

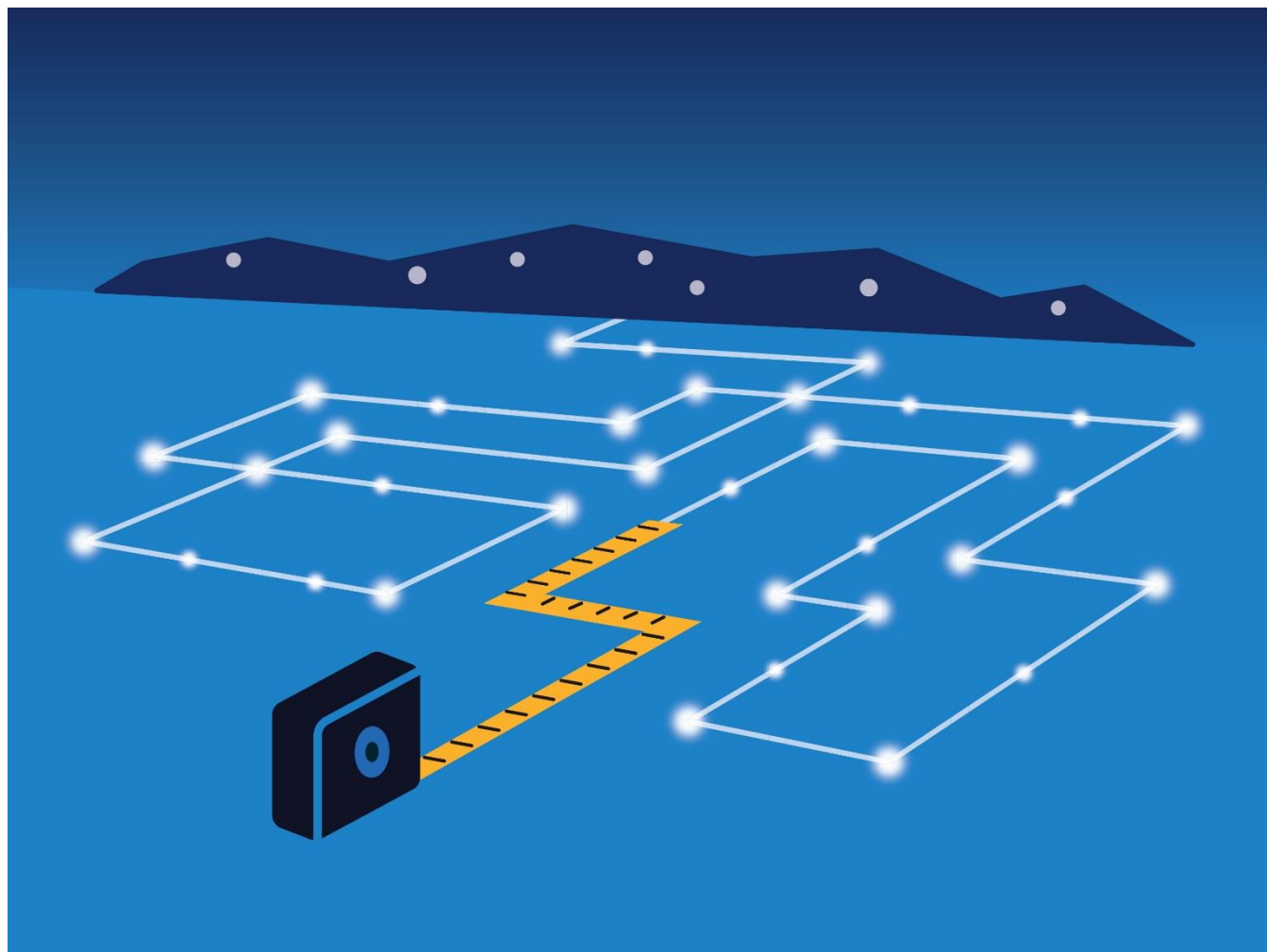


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# PY9 Evaluation Plan for the Ameren Illinois Company Electric and Natural Gas Residential and Commercial and Industrial Energy Efficiency Programs

July 10, 2017

CADMUS

NAVIGANT



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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 2016 and May 2017 (Program Year 9 [PY9]). However, due to new energy legislation in Illinois, PY9 will be extended to December 31, 2017. The evaluation team will develop a separate plan for the assessment of this seven-month transition period (June 2017 – December 2017). As such, this document covers only June 2016 through May 2017 (referred to as PY9), the third year of the 3-year Plan 3 period, which began on June 1, 2014.

As part of the PY9 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)
  - Behavioral Modification<sup>1</sup>
  - Appliance Recycling
  - Multifamily In-Unit<sup>2</sup>
  - 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 framework for the evaluation of program impacts and process improvements. The overarching evaluation objectives are to determine gross and net energy and demand impacts 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, Table 1 provides a summary of completed and planned evaluation activities for the Plan 3 period (PY7-PY9).

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<sup>1</sup> 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.

<sup>2</sup> 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 & Stakeholder 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	●	●	●	●	●	●	●	●			
Consumption Analysis	PY7		●									
	PY8		●									
	PY9		●									
On-Site Data Collection	PY7									●	●	●
	PY8	●									●	●
	PY9	●									●	●
Research to Update the IL-TRM	PY7	●								●		
	PY8	●				●	●			●		
	PY9	●										

\*Note: From PY7-PY9, the evaluation team conducted residential general population surveys. As such all programs were touched.

## 2. Program-Specific Evaluation Plans

### 2.1 Residential Behavioral Modification

#### 2.1.1 Program Description

AIC administers the Behavioral Modification Program as a part of its residential portfolio. AIC developed the program to reduce its residential customers' energy consumption; Leidos and Oracle Utilities (formerly Opower) implement the program, which launched in August 2010. The program is offered jointly through AIC (8-103/8-104) and the Illinois Power Agency (IPA). This evaluation plan discusses 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.

The PY9 evaluation focuses on the period from June 2016 through May 2017. According to the PY9 Implementation Plan, the expected savings from this program are 1,837,000 therms, representing 33% of the planned PY9 portfolio therm savings. Table 2 summarizes participation in the program to date.

**Table 2. Approximate Behavioral Modification Program Participation in PY9**

Cohort Name	Fuel Type	Number of Treated Customers in PY8	Start Date	Program Year
Original Cohort	Dual Fuel	35,147	August 2010	7 <sup>th</sup> year in the program
Expansion Cohort 1	Dual Fuel	53,431	April 2011	6 <sup>th</sup> year in the program
Expansion Cohort 2	Dual Fuel	85,967	November 2011	6 <sup>th</sup> year in the program
Expansion Cohort 3	Gas only	13,181	November 2011	6 <sup>th</sup> year in the program
Expansion Cohort 4	Dual Fuel	22,410	June 2013	4 <sup>th</sup> year in the program
Expansion Cohort 5	Dual Fuel	53,791	September 2014	3 <sup>rd</sup> year in the program
Expansion Cohort 6	Dual Fuel	34,954	April 2015	3 <sup>rd</sup> year in the program
Expansion Cohort 7	Dual Fuel	37,800	April 2016	2 <sup>nd</sup> year in the program
Expansion Cohort 8	Dual Fuel	44,000	September 2017	1 <sup>st</sup> year in the program
<b>Total Customers</b>		<b>380,681</b>		

#### 2.1.2 Evaluation Approach

As part of the most recent evaluation, we completed an assessment of energy impacts (including equivalency analysis, billing analysis, adjustment for double-counted savings, and review of participation lift over time) coupled with a survey of treatment and control customers. Our evaluation approach for PY9 will build on the findings from these prior activities and address key questions regarding the energy savings impacts associated with the program. We will also pursue additional analyses for this program during the transition period from

PY9 to PY 2018 (June 1, 2017 – December 31, 2017). The evaluation team will provide separate scopes of work for those efforts to AIC and ICC Staff.

## Research Objectives

The PY9 Behavioral Modification Program evaluation is focused on the assessment of program impacts and is structured to answer the following research questions:

1. How has the program changed since PY8? What, if any, changes are planned for PY10?
2. Are the new treatment and control groups' equivalent?
3. What are the estimated term savings from the program for all cohorts in PY9?
4. Is the program achieving savings year-over-year for each of the cohorts?
5. Do 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?

If needed, the evaluation team will continue exploring the factors that may explain the disparity between Oracle's billing analysis results and the billing analysis results arrived at by the evaluation team.

## Evaluation Tasks

To achieve our research objectives, we will complete a series of evaluation tasks as outlined in Table 3. Additional detail regarding each task can be found following the table.

