to discuss the findings and answer any questions.

Deliverable: Site visit formal M&V plans and results – Wave 1 *Deliverable Date:* August 2016

Deliverable: Site visit formal M&V plans and results – Wave 2 *Deliverable Date:* September/October 2016

Deliverable: Results provided in annual report *Deliverable Date:* November 2016

Task 10: Net Impact Analysis

In most cases, we will calculate PY8 net savings by applying SAG-approved NTGRs to gross savings (Table 25). For Custom Program projects implemented by CLIP and Staffing Grant participants, we will develop project-specific NTGRs. For these participants, the team will conduct NTGR interviews to develop NTGRs that will be applied retrospectively to those PY8 projects.

Through research detailed above, the team will also develop new NTGRs for the core Custom offering for prospective application in PY10.

Deliverable: Results provided in annual report *Deliverable Date:* November 2016

Task 11: Reporting

The team will provide an integrated annual evaluation report containing process and impact results for the Custom Program.

Deliverable: Draft report *Deliverable Date:* October 2016

Deliverable: Final report *Deliverable Date:* November 2016

2.10.5 Budget and Schedule

Figure 10 and Table 27 summarize the timing of each evaluation activity. Table 27 also lists the budget associated with each task. In total, the PY8 budget for the Custom Program is $240,900.

Figure 10. C&I Custom Program PY8 Evaluation Timeline

Task	Evaluation Activity	2016									
		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	Review Utility Data and Program Materials										
2	Program and Implementation Staff Interviews										
3	Energy Advisor Interviews										
5	Core Custom Participant Survey										
6	Staffing Grant Participant Interviews										
7	CLIP Participant Interviews										
8	Metering & Monitoring Pilot Participant Interviews										
9	Site Visits and Gross Impact Analysis										
10	Net Impact Analysis										
11	Reporting										

Data Request
Create Data Collection Instruments
Collect Data
Analyze Data
Milestone Deliverables

Note: Task 4, Program Ally Interviews, was an early evaluation activity and was completed between November 2015 and February 2016.

Table 27. C&I Custom Program PY8 Evaluation Timeline

Task	Evaluation Activity	Deliverable Date	Cost by Task
1	Review Utility Data and Program Materials	Ongoing	$5,000
2	Program and Implementation Staff Interviews	May 2016	$3,500
3	Energy Advisor Interviews	June 2016	$4,000
4	Program Ally Interviews	February 2016	$7,100
5	Core Custom Participant Survey	June 2016	$22,500
6	Staffing Grant Participant Interviews	June 2016	$11,200
7	CLIP Participant Interviews	June 2016	$14,700
8	Metering & Monitoring Pilot Participant Interviews	July 2016	$12,600
9	Site Visits and Gross Impact Analysis	August 2016, September/October 2016, and November 2016	$120,500
10	Net Impact Analysis	November 2016	$5,600
11	Reporting	October 2016 and November 2016	$34,200
		Total Cost	**$240,900**

2.11 Commercial and Industrial Retro-Commissioning

2.11.1 Program Description

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

Over time, deferred maintenance and changing operating directives and practices can lead to inefficient operation of building systems. Retro-commissioning is a process that examines current operations relative to the needs of equipment owners and those served by the equipment and determines opportunities for increasing equipment efficiency through maintenance, system tune-ups, scheduling, and optimization of operations. Most of the identified measures require little, if any, capital funds to implement. Secondary objectives of the program include:

- Channeling participation into other AIC programs to implement cost-effective equipment replacements and retrofits
- Developing a network of retro-commissioning service providers that will continue to operate in the AIC service territory

Major market barriers to these energy efficiency opportunities are lack of awareness and the cost of the detailed engineering studies. Furthermore, even with a quality study in-hand, customer apathy can inhibit implementation of recommendations, even if they are no-cost. To overcome these barriers, the program subsidizes retro-commissioning service provider (RSP) studies and publicizes the benefits of retro-commissioning to foster a market for the services, with utility-certified RSPs providing the marketing outreach. AIC incentives pay for 50%–80% of the study cost.