**Table 3. Summary of Behavior Modification Program Evaluation Activities for PY9**

Activity	Impact	Process	Forward Looking	Details
Program Staff Interviews	✓	✓	✓	Explore how the program has changed since PY8, as well as what, if any, augmentations are planned for PY10.
Program Materials Review	✓	✓		Review materials to assess program design, implementation, and operations.
Net Impact Analysis	✓		✓	Conduct billing analysis to quantify the changes in energy use among the treatment and control groups. Also perform a channeling analysis to ensure that savings were not double-counted from participation in other AIC residential programs.

### Task 1: Program Staff Interviews

We will conduct telephone interviews with key program staff from AIC, Leidos, and Oracle. The interviews will provide us with a comprehensive understanding of the program and its implementation, including insights into the daily workings of the program, program changes in PY9, and areas of success and challenges.



*Deliverable:* Conducted interviews

*Deliverable Date:* June 2017

## Task 2: Program Materials Review

The evaluation team will review the program-tracking database and other program materials, including the PY9 HERs. Through this review we will determine if there were any gaps present in the data, particularly around information required for the impact analysis.

*Deliverable:* Data request

*Deliverable Date:* June 2017

*Deliverable:* Findings included in annual report

*Deliverable Date:* October 2017

## Task 3: Net Impact Analysis

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

Because the evaluation team did not assign the customers to treatment and control groups in the new Expansion Cohorts 7, we will first conduct an equivalency analysis to ensure that the treatment and control groups are comparable.<sup>3</sup> This review will strengthen the internal validity and defensibility of the research design. To assess equivalency, we will utilize Experian data appended to the treatment and control group's monthly usage data for Expansion Cohort 7; for all other cohorts we will assess equivalency based on prior energy consumption. Finally, we will conduct a review and comparison of Oracle's data cleaning and modeling methods to our data cleaning and modeling methods to understand why the two sets of billing results may differ.

Data sources for the PY9 impact evaluation include:

- For all customer treatment and control groups, gas consumption/billing data from June 2013 to May 2017
- Experian data (including demographic data, housing characteristics, and psychographic data) for Expansion Cohort 7
- AIC program tracking database for all residential programs from June 2016 to May 2017
- Data from Oracle to conduct exploratory analysis, including raw data files, any code used for data cleaning and analysis, final data files and model outputs.

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<sup>3</sup> We will not assess Expansion Cohort 8 for equivalency in PY9 because this cohort will not be included in the impact analysis due to insufficient post-period billing data to model savings.

## Sampling

The billing analysis will include all cohorts except for Expansion Cohort 8, for which there will be insufficient post-period billing data to model savings. For Expansion Cohort 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, Expansion Cohort 1 through 6—some attrition might have occurred. Therefore, we will compare the treatment and control groups on pre-period usage only to ensure continued equivalence.

## Equivalency Analysis

We will compare the Expansion Cohort 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. A 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
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### Psychographic characteristics

Behavior bank (Social causes and concerns – environment)	Behavior bank (Computers – Internet/online subscriber or use Internet services)
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*Deliverable:* Data request

*Deliverable Date:* May 2017

*Deliverable:* Results provided in annual report

*Deliverable Date:* October 2017

## Billing Analysis

The evaluation team will use an approach for PY9 that augments the PY8 approach. Specifically, based on conversations with program implementers, we will conduct an intent to treat (ITT) approach rather than an average treatment effect on the treated (ATT) approach. In implementing this approach, we will estimate savings using a difference-in-differences (DID) approach. The DID refers to the model's implicit comparison of consumption before and after treatment of both treatment and control group customers. The model includes customer-specific intercepts (i.e., fixed effects) to capture unobserved differences between customers that do not change over time and which affect customers' energy use.

We will report savings from three different models to aid comparisons to previous evaluations:

1. A simple overall model, as described in Equation 1, which is consistent with previous years' evaluations
2. An overall model with the addition of weather adjustments, which allows year to year savings comparison
3. An overall model that incorporates post period only (consistent with vendor modeling)

All of these models will use an ITT approach. We will provide impact estimates for the program using the first model. The second model will be used to assess savings year over year. The third model is the model that the program implementer uses to estimate program impacts, as a result, we will run this model to ascertain whether there are any variations in savings due to model specifications.

#### Model 1: Overall Model

##### Equation 1. Overall Model Estimating Equation

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

Where:

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

$\alpha_i$  = Household-specific intercept

$\beta_1$  = Coefficient for the change in consumption between pre- and post-periods

$\beta_2$  = 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.

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

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

#### Model 2: Weather Adjusted Model

To enable accurate comparisons across program years, we will incorporate weather terms. These weather terms also improve 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

$\alpha_i$  = Household-specific intercept

$\beta_1$  = Coefficient for the change in consumption between pre and post periods

$\beta_2$  = 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.

$\beta_3$  = Coefficient for HDD

$\beta_4$  = Coefficient for CDD

Post = Dummy variable for pre (Post=0) and post (Post=1), marked by receipt of the first report

Treatment = Dummy variable for treatment (Treatment=1) and control (Treatment=0)

$HDD_{it}$  = Sum of heating degree days (base 65 degrees Fahrenheit)

$CDD_{it}$  = Sum of cooling degree days (base 75 degrees Fahrenheit)

$\varepsilon_{it}$  = Error

### Model 3: Post Only Model

To enable comparisons to vendor supported models, 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

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

Where:

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

$\alpha_i$  = Household-specific intercept

$\beta_1$  = Coefficient for the change in consumption for the treatment group

$\beta_2$  = Coefficient for the average daily usage across household  $i$  available pre-treatment meter reads

$\beta_3$  = Coefficient for the average daily usage over the months of December, January, February, and March across household  $i$  available pre-treatment meter reads

$\beta_4$  = Coefficient for the average daily usage over the months of June, July, August, and September across household  $i$  available pre-treatment meter reads

$\beta_5$  = Vector of coefficients for month- year dummies

$\beta_6$  = Vector of coefficients for month- year dummies by average daily pre-treatment usage

$\beta_7$  = Vector of coefficients for month- year dummies by average daily winter pre-treatment usage

$\beta_8$  = Vector of coefficients for month- year dummies by average daily summer pre-treatment usage

$Treatment_i$  = Dummy variable for treatment (Treatment=1) and control (Treatment=0)

$MonthYear_t$  = Vector of month-year dummies

$PreWinter_i$  = 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

$\varepsilon_{it}$  = Error

Results of the billing analyses conducted by Oracle and Opinion Dynamics have been discrepant in previous evaluations. As such, if we find differences in the vendor and evaluated impact estimates, we will conduct additional review of data cleaning approaches to identify the source (or sources) of these differences. To do this, we will request raw and cleaned billing analysis data files from Oracle, as well as the corresponding code and model outputs for PY9. These items will be carefully compared to our data cleaning code and model outputs to determine where our processes are differing, and how these differences affect billing analysis results.

### 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 compact fluorescent lamps (CFLs), or other purchase behaviors. Savings from measures that were rebated through AIC's energy efficiency programs appear in both the Behavioral Modification Program and the rebate programs, and thus would be double-counted if an adjustment were not made.

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).

*Deliverable:* Data request

*Deliverable Date:* June 2017

*Deliverable:* Results provided in annual report

*Deliverable Date:* October 2017

### Task 4: Reporting

The evaluation team will compose a draft report of findings for AIC and ICC staff review. We will then deliver a final report that incorporates any comments from the review.

*Deliverable:* Draft report

*Deliverable Date:* October 2017

*Deliverable:* Final report

*Deliverable Date:* November 2017

### 2.1.3 Evaluation Budget and Timeline

Table 4 summarizes the timing of each evaluation activity, as well as the budget associated with each task. In total, the PY9 budget for the Behavioral Modification Program is \$42,000. Note that all evaluation activities are conducted in conjunction with the IPA Behavioral Modification Program.

**Table 4. Behavioral Modification Program PY9 Evaluation Budget**

Task	Evaluation Activity	Deliverable Date	Budget
1	Review Program Materials and Database	May 2017	\$2,500
2	Program Staff Interviews	May 2017	\$2,500
3	Net Impact Analysis	October 2017	\$24,000
4	Draft Report	October 1, 2017	\$13,000
	Comments from AIC and ICC Staff	October 15, 2017	
	Final Report	November 1, 2017	
<b>Total</b>			<b>\$42,000</b>

## 2.2 Residential Heating and Cooling (HVAC)

### 2.2.1 Program Description

Through the Residential HVAC Program, AIC offers incentives for the purchase of high-efficiency air-source heat pumps (ASHPs) 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 the equipment type being replaced, 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 an incentive for ASHP 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 well-functioning 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 PY9 Implementation Plan, the expected savings from this program are 5% of the AIC PY9 portfolio's electric savings (including both residential and commercial programs).

### 2.2.2 Evaluation Approach

The PY9 assessment of the Residential HVAC Program includes both impact and process analyses, as outlined in the following sections.