In PY8, the RCx Program had three major subcomponents:

- **Compressed Air Retro-Commissioning.** The Compressed Air offering provides incentives to defray the cost of a retro-commissioning study of compressed air equipment, leading to the implementation of low-cost/no-cost energy efficiency measures for existing compressed air systems. Typical measures include leak repair, installation of zero-loss drains, and installation or tune-up of compressed air system controls.
- **Industrial Refrigeration Retro-Commissioning.** The Industrial Refrigeration offering provides incentives to defray the cost of a retro-commissioning study of industrial refrigeration equipment, leading to the implementation of low-cost/no-cost energy efficiency measures for existing industrial refrigeration systems. Typical measures include lowering condensing pressure, raising suction pressure, evaporator fan control, evaporator defrost settings, and compressor sequencing.
- **Large Facilities Retro-Commissioning.** The Large Facilities offering targets three separate types of facilities: health care facilities, large commercial facilities (primarily offices), and grocery stores. Health care facilities in particular represent a major opportunity for energy savings. Typical measures include EMS settings adjustments to optimize the operation of HVAC systems.

Our understanding from early discussions with program staff is that the Compressed Air offering continues to operate smoothly and accounts for a large share of PY8 program projects. The Large Facilities offering also

has a number of PY8 projects. As in PY7, the Industrial Refrigeration offering was not very active in PY8 and did not produce any completed projects.

According to the PY8 Implementation Plan, the expected savings from this program are 5% of overall portfolio electric savings and 5% of overall portfolio therm savings (including both residential and commercial programs).

2.11.2 Research Objectives

This evaluation addresses the program's performance in PY8. The objective of the PY8 RCx Program evaluation is to provide estimates of gross and net electric and gas savings associated with the program. In particular, the PY8 impact evaluation will answer the following questions:

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

In addition, we will provide limited insights into program processes and opportunities for improvement where possible. Key areas of inquiry for the process evaluation are as follows:

3. Effectiveness of Program Design and Implementation
    a. Did the program as implemented change compared to PY7? If so, how and why and was this an advantageous change?
    b. What implementation challenges occurred in PY8, and how were they overcome?
    c. What areas could the program improve to create a more effective program for customers and help increase the energy and demand impacts?
4. Program Participation
    a. What were the characteristics of participating customers? How many projects were completed? By how many different customers? What type of projects?
    b. Did customer participation meet expectations? If not, how and why is it different from expectations? Are any changes in the mix of customers and projects desirable?

We will explore each of these questions through the activities described in this evaluation plan.

2.11.3 Methodology

Below we provide a summary of the methods planned for the PY8 RCx Program evaluation.

Data Sources

We will estimate gross savings targeting at least 90/10 level of confidence and precision. To accomplish this level of confidence and precision, the evaluation team plans to conduct a detailed engineering review of project files and calculations for a sufficient sample of program participants. This review will include an assessment of measure appropriateness, as well as a review of trend data, savings calculations, and implementation records. The engineering review may require telephone verification of measure parameters with the customer and/or RSPs, as well as review of new trend data. We also plan to conduct site visits with a stratified random sample of participants.

We will calculate PY8 net savings by applying SAG-approved NTGRs to gross savings. Further detail is provided in the Analysis Plan section below.

PY8 process research will include interviews with key program staff (AIC and implementer Leidos), as well as a limited number of interviews with industry experts.

Sampling Plan

Engineering Analysis and Site Visits

For the impact evaluation, we will sample participants to achieve several goals: a target of 90/10 confidence and precision, a representation of program offerings, and the inclusion of a large share of program savings.

Retro-commissioning projects can have large variability in savings among participants. Sources of variability include the physical size of the participant site, the systems installed, the condition of systems prior to retro-commissioning, the extent of control capabilities, the scope and quality of the retro-commissioning study itself, and the willingness of customers to implement recommendations.