#### Research Objectives

##### Impact Questions

The PY9 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?

##### Process Questions

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

3. Did program implementation change compared to PY8? 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. Were contractors satisfied with the program in PY9 and how do they feel about program changes?
6. Did contractors observe a change in market shares of energy efficient equipment during the time that the program has been offered?

## Forward Looking

The HVAC metering study will provide data to answer the following forward-looking questions:

7. What is the region's actual seasonal operating efficiency of participating multi-speed CACs and heat pumps?
8. How do energy-use patterns and energy-consumption differ between ECM and non-ECM fans?

## Evaluation Tasks

Table 5 summarizes the PY9 evaluation activities conducted for the Residential HVAC Program.

**Table 5. Summary of Residential HVAC Program Evaluation Activities for PY9**

Activity	Impact	Process	Forward Looking	Details
Program Materials Review	✓	✓		Review all program materials and the tracking database to ensure collection of appropriate data to inform the evaluation.
Program Staff Interviews		✓		Interview AIC, CLEAResult, and Leidos managers to understand goals, progress to date, program changes from PY8 and over the PY9 period, successes and challenges, and future goals.
Trade Ally Interviews		✓	✓	Interview trade allies to determine effect of historical program changes on trade ally engagement and gather NPSO data.
Multi-Speed HP/CAC Metering			✓	Analyze CAC and HP meter data to understand the region's actual seasonal operating efficiencies (SEER and HSPF).
Non-ECM System Metering			✓	Analyze meter data to compare energy-use patterns and energy-consumption differences between ECM and non-ECM fans.
Impact Analysis	✓			Calculate gross and net impacts using the IL-TRM V5.0 and SAG-Approved NTGR values for PY9.

We describe each activity below in detail.

## Evaluation Tasks

We plan to perform the following tasks in support of the PY9 evaluation.

### Task 1: 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.

In June 2017, the team will request program materials; communications will continue with AIC and its implementation staff at Leidos and CLEAResult regarding data needs. The team will request year-end program data upon database finalization for the year (typically occurring in August 2017).



*Deliverable:* Data request

*Deliverable Date:* June 2017 and August 2017

## **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, program design/delivery modifications and reasons for change, implementation challenges and successes, and plans for the program's future.

*Deliverable:* Conducted interviews

*Deliverable Date:* June 2017

## **Task 3: Trade Ally Interviews**

We will conduct 15-20 interviews with trade allies (contractors and distributors) to gather both process and impact information. For the process evaluation, we will gather information on how the program changes over the past few years have impacted their business and how AIC can best work with trade allies going forward. For the impact evaluation, we will collect data as to how energy efficient equipment market shares have changed over the period AIC has offered incentives for equipment. This data will be an input to the HVAC nonparticipant spillover analysis.

*Deliverable:* Conducted interviews

*Deliverable Date:* July 2017

## **Task 4: 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. To develop a sample of installations, the team used PY7 participation data to identify recent CAC and HP installations. To identify potential candidates for this research, the team sent letters to the HVAC Program's CAC and HP participants. The team then called these participants to determine their willingness to participate.

CAC and HP metering studies typically focus on 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 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 metered heating and cooling energy consumption capacity across indoor heat exchangers. Indoor units installed with these systems use an ECM fan. The team metered fan runtimes and energy consumption of indoor fans in heating mode, cooling mode, and circulation mode to inform the ECM savings analysis. The team removed meters in early 2017, and will provide the analysis and results in this year's report along with recommendations for TRM updates.

*Deliverable:* Analysis provided in memo

*Deliverable Date:* June 2017

*Deliverable:* TRM update documents

*Deliverable Date:* August 2017

## **Task 5: 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 removed the meters in early 2017 and will provide the analysis and results in this year's report along with recommendations for TRM updates.

*Deliverable:* Analysis provided in memo

*Deliverable Date:* June 2017

*Deliverable:* TRM update documents

*Deliverable Date:* August 2017

### Task 6: Impact Analysis

To estimate PY9 ex post gross savings for the HVAC Program, the evaluation team will use appropriate IL-TRM V5.0 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 V5.0. The team will multiply gross savings by each measure installed, as tracked through the participant database.

The evaluation team will review all of the data in the PY9 tracking database to support estimation of gross impacts for the HVAC Program. The team will also verify up to 70 HVAC measure installations by reviewing available project documents (e.g., invoices, AHRI numbers) and comparing the resulting findings to the tracking database.

The evaluation team will apply the SAG-approved NTGRs to gross savings (presented in Table 6) to determine PY9 net impacts.

**Table 6. HVAC Program PY9 NTGRs**

Measure Description	Electric NTGR
SEER 16+ w/ASHP (Early replacement [ER])	0.761
SEER 16+ ASHP (ER)	0.761
Brushless Motors	0.761

*Deliverable:* Analysis provided in draft report

*Deliverable Date:* October 2017

*Deliverable:* Analysis provided in final report

*Deliverable Date:* November 2017

### Task 7: Reporting

The evaluation team will compose a draft report of findings for AIC and ICC staff review. We will then deliver a final report that incorporates any comments from the review.

*Deliverable:* Draft report

*Deliverable Date:* October 2017

*Deliverable:* Final report

*Deliverable Date:* November 2017

### 2.2.3 Evaluation Budget and Timeline

Table 7 summarizes the timing of each evaluation activity. Table 7 also lists the budget associated with each task. The total budget for the PY9 Residential HVAC Program evaluation is \$186,000.

**Table 7. HVAC Program PY9 Evaluation Budget**

Task	Evaluation Activity	Deliverable Date	Budget
1	Request and Review Program Materials and Database	June 2017 and August 2017	\$2,000
2	Program and Implementation Staff Interviews	June 2017	\$2,500
3	Trade Ally Interviews and NPSO Analysis	July 2017	\$26,000
4	Multi-Speed HP/CAC Metering	June 2017 and August 2017	\$54,000
5	Non-ECM System Metering	June 2017 and August 2017	\$54,000
6	Impact Analysis	October 2017	\$21,000
7	Draft Report	October 1, 2017	\$26,000
	Comments from AIC and ICC Staff	October 15, 2017	
	Final Report	November 1, 2017	
<b>Total Budget</b>			<b>\$186,000</b>

## 2.3 Residential Multifamily

### 2.3.1 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<sup>4</sup>:

- **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 property manager 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 PY9 Implementation Plan, the expected savings from this program are 4% of the AIC PY9 portfolio's electric savings and 3% of overall portfolio therm savings (including both residential and commercial programs).

### 2.3.2 Evaluation Approach

#### Research Objectives

##### Impact Questions

The objective of the PY9 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?

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<sup>4</sup> 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. What were the estimated net energy and demand impacts from this program?

### Process Questions

The evaluation team will also explore a number of process-related research questions as part of the PY9 evaluation.<sup>5</sup> Through these questions, we will benchmark the Multifamily Program (AIC and IPA components) against other multifamily programs and explore the program design and implementation process and potential opportunities to improve program participation.

### Program Participation

3. How many projects were completed? By how many different customers? What types of projects?

### Program Design and Implementation

4. Has the program changed compared to PY8? If so, how, why, and was this an advantageous change?
5. What implementation challenges have occurred in PY9, and how has the program overcome them?
6. Trade Allies
  - a. Did trade ally participation meet expectations? If not, how different is it and why?
  - b. How do trade allies work with property managers to select and install measures?
  - c. How satisfied were trade allies with different aspects of the program?
  - d. What was the impact of program participation on trade allies' business and practices?
  - e. What changes would trade allies suggest to improve the program?
7. Program Benchmarking
  - a. To set a baseline for benchmarking, what progress towards program goals have the AIC and IPA Multifamily Programs (combined) made since PY4? To frame benchmarking results, what changes are anticipated for PY10?
  - b. How do the AIC and IPA Multifamily Programs' outcomes compare to other multifamily programs throughout the United States, in context of factors like multifamily market characteristics, program goals, and program design and implementation?
  - c. What best practices and lessons learned from other programs could enhance the programs' design and implementation to achieve additional savings?

### Evaluation Tasks

Table 8 summarizes the PY9 evaluation activities conducted for the AIC Multifamily Program.

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<sup>5</sup> The evaluation team will conduct these activities in conjunction with our evaluation of the IPA Multifamily Program.

**Table 8. Summary of AIC Multifamily Program Evaluation Activities for PY9**

Activity	Impact	Process	Forward Looking	Details
Program Staff Interviews		✓		Conduct interviews with AIC and CLEAResult program managers to understand changes in program design and implementation.
Program Materials Review		✓		Review the PY9 database, relevant administrative program reports, and marketing and outreach materials to document program design and changes since PY8.
Trade Ally Interviews		✓	✓	Investigate program participation levels, program participation processes, trade ally satisfaction, barriers to participation, and impacts of program participation on trade ally business and practices.
Program Benchmarking Literature Review			✓	Compile changes made to AIC/IPA programs since PY4; review multifamily program best-practices; gather information about peer programs' market context, goals, processes, and success metrics; and, compare AIC/IPA programs to peer programs.
Impact Analysis	✓			Calculate gross and net impacts using the IL-TRM V5.0 and SAG-Approved NTGR values for PY9.