To accommodate this variability, the evaluation team will use a stratified ratio estimation technique, based on anticipated coefficient of variation for realization rates, to draw the impact sample for engineering analysis. We anticipate drawing separate samples for gas and electric projects, stratifying participants into small and large energy savers (or small, medium, and large savers, depending on the program results) within each sample. Stratification of the program participants in this way tends to include a large proportion of large savers and comparable numbers of participants from the other savings strata. From within each stratum, we will randomly sample participants to achieve the precision and confidence targets.[22] To ensure diversity of measures and program offerings, we may consider stratifying the impact sample by program offering if the final population of projects appears to require it. We will conduct up to 26 detailed project reviews in PY8.

We will also conduct onsite verification with a subsample of the impact sample. The evaluation team will select sites for onsite verification by considering the degree of uncertainty within the supporting files, the magnitude of the project savings, and the prevalence of the measures among program participants. In some cases, these activities will entail monitoring over several weeks and/or taking other measurements. In other cases, simple visual verification will suffice.

We have budgeted for 8 onsite visits based on sample optimization through stratification and will target the 90/10 level of confidence and precision. We will adjust the sample size depending on participation in order to achieve the statistical targets.

Analysis Plan

The evaluation team will conduct a gross impact, a net impact, and a limited process evaluation for the RCx Program in PY8. Our analysis plan for key impact- and process-related evaluation activities is described below.

[22] Based on the most recent available database extract, we expect to review a census of projects with gas savings.

Gross Impacts

Consistent with prior years, the gross impact analysis for the RCx Program in PY8 is based on site-specific M&V results, which we will use to verify savings through the RCx Program. The impact analysis for the PY8 RCx Program will employ a bottom-up approach to estimating gross savings. We will determine realization rates from sampled sites for each impact metric—kWh, kW, and therms—individually at the project level.

We will base the gross impact analysis on site-specific engineering desk reviews and site visits. Based on the results from both activities, we will calculate the gross impact for each site, compare the ex post site-specific impacts to the ex ante site-specific impacts at the stratum level to create a ratio, and extrapolate these findings to the participant population using the ratio adjustment method.

Based on the results of our reviewed sample, we will calculate the savings-weighted realization rate (total ex post gross savings divided by the total ex ante gross savings). This sample-based realization rate will be used to adjust the ex ante savings for the population of RCx projects in Amplify. The ratio estimate of Y, the ex post savings for the population of custom projects in Amplify, is:

Equation 6. Ratio Estimate of Population Total[23]

$$\hat{Y}_R = \frac{y}{x}X$$

Where:

y = The total ex post savings for the sample of projects

x = The total ex ante savings for the sample of projects

X = The ex ante savings for the population of projects

Net Impacts

We will estimate PY8 net savings by multiplying the ex post gross savings by the SAG-approved NTGRs of 0.92 for electric savings and 0.91 for gas savings.[24] Table 28 presents the NTGRs to be applied in PY8.

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

[24] There is one exception to this approach. For projects associated with a Staffing Grant, we may apply a Staffing Grant-specific NTGR. For further detail on this approach please see Section 2.10.3.

Table 28. C&I Retro-Commissioning Program PY8 NTGRs

Measure Description	Electric NTGR	Gas NTGR
All Projects	0.92	0.91
Staffing Grant Projects	Retrospective research	

Process Findings

We will present limited process-related findings based on our analysis of the program materials, databases, and interviews conducted with program staff and industry experts.

2.11.4 Tasks

This section outlines the planned tasks for our PY8 evaluation of the RCx Program. Data requests and some of the planned data collection activities will overlap with the other C&I programs in AIC's portfolio. We will coordinate data requests, sampling, and data collection across the various C&I programs, as necessary.

Task 1: Review Program Materials and Tracking Data

The evaluation team will review all program materials and tracking data to document the design and implementation of the PY8 program. This includes program marketing and implementation plans, customer and program ally communications, and extracts from the program tracking database (initial extract anticipated in April 2016, final data anticipated in August 2016).

Our engineering review and site visit tasks will focus on project files for each of the retro-commissioning projects included in our sample. The evaluation team requests notification as soon as each project is finalized, so we can download the final project files from the Amplify system.

Deliverable: Data requests *Deliverable Date:* May 2016

Task 2: Program and Implementation Staff Interviews

We conducted brief interviews with AIC and Leidos program staff in March 2016 to understand changes made to the program in PY8 and to discuss the evaluation priorities of program and implementation staff. As in past years, we also plan to complete more-detailed interviews with program staff closer to the end of the program year to get staff perspectives on program performance. In total, we plan to complete three or four interviews.

Deliverable: Conducted interviews *Deliverable Date:* June 2016

Task 3: Subject Matter Expert Interviews

The evaluation team will conduct several interviews with industry experts familiar with retro-commissioning programs in other jurisdictions to assess how the challenges faced by AIC's offering compare to challenges faced elsewhere and to investigate any other potential changes or additions that could be made to the program. We currently expect to conduct approximately three interviews, including interviews with implementers and evaluators.

Deliverable: Draft and final interview guides *Deliverable Date:* June 2016

Deliverable: Conducted interviews *Deliverable Date:* July 2016

Task 4: Engineering Review and Site Visits

The evaluation team will establish the final impact sample after the final program tracking database is received. For each sampled project, we will review detailed project files. The review will include verification of calculation methods and input data and review of implementation records and costs. For a subset of sampled participants, we will conduct onsite verification of measure installation and savings. In some cases, these activities will entail monitoring over several weeks and/or taking other measurements. In other cases, simple visual verification will suffice. We have budgeted for 26 detailed reviews and 8 onsite visits based on sample optimization through stratification and will target 90/10 precision. We will adjust the sample size depending on participation in order to achieve the statistical targets.

Deliverable: Impact analysis summary spreadsheet *Deliverable Date:* November 2016

Deliverable: Final analysis in annual report *Deliverable Date:* December 2016

Task 5: Reporting

After data collection and analysis are complete, we will prepare a detailed report, including findings from the limited process evaluation, impact results, and recommendations for future program activities grounded in our key findings.

Deliverable: Draft report *Deliverable Date:* November 2016

Deliverable: Final report *Deliverable Date:* December 2016

2.11.5 Budget and Schedule

Figure 11 and Table 29 summarize the timing of each evaluation activity. Table 29 also lists the budget associated with each task. In total, the PY8 budget for the Retro-Commissioning Program is $75,800.

Figure 11. C&I Retro-Commissioning Program PY8 Evaluation Timeline

Task	Evaluation Activity	2016									
		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	Review Program Materials and Tracking Data										
2	Program and Implementation Staff Interviews										
3	Subject Matter Expert Interviews										
4	Engineering Review and Site Visits										
5	Reporting										

Data Request
Create Data Collection Instruments
Collect Data
Analyze Data
Milestone Deliverables

Table 29. C&I Retro-Commissioning Program PY8 Evaluation Budget

Task	Evaluation Activity	Deliverable Date	Cost by Task
1	Review Program Materials and Tracking Data	May 2016	$2,500
2	Program and Implementation Staff Interviews	June 2016	$2,800
3	Subject Matter Expert Interviews	June 2016 and July 2016	$2,500
4	Engineering Review and Site Visits	November 2016 and December 2016	$51,500
5	Reporting	November 2016 and December 2016	$16,500
		Total Cost	**$75,800**

3. Portfolio-Level Evaluation Activities

As part of the PY8 evaluation, the team will perform a number of portfolio-level activities. These tasks are described in detail in the following subsections.

3.1 Statewide Technical Reference Manual

The team will continue its involvement in the IL-TRM process, including participation in Technical Advisory Committee (TAC) meetings and NTGR Methodology Working Group meetings as needed. For the former, this will include participation in weekly calls, as well as reviewing and commenting on TRM update items presented to the TAC. For the latter, this includes participation in periodic calls with working group members to discuss any pending issues.