We describe each activity below in detail.

### Task 1: Program Staff Interviews

We plan to conduct detailed interviews with AIC, Leidos, and CLEAResult program staff at 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 three interviews with AIC, Leidos, and CLEAResult program staff.

*Deliverable:* Conducted interviews

*Deliverable Date:* May 2017

### Task 2: Program Materials Review

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 PY9 program.

*Deliverable:* Data request

*Deliverable Date:* June 2017

### Task 3: Trade Ally Interviews

Trade allies play an important role in marketing and implementing the AIC Multifamily Program. Furthermore, trade allies offer an important perspective on the multifamily property market. The team will conduct up to ten interviews with participating trade allies in PY9. Interviews will investigate such topics as trade allies' success in bringing projects into the program, barriers to participation, trade ally satisfaction, any impacts of program participation on trade ally business and practices, and trade allies' suggestions for program improvement. In particular, the team will use information from these interviews to understand multifamily market saturation from the trade allies' perspective.

*Deliverable:* Draft and final interview guide

*Deliverable Date:* June 2017

*Deliverable:* Results provided in annual report

*Deliverable Date:* September 2017

#### **Task 4: Program Benchmarking Literature Review**

Program benchmarking is the “process of gathering, tracking, and assessing a program’s current performance against past results in order to measure progress over time, or to compare results to a peer group.”<sup>6</sup> The team will complete a secondary literature review in support of benchmarking the Multifamily Program (AIC and IPA components). Specifically, the team will document the AIC Multifamily Program’s evolution over time and will compare the PY9 program to other multifamily direct-install programs in the United States. Key sources will include American Council for an Energy Efficient Economy (ACEEE) multifamily energy efficiency program best practice reports and recent program evaluation reports of comparable multifamily programs.

The team will focus on benchmarking program elements, including context (e.g., multifamily market saturation), program design and implementation (e.g., trade ally networks, customer marketing strategies, incentives), measure offerings, and evaluated outcomes (i.e., results of impact and process evaluations). Based on the benchmarking results, we will recommend best practices and lessons-learned that can enhance the programs’ design and implementation to achieve additional savings moving forward.

*Deliverable:* Memo

*Deliverable Date:* July 2017

#### **Task 5: Impact Analysis**

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 V5.0. 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 V5.0 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.

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<sup>6</sup> Guide for Benchmarking Residential Energy Efficiency Program Progress. 2014. Report prepared for the U.S. Department of Energy. Available online: [https://energy.gov/sites/prod/files/2014/11/f19/bbr\\_program\\_benchmarking\\_guide\\_draft\\_nov2014\\_0.pdf](https://energy.gov/sites/prod/files/2014/11/f19/bbr_program_benchmarking_guide_draft_nov2014_0.pdf)

We will calculate PY9 ex post net savings for the AIC Multifamily Program by applying SAG-approved NTGRs to ex post gross electric and gas savings. Table 9 presents the NTGRs that we will apply to PY9 savings, by measure.

**Table 9. Multifamily Program PY9 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

### Task 6: Reporting

The evaluation team will compose a draft report of findings for AIC and ICC staff review. We will then deliver a final report that incorporates any comments from the review.

*Deliverable:* Draft report

*Deliverable Date:* September 2017

*Deliverable:* Final report

*Deliverable Date:* November 2017

### 2.3.3 Evaluation Budget and Timeline

Table 10 summarizes the timing and budget associated with each evaluation activity.

**Table 10. AIC Multifamily Program Evaluation Schedule and Budget**

Task	Evaluation Task	Deliverable Date	Budget
1	Program Staff Interviews	May 2017	\$1,500
2	Program Materials Review	May 2017	\$2,000
3	Trade Ally Interviews	July 2017	\$8,000
4	Multifamily Program Literature Review	September 2017	\$8,000
5	Impact Analysis	September 2017	\$11,000
6	Draft Report	September 29, 2017	\$9,500
	Comments from AIC and ICC Staff	October 15, 2017	
	Final Report	November 1, 2017	
<b>Total Budget</b>			<b>\$40,000</b>



## 2.4 Residential Home Efficiency Standard

### 2.4.1 Program Description

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

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

The program was discontinued in PY9 due to an estimated prospective TRC of less than one. According to the PY9 Implementation Plan, the expected savings from this program are 0.3% of the AIC PY9 residential portfolio's electric savings and 1% of overall residential portfolio therm savings. Per the Implementation Plan, AIC estimates that it will complete 123 retrofits in PY9.

### 2.4.2 Evaluation Approach

The PY9 assessment of the HES Program includes both process and impact analyses as outlined in the following sections.

#### Research Objectives

##### Impact 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?

##### Process Questions

3. 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?
4. Program Participation
  - a. How many homes received audits? How many homes received shell measures? Has participation met expectations? If not, why?

#### Evaluation Tasks

Table 11 summarizes the PY9 evaluation activities conducted for the HES Program.

**Table 11. Summary of Home Efficiency Standard Program Evaluation Activities for PY9**

Activity	Impact	Process	Forward Looking	Details
Program Staff Interviews		✓		Explore the PY9 implementation process and program close-out with AIC and implementation staff.
Program Materials Review	✓	✓		Review implementation plans, marketing plans and collateral, and the program tracking database.
Impact Analysis	✓			Calculate gross and net impacts using the IL-TRM V5.0 and SAG-Approved NTGR values for PY9.

We describe each activity below in detail.

### Task 1: 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:* June 2017

### Task 2: Program Materials 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.

*Deliverable:* Data request

*Deliverable Date:* June 2017

### Task 3: Impact Analysis

The PY9 evaluation will include gross and net impact estimates. The impact evaluation team will use savings algorithms from the IL-TRM V5.0 and data inputs from the program tracking database to estimate ex post gross savings. We will calculate PY9 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 PY9 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

*Deliverable:* Results provided in annual report

*Deliverable Date:* July 2017

#### Task 4: Reporting

The team will provide an integrated annual evaluation report containing process and impact results for the Home Efficiency Standard Program. This task also includes updating TRC inputs and binders after the final report is complete.

*Deliverable:* Draft report

*Deliverable Date:* July 2017

*Deliverable:* Final report

*Deliverable Date:* August 2017

### 2.4.3 Evaluation Budget and Timeline

Table 13 summarizes the timing and budget associated with each evaluation activity.

**Table 13. Home Efficiency Standard Program Evaluation Schedule and Budget**

Task	Evaluation Task	Deliverable Date	Budget
1	Program Staff Interviews	May 2017	\$2,000
2	Program Materials Review	May 2017	\$3,000
3	Impact Analysis	July 1, 2017	\$13,000
4	Draft Report	July 1, 2017	\$10,000
	Comments from AIC and ICC Staff	July 15, 2017	
	Final Report	August 1, 2017	
<b>Total Budget</b>			<b>\$28,000</b>

## 2.5 Residential Home Efficiency Income Qualified

### 2.5.1 Program Description

The Home Efficiency Income Qualified (HEIQ) Program is a home energy diagnostic and whole-house retrofit program. The target market for the program is AIC customers with homes heated by a fuel source (electricity or natural gas) provided by AIC and with a household income up to 300% of federal poverty guidelines for household size. CLEAResult implements the HEIQ Program, reporting to Leidos, who manages all of AIC's commercial and residential programs. Customers can 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.

According to the PY9 Implementation Plan, the expected savings from this program are 16% of the AIC PY9 residential portfolio's electric savings and 23% of overall residential portfolio therm savings. Per the Implementation Plan, AIC estimates that it will perform 1,794 audits and complete 1,350 retrofits in PY9.

### 2.5.2 Evaluation Approach

The PY9 assessment of the HEIQ Program includes both process and impact analyses as outlined in the following sections.

#### Research Objectives

##### Impact 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?

##### Process Questions

3. 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 PY9 and how were they overcome?
4. Program Participation
  - a. How many homes received audits? How many homes received shell measures? Has participation met expectations? If not, why?
5. Opportunities for Expanding Low- and Moderate-Income Program Offerings
  - a. Which predominately low- to moderate-income geographic areas has AIC's residential portfolio historically served?
  - b. Which areas are currently underserved? Which have the greatest need based on energy usage and household characteristics?

## 6. Opportunities for Program Design Adjustments

- a. What are examples of successful and unsuccessful low- and moderate-income program designs across the country? Why were some designs more successful than others?
- b. How many programs provided direct install versus deeper retrofits (or both)?
- c. How were these programs marketed? Did they use community-based marketing strategies?
- d. What are AIC's opportunities for altering the HEIQ Program's design?

## Evaluation Tasks

Table 14 summarizes the PY9 evaluation activities conducted for the HEIQ Program.

**Table 14. Summary of Home Efficiency Income Qualified Program Evaluation Activities for PY9**

Activity	Impact	Process	Forward Looking	Details
Program Staff Interviews		✓		Explore program implementation, changes to program design, and future plans for the HEIQ program.
Program Materials Review	✓	✓		Review of implementation plans, marketing plans and collateral, and the program tracking database.
Participation Analysis		✓	✓	Analysis of historical participation across the AIC residential portfolio; identification of opportunities to serve low- to moderate-income customers.
Literature Review		✓	✓	Review of best practices for low- and moderate-income program design and marketing strategies.
Impact Analysis	✓			Calculate gross and net impacts using the IL-TRM V5.0 and SAG-Approved NTGR values for PY9.

We describe each activity in detail below.

### Task 1: Program Staff Interviews

We will conduct interviews with the AIC program manager, 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:* June 2017

### Task 2: Program Materials 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.

*Deliverable:* Data request

*Deliverable Date:* June 2017

### Task 3: Participation Analysis

With the increased program focus on low- and moderate-income ratepayers in future years, we will build on the work we did in PY8 to help AIC better understand the needs of customers that require extra assistance to make energy-saving upgrades to their homes. In PY8, the evaluation team conducted a historical participation analysis mapping participation in the HEIQ Program from PY4 through PY8 alongside census data. The team provided AIC with a mapping tool that can be used to identify the geographic areas that have been underserved.

For PY9, we will expand this tool to include data from all programs, as well as adding data for PY9. We will map program participation across AIC territory and overlay it with census data. The purpose of this exercise is to understand the customers that have been well-served by existing and past AIC programs and which have been underserved. We will focus on participation by the income levels of census block groups across the territory with an emphasis on “predominately” low- to moderate-income areas, which we define as a census block in which at least 75% of customers have incomes from 0% to 300% of the federal poverty guidelines for household size. Further, to help identify areas with the highest need for retrofits, we will include an analysis of energy intensity by examining usage and housing characteristics data. We will conduct analyses to identify the communities that would be good targets for low- and moderate-income programs in the future. We will also provide AIC with an updated mapping tool and the interim memo mentioned in the next task.

*Deliverable:* Mapping Tool and Memo

*Deliverable Date:* August 2017

### Task 4: Literature Review

To help AIC consider future program designs to meet its expanded low- and moderate-income program goals, the evaluation team will conduct a review of past and current low- and moderate-income programs across the country. The review will help us identify best practices in low- and moderate-income program designs and marketing strategies. For each program, we will document the design, marketing strategy, and evaluation results. We will give special focus as to how these programs targeted customers, whether these programs offered direct install measures or deeper retrofits (or some combination), and any community-based marketing strategies they used. We will summarize our research in a memo that presents lessons learned from past programs and recommendations for potential program design adjustments. We will synthesize results with findings from the Participation Analysis task above.

*Deliverable:* Memo

*Deliverable Date:* August 2017

### Task 5: Impact Analysis

The PY9 evaluation will include gross and net impact estimates. The impact evaluation team will use savings algorithms from the IL-TRM V5.0, and data inputs from the program tracking database to estimate ex post gross savings. We will calculate PY9 net savings by applying the SAG-approved NTGR of 1.0 to ex post gross electric and gas savings.

*Deliverable:* Results provided in annual report

*Deliverable Date:* October 2017

### Task 6: Reporting

The evaluation team will compose a draft report of findings for AIC and ICC staff review. We will then deliver a final report that incorporates any comments from the review.

*Deliverable:* Draft report

*Deliverable Date:* October 2017

*Deliverable:* Final report

*Deliverable Date:* November 2017

### 2.5.3 Evaluation Budget and Timeline

Table 15 summarizes the timing and budget associated with each evaluation activity.

**Table 15. Residential Home Efficiency Income Qualified Program Evaluation Schedule and Budget**

Task	Evaluation Task	Deliverable Date	Budget
1	Program Staff Interviews	June 2017	\$5,000
2	Program Materials Review	June 2017	\$7,000
3	Participation Analysis	August 2017	\$18,200
4	Literature Review	August 2017	\$12,300
5	Impact Analysis	October 1, 2017	\$16,500
6	Draft Report	October 1, 2017	\$21,000
	Comments from AIC and ICC Staff	October 15, 2017	
	Final Report	November 1, 2017	
<b>Total Budget</b>			<b>\$80,000</b>

## 2.6 Residential Appliance Recycling

### 2.6.1 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 PY9 Implementation Plan, the expected savings from this program are 3% of the AIC PY9 portfolio's electric savings (including both residential and commercial programs). In assessing programs for inclusion in its PY10 through PY12 plans, AIC decided to discontinue the ARP part way through PY9 due to decreased savings for recycled appliances as appliance stock became more efficient and it presented lower avoided costs than in the previous plan.

### 2.6.2 Evaluation Approach

The PY9 assessment of the Residential Appliance Recycling Program includes both impact and process analyses as outlined in the following sections.

#### Research Objectives

##### Impact Questions

The PY9 ARP evaluation seeks to provide estimates of gross and net electric savings associated with the program. The PY9 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?

##### Process Questions

The evaluation team will also explore limited process-related research questions for the PY9 evaluation, including the following:

3. Did the program implementation change since PY8? If so, how and why, and was this change advantageous?

The PY9 evaluation will build on research the evaluation team conducted in previous evaluations. We will rely on the PY6 participant survey for part-use factors and will apply the IL-TRM V5.0 algorithm to calculate gross savings and SAG-approved NTGRs to determine net savings.

#### Evaluation Tasks

Table 16 summarizes the PY9 evaluation activities conducted for the Residential Appliance Recycling Program.



**Table 16. Summary of Residential Appliance Recycling Program Evaluation Activities for PY9**

Activity	Impact	Process	Forward Looking	Details
Program Materials Review	✓	✓		Review all program materials and data in the tracking database to ensure collection of appropriate data to inform the evaluation.
Program Staff Interviews		✓		Interview program staff at AIC and Leidos to gather insights into program design and delivery, including program close out in PY9 and plans for the program in the future.
Impact Analysis	✓			Calculate gross and net impacts using the IL-TRM V5.0 and SAG-Approved NTGR values for PY9.

We describe each activity below in detail.

### 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 for relevant data required to estimate gross savings using the IL-TRM V5.0 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. Given the program closure part way through PY9, the team will make an initial data request in April 2017.

*Deliverable:* Data request

*Deliverable Date:* April 2017

### Task 2: Program and Implementation Staff Interviews

The evaluation team will conduct up to two interviews with program managers and implementers. The interviews will focus on changes in the program's design or marketing strategy since PY8, specific marketing tactics and perceived results, and 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 PY9 and program plans for the near future.

*Deliverable:* Conducted interviews

*Deliverable Date:* June 2017

### Task 3: Impact Analysis

The evaluation team will use the program tracking database to estimate the program's PY9 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) and location where the unit was kept while in use (we will utilize the program tracking database results on location of unit when in use).

The team will apply a verification rate based on self-report responses from the PY6 participant surveys, combined with a review of the program tracking data for the percentage of picked-up appliances that meet the program's requirements.

The team will review all data in the program tracking database, apply the IL-TRM V5.0 as well as part-use factors calculated from the PY6 participant survey to estimate gross savings, and apply SAG-approved NTGRs (Table 17) to estimate net savings.

**Table 17. ARP PY9 NTGRs**

Measure Description	Electric NTGR
Refrigerator	0.51
Freezer	0.59

*Deliverable:* Analysis provided in draft report

*Deliverable Date:* August 2017

*Deliverable:* Analysis provided in final report

*Deliverable Date:* September 2017

#### Task 4: Reporting

The evaluation team will compose a draft report of findings for AIC and ICC staff review. We will then deliver a final report that incorporates any comments from the review.

*Deliverable:* Draft report

*Deliverable Date:* August 2017

*Deliverable:* Final report

*Deliverable Date:* September 2017

### 2.6.3 Evaluation Budget and Timeline

Table 18 summarizes the timing of each evaluation activity. Table 18 provides budgets associated with each task. The total budget for the PY9 ARP evaluation is \$28,000.