3.2 Cost-Effectiveness Analysis

As in prior program years, the evaluation team will work with AIC, as needed, to audit the company's cost-effectiveness analysis based on PY8 programs' results. As part of this process, we will first prepare the model inputs, which consist of evaluated program savings as determined through the PY8 evaluation effort. Next, we will review AIC's assumptions for avoided costs, discount rates, measure cost information, administrative costs, and other relevant data. Below we present a discussion of the Total Resource Cost (TRC) test used by AIC. Note that we will also review the cost-effectiveness equations for any updates to methodologies based on current standard practice.

Total Resource Cost Test

To assess cost-effectiveness, the team will begin with a valuation of each program's and the portfolio's net total resource benefits, as measured by the avoided electric costs, the total incremental costs of measures installed, and administrative costs associated with the program. A program is cost-effective if its net total resource benefits are positive:

Equation 7. Definition of Cost-Effectiveness

$$\frac{Total\ Resource\ Benefits}{Total\ Resource\ Costs} \geq 1$$

Where:

Equation 8. Definition of Total Resource Benefits

$$Total\ Resource\ Benefits = PV\left(\sum_{Year=1}^{Measure\ Life}\left(\sum_{i}^{i=8760}(Net\ Impact_i\ x\ Avoided\ Cost_i)\right)\right)$$

And

Equation 9. Definition of Total Resource Costs

$$Total\ Resource\ Costs = PV(Incremental\ Measure\ Costs * NTGR + Utility\ Costs)$$

The benefits used in the TRC test calculation include the full value of time and seasonally differentiated generation, transmission, and distribution, as well as capacity costs. The TRC test also accounts for avoided line losses and other quantifiable societal benefits, including avoided natural gas costs.

The calculation of avoided costs of power and energy that an electric utility would otherwise have had to acquire requires the inclusion of reasonable estimates of financial costs likely to be imposed by future regulations and legislation on emissions of greenhouse gases. For each energy efficiency measure included in a program, the team will adjust the hourly (8,760) system-avoided costs by the hourly load shape of the end use affected by the measure; this enables us to capture the full value of time and seasonally differentiated measure impacts.

For the cost component of the analysis, the team considered incremental measure costs and direct utility costs. Incremental measure costs are the incremental expenses associated with installing energy efficiency measures and, where applicable, ongoing operation and maintenance costs. These costs include incentives as well as customer contributions. Utility costs include the expenses associated with program development, marketing, delivery, operation, and EM&V.

Table 30 outlines our understanding of the allocation of savings as incentive payments by fuel type. We understand that, from a goal attainment perspective, the AIC programs' savings by fuel type are driven by the type of customer account. From a cost-effectiveness perspective, however, AIC counts all measure savings regardless of the type of customer account. The team will assign saving credits according to the following table.

Table 30. Savings by Fuel Type

Type of Account with AIC	Incentive Budget by Fuel	Electric Measures		Natural Gas Measures	
		Incentive Paid?	Accrue Electric Savings?	Incentive Paid?	Accrue Therm Savings?
Electric only	Electric	Yes	Yes	No	For TRC only
Natural gas only	Natural gas	No	For TRC only	Yes	Yes
Both electric and natural gas	Electric	Yes	Yes	No	Yes
	Natural gas	No	Yes	Yes	Yes

For purposes of the cost-effectiveness analysis, we will discuss with AIC the assignment of cost to the primary fuel targeted, ensuring that the primary fuel incentive is cost-effective for the primary fuel savings.

3.3 Residential Cross-Cutting Research Activities

3.3.1 General Population Surveys

Currently in its eighth year of program operations, AIC conducts general energy efficiency marketing and education in addition to offering discrete energy efficiency programs. Over time, these marketing and education efforts can create spillover. Spillover created by these efforts among program participants is captured in individual program evaluation efforts, but nonparticipant spillover is not captured. In PY8, the evaluation team will conduct a residential general population survey to quantify nonparticipant spillover and to collect additional general information that may prove beneficial to AIC (e.g., marketing preferences and satisfaction with AIC).