**Table 18. ARP PY9 Evaluation Budget**

Task	Evaluation Activity	Deliverable Date	Budget
1	Request and Review Data from Utility	April 2017	\$2,000
2	Program and Implementation Staff Interviews	June 2017	\$2,000
3	Impact Analysis	August 2017	\$9,000
4	Draft Report	August 15, 2017	\$15,000
	Comments from AIC and ICC Staff	September 1, 2017	
	Final Report	September 15, 2017	
<b>Total Budget</b>			<b>\$28,000</b>

## 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 PY9 Implementation Plan, the expected savings from this program are about 4% of the AIC PY9 portfolio's electric savings and 2% of overall portfolio therm savings (including both residential and commercial programs). AIC discontinued the New Homes Program in early PY9.

### 2.7.2 Evaluation Approach

The New Homes Program PY9 evaluation seeks to provide estimates of gross and net electric and gas savings associated with the program.

#### Research Objectives

##### Impact Questions

The PY9 impact evaluation will answer the following questions:

1. What were the program's estimated gross and net energy and demand impacts?
2. What was the appropriate baseline for estimating program savings?
3. Does the program continue to result in savings from market transformation and spillover?

##### Process Questions

The evaluation team will also explore process-related research questions for the PY9 evaluation. These questions focus on program design and implementation changes between PY8 and PY9 and on any insights gained from the PY8 evaluation that warrant follow-up. The team will specifically design the process evaluation to answer the following questions:

4. Program Design and Implementation
  - a. How many homes were built to program standards in PY9?
  - b. What changes occurred in PY9, and what are the impacts of these changes?
  - c. How well did the program's processes work, and what opportunities existed for improvements?

## Evaluation Tasks

Table 5 summarizes the PY9 evaluation activities conducted for the ENERGY STAR New Homes Program.

**Table 19. Summary of ENERGY STAR New Homes Program Evaluation Activities for PY9**

Activity	Impact	Process	Forward Looking	Details
Program Materials Review	✓	✓		Review of the program marketing materials and tracking database.
Program Staff Interviews		✓		Interview AIC and Leidos to discuss program design, market trends, and program close out.
Impact Analysis		✓		Measure partial-year PY9 gross and net impacts.

We describe each activity below in detail.

### 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. Given the program closure early in PY9, the team will make an initial data request in May 2017.

*Deliverable:* Data request

*Deliverable Date:* May 2017

### 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:* June 2017

### Task 3: Impact Analysis

The PY9 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 PY9, 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.

To determine net savings, the evaluation team will use the deemed NTGRs, which the SAG agreed on for PY9 (shown in Table 20).

**Table 20. New Homes Program PY9 NTGRs**

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

*Deliverable:* Analysis provided in draft report

*Deliverable Date:* September 2017

*Deliverable:* Analysis provided in final report

*Deliverable Date:* October 2017

#### Task 4: Reporting

The evaluation team will compose a draft report of findings for AIC and ICC staff review. We will then deliver a final report that incorporates any comments from the review.

*Deliverable:* Draft report

*Deliverable Date:* September 2017

*Deliverable:* Final report

*Deliverable Date:* October 2017

### 2.7.3 Evaluation Budget and Timeline

Table 21 summarizes the timing of each evaluation activity. Table 21 also lists the budget associated with each task. The total budget for the New Homes Program PY9 evaluation is \$30,500.

**Table 21. New Homes Program PY9 Evaluation Budget**

Task	Evaluation Activity	Deliverable Date	Budget
1	Request and Review Data from Utility	May 2017	\$2,000
2	Program Manager and Implementer Interviews	June 2017	\$2,500
3	Impact Analysis	September 2017	\$10,000
4	Draft Report	September 15, 2017	\$16,000
	Comments from AIC and ICC Staff	October 1, 2017	
	Final Report	October 15, 2017	
<b>Total Budget</b>			<b>\$30,500</b>

## 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 PY9 Implementation Plan, the expected savings from this program are less than 1% of the AIC PY9 portfolio's electric and gas savings (including both residential and commercial programs).

### 2.8.2 Evaluation Approach

The PY9 assessment of the School Kits Program includes both process and impact analyses as outlined in the following sections.

#### Research Objectives

##### Impact Questions

For the PY9 School Kits Program evaluation, the team will estimate program gross and net electric and natural gas savings. The team will design the PY9 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?

##### Process Questions

The evaluation team will also conduct a process evaluation to explore how the program performed during 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?
  - c. What is free-ridership and spillover associated with the kits?

#### 4. Program Design and Implementation

- a. Did AIC make any program changes since PY8? How did these changes affect program performance or delivery?
- b. What implementation challenges occurred in PY9?
- c. What changes could AIC make to improve future program effectiveness?

### Evaluation Tasks

Table 5 summarizes the PY9 evaluation activities conducted for the School Kits Program.

**Table 22. Summary of School Kits Program Evaluation Activities for PY9**

Activity	Impact	Process	Forward Looking	Details
Request and Review Data from Utility	✓	✓		Review implementation plan, program marketing materials, and instructional materials.
Program and Implementation Staff Interviews		✓		Interview program and implementation staff to gain insights into the program's design and delivery.
Participating Student Household Survey		✓	✓	Survey participating households to gather satisfaction and NTG data.
Impact Analysis	✓		✓	Calculate gross and net impacts using the IL-TRM V5.0 and SAG-Approved NTGR values for PY9.

We describe each activity below in detail.

#### Task 1: 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 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 2017, with subsequent requests in August 2017 to obtain the final program tracking database.

*Deliverable:* Data requests

*Deliverable Dates:* June 2017 and August 2017

## Task 2: 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 program goals and progress toward meeting these goals. Additionally, the evaluation team will explore the following:

- Program changes since PY8
- Program design and implementation
- Program strengths and weaknesses
- Outreach and marketing

*Deliverable:* Conducted interviews

*Deliverable Date:* June 2017

## Task 3: 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 October 2017 after gathering data from the fall semester.

All schools receiving kits between April 2016 and December 2017 will include the parent contact postcards. We will attempt to complete interviews with 70 parents, which should be sufficient for most survey-based estimates to achieve 10% precision at the 90% confidence level.

*Deliverable:* NTG analysis memo

*Deliverable Date:* January 2018

## Task 4: 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 PY9 to verify participation
- Apply installation rates for all measures and the water heater saturation rate by fuel type, derived from the implementer's web-based surveys
- For each measure, apply IL-TRM V5.0 per-unit savings to verified participation numbers to determine gross savings
- Apply the SAG-approved NTGRs by measure to calculate net savings (Table 23)

**Table 23. School Kits Program PY9 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



*Deliverable:* Analysis provided in draft report

*Deliverable Date:* October 2017

*Deliverable:* Analysis provided in final report

*Deliverable Date:* November 2017

### Task 5: Reporting

The evaluation team will compose a draft report of findings for AIC and ICC staff review. We will then deliver a final report that incorporates any comments from the review.

*Deliverable:* Draft report

*Deliverable Date:* October 2017

*Deliverable:* Final report

*Deliverable Date:* November 2017

## 2.8.3 Evaluation Budget and Timeline

Table 24 summarizes the timing of each evaluation activity. Table 24 also shows the budget associated with each evaluation task. The total budget for the PY9 School Kits Program evaluation is \$47,000.

**Table 24. School Kits Program PY9 Evaluation Budget**

Task	Evaluation Activity	Deliverable Date	Budget
1	Request and Review Data from Utility	June 2017 and August 2017	\$2,000
2	Program and Implementation Staff Interviews	June 2017	\$2,000
3	Participating Student Household Survey	January 2018	\$22,000
4	Impact Analysis	October 2017	\$6,000
5	Draft Report	October 15, 2017	\$15,000
	Comments from AIC and ICC Staff	November 1, 2017	
	Final Report	November 15, 2017	
<b>Total Budget</b>			<b>\$47,000</b>

## 2.9 C&I Standard

### 2.9.1 Program Description

The C&I Standard Program (“the 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 Core 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 for these project types in PY9 as compared to previous years. The program is implemented by Leidos.

Additionally, the Standard Program includes the Instant Incentives offering, which expanded from a pilot program (first introduced in PY7) into a major program component in PY8. This component of the Standard Program provides incentives to customers purchasing lighting products at distributor retail locations to help increase the market share of efficient lighting products. Another offering through the Standard Program is the Ameren Illinois Business Customer Online Store (Online Store) that is available to all electric business customers. The Online Store, maintained by Energy Federation, Inc. (EFI), offers a variety of energy-saving lighting products, including LEDs, occupancy sensors, and smart power strips. Last, the Standard Program includes a Green Nozzle initiative, which is a relatively small offering that provides free efficient water nozzles to gas customers and to customers in the food service sector who use electric or natural gas water heating.

Leidos noted that In PY9, the Standard Program was used to make up for lost goals from other programs in the portfolio that were discontinued during PY9 (Appliance Recycling, ENERGY STAR New Homes, Home Efficiency Standard), and as such goals increased from the original targets at the beginning of PY9. Table 25 summarizes program activity, by program offering (Core Program, Instant Incentives, Online Store, and Green Nozzles) and, for the Core Program, by end use, through March 2<sup>nd</sup>, 2017.<sup>7</sup>

**Table 25. C&I Standard Program Ex Ante Gross MWh and Therm Savings (as of March 2, 2017)**

Projects	Number of Projects	Ex Ante MWh Savings	Percent of Total MWh	Ex Ante Therm Savings	Percent of Total Therms
Lighting	696	28,721	55%	—	—
HVAC	44	1,019	2%	34,634	18%
Specialty Equipment	75	1,387	3%	8,094	4%
VFDs	25	7,520	14%	—	—
Steam Traps	6	—	—	143,203	76%
Leak Survey & Repair	3	108	<1%	—	—
<b>Core Total</b>	<b>849</b>	<b>38,755</b>	<b>74%</b>	<b>185,931</b>	<b>98%</b>
Instant Incentives	356	9,658	18%	—	—
Online Store	3,575	4,103	8%	—	—
Green Nozzles	7	20	<1%	3,433	2%
<b>Total</b>	<b>4,787</b>	<b>52,536</b>	<b>100%</b>	<b>189,364</b>	<b>100%</b>

Note: Columns may not sum due to rounding.

<sup>7</sup> We included only projects with application statuses of “Check Sent” and “Sent to Check Processor” in this summary.

Thus far, the implementation of the PY9 Standard Program remains relatively similar to PY8. Lighting projects are still resulting in a majority of the kWh savings for the program (55%) and steam trap projects make up three-quarters of the therm savings (76%). According to the PY9 Implementation Plan, the expected electric savings from the Standard Program in PY9 are similar to the previous program year, making up 39% of the AIC PY9 portfolio's electric savings. Projected therm savings were expected to make up 38% of the overall portfolio's therm savings, comparable to the Standard Program's contribution to the PY8 portfolio (35%). Note these proportions include both AIC's residential and commercial programs.

## 2.9.2 Evaluation Approach

The PY9 assessment of the C&I Standard Program includes both process and impact analyses as outlined in the following sections.

### Research Objectives

The research objectives, which cover both impact and process related tasks, are presented below and cover several areas that were also examined during the PY8 and PY7 evaluations.

### Impact Questions

This evaluation addresses the program's performance in PY9. The primary objective of the PY9 Standard Program evaluation is to provide estimates of gross and net electric and gas savings associated with the program. More specifically, the PY9 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 Instant Incentives offering (for prospective application)?

### Process Questions

In addition, we will conduct a targeted process assessment, with an emphasis on the Core Program component and Instant Incentives offering.

4. 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 meet expectations? If not, how different was it and why?
5. Program Design and Implementation
  - a. Did the program, as implemented, change compared to PY8? If so, how and why and was this an advantageous change?
  - b. What, if any, implementation challenges occurred in PY9, and how were they overcome?
  - c. What changes could the program make to improve the customer experience and generate greater energy savings?

## 6. Participant Experience and Satisfaction

- a. How satisfied were participating customers with different aspects of their program experience?
- b. How did participants become aware of the program?
- c. What changes would participants suggest to improve the program?

## 7. Instant Incentives Offering

- a. How satisfied were customers participating in the Instant Incentives offering with different aspects of the offering?
- b. What changes would customers suggest to improve the offering?

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

## Evaluation Tasks

This section outlines the planned tasks for the PY9 evaluation of the Standard Program. Data requests and some of the planned data collection activities will overlap with the Custom Program and with 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.

Table 26 summarizes the PY9 evaluation activities that will be conducted for the C&I Standard Program. We describe each activity below in detail.

**Table 26. Summary of C&I Standard Program Evaluation Activities for PY9**

Activity	Impact	Process	Forward Looking	Details
Program Staff Interviews		✓	✓	Explore changes made since PY8 and gather information about program marketing and implementation, with a focus on Core Program and Instant Incentives offerings.
Review of Utility Data and Program Materials	✓	✓		Comprehensive review of program data to assess any changes in program processes or impacts and to support evaluation planning, sampling, and reporting.
Core Program Participant Survey		✓		Investigate program processes and participant satisfaction, verify installation of equipment.
Instant Incentive Participant Web Survey	✓	✓	✓	Investigate program processes and participant satisfaction, verify installation of equipment, and gather data for estimation of NTGRs (i.e., free-ridership and spillover).
Gross Impact Analysis	✓		✓	Estimates gross impacts through review of the program-tracking database and application of the IL-TRM V5.0
Net Impact Analysis	✓		✓	Estimate net impacts using SAG-approved NTGR values for PY9.

### Task 1: Program Staff Interviews

We conducted a brief interview with Leidos program staff in April 2017 to understand changes made to the program in PY9 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 and additional information on program marketing. We plan to complete up to four interviews.

*Deliverable:* Conduct interviews

*Deliverable Date:* April 2017 and June 2017

## Task 2: Review of 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<sup>8</sup> extract in January 2017, 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 PY9 (June 2017) and then again in August 2017, 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 2017. Table 27 provides a general summary of when we expect to make these requests.

**Table 27. C&I Standard Program Summary of Expected Data Requests**

Items Requested	Timeline
Program Materials	May 2017 and ongoing as necessary
Preliminary Amplify Extract	January 2017
Year-End Amplify Extract	June 2017
Final Amplify Extract	August 2017

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 may supplement the primary program tracking database extract with other offering-specific extracts supplied by Leidos.

*Deliverable:* Data requests

*Deliverable Date:* Ongoing

## Task 3: Core Program Participant Survey

The evaluation team will conduct quantitative telephone interviews with customers who have participated in the Core Program in PY9. These interviews will focus on measure installation verification and process questions. We will stratify our sample by first-time versus repeat participants to help understand why new participants have not engaged with the program prior to PY9. Within each stratum, we will then draw a random sample, and set quotas for lighting and non-lighting projects. For budgeting purposes, we assume that we will conduct 140 interviews.

Additionally, the Core Program participant survey will include questions designed to assess program processes. Because there may be differences in the participation process for different types of projects, we will weight the process data as necessary to ensure that process results are representative of the population of participants.

The sample unit for the Core Program participant telephone survey will be the project contact, rather than the project. This is necessary because, as in previous program years, many customers complete more than one

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<sup>8</sup> AMPlify is the program tracking database for the C&I Standard, C&I Custom, and C&I Retro-Commissioning Programs.

project during a given program year. In addition, as in past years, the evaluation team will simultaneously conduct participant research with customers in other Business Program offerings, including the C&I Retro-Commissioning and C&I Custom programs. Given the larger population of customers in the Standard Program, we will remove customers who have participated in other offerings for which research is being conducted from the Standard frame, to be able to capture a sufficient number of participants in other offerings.

*Deliverable:* Draft and final participant survey instrument

*Deliverable Date:* June 2017

#### **Task 4: Instant Incentives Participant Survey**

The evaluation team will conduct a quantitative internet survey with customers who have participated in the Instant Incentives offering in PY9. 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 available email addresses. The free-ridership and spillover questions will be used to develop a NTGR value for the Instant Incentives offering for prospective application in the calendar year 2019 program (which will be referenced, in the future, as PY2019).

The sample for this survey will be a census of all customers who participated in the Instant Incentives offering during PY9; as such, the concept of sampling error does not apply.

*Deliverable:* Draft and final participant survey instruments

*Deliverable Date:* June 2017

#### **Task 5: Gross Impact Analysis**

The team will use the IL-TRM V5.0 to calculate ex post gross savings associated with the measures installed through the program.

*Deliverable:* Results provided in annual report

*Deliverable Date:* August 2017

#### **Task 6: Net Impact Analysis**

For PY9 net savings, the team will apply SAG-approved NTGRs, specific to end uses, to PY9 gross savings. Through research detailed above, the team will also develop new NTGRs for the Incentive Incentives offerings for prospective application in PY2019.

*Deliverable:* Results provided in annual report

*Deliverable Date:* September 2017

#### **Task 7: Reporting**

The evaluation team will compose a draft report of findings for AIC and ICC staff review. We will then deliver a final report that incorporates any comments from the review.

*Deliverable:* Draft report

*Deliverable Date:* October 2017

*Deliverable:* Final report

*Deliverable Date:* November 2017

### **2.9.3 Evaluation Budget and Timeline**

Table 28 summarizes the timing and budget associated with each evaluation activity. In total, the PY9 budget for the Standard Program is \$130,000.

**Table 28. C&I Standard Program Evaluation Schedule and Budget**

Task	Evaluation Activity	Deliverable Date	Budget
1	Review Utility Data/Program Materials	Ongoing	\$5,000
2	Program and Implementation Staff Interviews	April 2017	\$3,500
3	Core Program Participant Telephone Survey	July 2017	\$30,000
4	Instant Incentives Participant Web Survey	July 2017	\$16,000
5	Gross Impact Analysis	August 2017	\$29,000
6	Net Impact Analysis	September 2017	\$6,500
7	Draft Report	October 1, 2017	\$40,000
	Comments from AIC and ICC Staff	October 15, 2017	
	Final Report	November 1, 2017	
<b>Total Budget</b>			<b>\$130,000</b>

## 2.10 C&I 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 29 summarizes program activity through March 2, 2017, by program offering.