As nonparticipant spillover is likely to be a rare event, determining spillover requires a large sample (n=350) to ensure acceptable precision at a desired confidence level.[25] The team will draw a general population sample from AIC's residential customer database, using customer identification numbers to remove those participating in any AIC energy efficiency programs (including the Behavioral Modification Program).

General population surveys will contain batteries of questions about each AIC residential energy efficiency program. The team will ask residential respondents program-specific questions to determine whether they made energy-efficient, program-qualified upgrades, and then determine why they did not participate in that AIC program.

In addition, the team will identify installed energy efficiency measures not provided through AIC programs and will collect information to enable reliable savings estimates. To measure nonparticipant spillover, the team will follow the protocol outlined in the IL-TRM V5.0. For potential spillover measures installed, the team will ask consumers about the influence of AIC's general marketing and education in their decisions to install measures. The evaluation will include spillover only if consumers rated AIC's involvement greater than 7on a scale of 0 to 10.

The team also will use the surveys as an opportunity to identify the following: customer participation motivations and barriers; preferred communications channels; and existing levels of awareness, satisfaction with AIC, and likelihood to recommend an AIC program to a friend. The team will also compare PY7 and PY8 results and assess any potential trends.

Upon survey completion, the team will analyze the data and present evaluation results in a stand-alone memo. The memo will detail the methods for estimating nonparticipant spillover, as well as how the value will be applied going forward.

3.4 Quality Assurance/Quality Control Collaboration

Per our contract, the team must hire a separate entity for quality assurance/quality control (QA/QC) review, and work collaboratively with this entity to ensure the quality of our evaluation plans, analysis, and reporting. Since PY4, the team has worked with Dr. Richard Ridge, who has a long and illustrious history in energy efficiency evaluation. In recent years, Dr. Ridge has used his expertise to help write evaluation protocols and oversee other firms in their evaluation efforts, as well as continuing to perform evaluations across the country. For several years, Dr. Ridge was a consultant to the California Public Utilities Commission (CPUC) evaluation staff, where he worked with them to understand evaluation needs, review contractor plans, and participate in many aspects of a multi-million dollar evaluation effort. Since 2008, he has been providing similar support to the New York State Department of Public Service.

As part of the PY8 evaluation effort, Dr. Ridge will continue to:

- Discuss portfolio evaluation plans with the evaluation team, providing advice as needed
- Participate in ongoing sampling and evaluation design efforts as requested; the team will meet with Dr. Ridge at least once a quarter to discuss ongoing activities
- Review draft evaluation reports to ensure quality and accuracy

[25] *Illinois Statewide Technical Reference Manual for Energy Efficiency Version 5.0*. Volume 4: Cross-Cutting Measures and Attachments. February 11, 2016.

- Provide the ICC with a report on the efforts in which he was involved; Dr. Ridge will provide this report as soon as the team has finalized all PY8 reports

4. Evaluation Budget

The following table outlines the expected budget per program to execute the evaluation plans presented above. Note that some of the budgeted activities have already begun and been invoiced.

Table 31. PY8 AIC Evaluation Budget

Program/Task	Estimated Budget
Program-Specific Activities	
Residential HVAC	$243,000
Residential Behavioral Modification	$50,600
Residential Appliance Recycling	$55,000
Residential Multifamily	$77,400
Residential Home Efficiency Standard	$31,000
Residential Home Efficiency Income Qualified	$98,200
Residential New Homes	$56,000
Residential School Kits	$36,500
C&I Standard	$133,400
C&I Custom	$240,900
C&I Retro-Commissioning	$75,800
Total Program-Specific Efforts	*$1,097,800*
Non-Program Activities	
Statewide Technical Reference Manual	$34,800
TRM NTG Working Group	$40,600
Cost-Effectiveness Analysis	$20,300
Residential Cross-Cutting Research Activities	$36,540
QA/QC Coordination	$17,400
Other Non-Program Activities (i.e., Planning, SAG, Collaboration, etc.)	$123,598
Total Non-Program Efforts	*$273,238*
Contingency	$52,106
Total	**$1,423,144**

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