**Table 29. C&I Custom Program Ex Ante Gross kWh and Therm Savings (through March 2, 2017)**

Program Offering	Projects	Ex Ante MWh	%	Ex Ante Therms	%
Custom Incentives (Core Program)	42	28,292	89%	282,071	100%
Competitive Large Incentive Project (CLIP)	2	1,705	5%	—	—
New Construction Lighting	24	1,780	6%	—	—
Feasibility Study <sup>a</sup>	3	—	—	—	—
Metering & Monitoring <sup>b</sup>	6	—	—	—	—
Strategic Energy Management <sup>b</sup>	2	—	—	—	—
Staffing Grant <sup>a</sup>	7	—	—	—	—
<b>Total</b>	<b>86</b>	<b>31,777</b>		<b>282,071</b>	

Note: Columns may not sum due to rounding.

<sup>a</sup> The Custom Program does not claim savings from these offerings; these offerings lead to additional Custom, Standard, and/or Retro-Commissioning projects from which savings are claimed. Project counts are presented solely as an indication of program activity.

<sup>b</sup> To date, the Custom Program has not claimed savings from these offerings. However, program staff have indicated that savings claims from these offerings are possible by the close of PY9.

According to the PY9 Implementation Plan, the expected savings from this program are 42% of overall portfolio electric savings and 8% of overall portfolio therm savings (including both residential and commercial programs).

### 2.10.2 Evaluation Approach

#### Research Objectives

#### Impact Evaluation

The primary objective of the PY9 Custom Program evaluation is to provide estimates of gross and net electric and gas savings associated with the program. The team will use engineering reviews, engineering modeling, database and hardcopy verification, and onsite measurement and verification (M&V) to estimate PY9 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 PY9 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 interviews to develop NTGRs that will be applied retrospectively to those PY9 projects.

In particular, the PY9 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 Grants and CLIP program participants (for application in PY9)?

### Process Evaluation

The evaluation team will also conduct a limited process evaluation in PY9. The process research will utilize data from multiple data collection methods and sources: in-depth interviews with AIC and Leidos program staff, Staffing Grant and CLIP interviews, and a review of program implementation and marketing materials. The focus of the process evaluation in PY9 will be primarily on special initiatives and components of the Custom Program, including CLIP, Staffing Grants, and the Strategic Energy Management offering.

We will explore a number of process-related research questions outlined below.

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

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

## Evaluation Tasks

Table 30 summarizes the PY9 evaluation activities proposed for the C&I Custom Program.

**Table 30. Summary of C&I Custom Program Evaluation Activities for PY9**

Activity	Impact	Process	Forward Looking	Details
Program Staff Interviews		✓		Explore changes made since PY8, gather information about program marketing, implementation—with a focus on special initiatives including CLIP, staffing grants, SEM, and the metering and monitoring offering.
Program Materials Review	✓	✓		Gather information about program implementation and performance.
Staffing Grant Participant Interviews	✓	✓	✓	Support the development of NTGRs for these participants to be applied retrospectively and gather process information.
CLIP Participant Interviews	✓	✓	✓	Gather NTGR information for each project, investigate ways that CLIP participants' projects differ from other custom program projects, and explore satisfaction, program processes, and areas for program improvement.
SEM Participant Interviews	✓ <sup>a</sup>	✓	✓	Collect information to explore satisfaction, program processes, and areas for program improvement.
Site Visits and Gross Impact Analysis	✓			Collect data to inform measure verification and ex post gross impacts.
Net Impact Analysis	✓			Estimate ex post net impacts using SAG-approved NTGR values. For CLIP and Staffing Grant projects, the team will use interviews with program participants to calculate PY9 NTGR values. These values will be applied retrospectively to calculate net impacts for both electric and gas.

<sup>a</sup> If savings are claimed from these projects in PY9, we may consider gathering information relevant to impacts as part of these interviews.

We describe each activity below in detail.

### Task 1: Program and Implementation Staff Interviews

We conducted a brief interview with AIC and Leidos program staff in March 2017, to understand changes made to the program in PY9 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 2017

### Task 2: Program Materials Review

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 January 2017 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 PY9 (June 2017) and then again in August 2017, when the database is typically finalized for the previous program year. We will use the database as the sample frame for the participant surveys described below.

*Deliverable:* Data requests

*Deliverable Date:* Ongoing

### **Task 3: Staffing Grant Participant Interviews**

The team will conduct interviews with AIC customers who participated in the Staffing Grant offering. 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 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. 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 2017

### **Task 4: CLIP Participant Interviews**

The team will conduct interviews with AIC customers who participated in the CLIP offering. Analyst staff will conduct the interviews and focus on gathering NTGR information for each project. Given the low number of CLIP projects, we will attempt a census of participants for the offering. For budgeting purposes, we plan to conduct approximately 15 interviews with PY9 CLIP participants. 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 2017

### **Task 5: Strategic Energy Management Pilot Participant Interviews**

We will conduct approximately 5 interviews with participants in the Strategic Energy Management Pilot offering. Analyst staff will conduct the interviews and focus on participants' experience tracking energy. We will also gather 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 offering and, if so, the characteristics of the follow-up projects.

*Deliverable:* Draft and final interview guides

*Deliverable Date:* July 2017

### **Task 6: Site Visits and Gross Impact Analysis**

We will conduct onsite data collection for a sample of 40 projects to review and verify savings assumptions. 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.

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.

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. 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 Leidos, as well as with ICC staff, to discuss the findings and answer any questions.

### Sampling Plan

Similar to prior evaluations, we will conduct a total of 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 an attempt to conduct impact research in a more "real time" fashion, we will develop our site visit sample in a minimum of two waves, using the program tracking database as a sample frame. The first wave will include projects completed between June 1, 2016 and March 2, 2017. The second wave will include projects completed between March 2, 2017 and May 31, 2017. If needed, based on availability of tracking data, we may conduct a third wave of site visits to "clean up" any large projects finalized late in the evaluation period. For each wave, we will stratify the Custom Program projects included in the program tracking database by ex ante savings, and select a number of projects proportionate to size of the population the wave represents, totaling 40 site visits across all waves.

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.

### Analysis Plan

Consistent with prior years, the gross impact analysis for the Custom Program in PY9 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 a site-specific M&V plan 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 quality assurance and control by senior staff, who are licensed professional engineers

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 customer's billing/usage 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/usage 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 project 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  $\hat{Y}$ , the ex post savings for the population of custom projects in AMPlify, is:

#### Equation 4. Ratio Estimate of Population Total<sup>9</sup>

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

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 PY9 net savings by applying SAG-approved NTGRs to gross savings. Those NTGRs are provided in Table 31. 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 interviews to develop NTGRs that will be applied retrospectively to those PY9 projects.<sup>10</sup>

<sup>9</sup> Cochran, William. 1977. *Sampling Techniques*. New York: John Wiley & Sons.

<sup>10</sup> For projects associated with a Staffing Grant, the evaluation team will use the same NTGR approach as past years. We will compare the NTGR developed through the PY9 interviews with the SAG-approved PY9 NTGR. The SAG-approved PY9 NTGR will be used as a floor and, if the NTGR developed through the Staffing Grant interviews exceeds the SAG-approved PY9 value, then we will apply the

**Table 31. C&I Custom Program PY9 NTGRs**

Project Description	Electric NTGR	Gas NTGR
Core Offering	0.741	0.830
CLIP Projects	Retrospective research	
Staffing Grant Projects <sup>a</sup>		

<sup>a</sup> Per agreement, retrospective research is applied to staffing grant projects in cases where retrospective research indicates a higher NTGR than the deemed value.

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

*Deliverable Date:* June/July 2017

*Deliverable:* Site visit formal M&V plans and results – Wave 2

*Deliverable Date:* October 2017

*Deliverable:* Results provided in annual report

*Deliverable Date:* October 2017

### Task 7: Reporting

The evaluation team will compose a draft report of findings for AIC and ICC staff review. We will then deliver a final report that incorporates any comments from the review.

*Deliverable:* Draft report

*Deliverable Date:* October 2017

*Deliverable:* Final report

*Deliverable Date:* November 2017

## 2.10.3 Budget and Schedule

Table 32 summarizes the timing and budget associated with each evaluation activity. In total, the PY9 budget for the Custom Program is \$227,000.

**Table 32. C&I Custom Program PY9 Evaluation Timeline**

Task	Evaluation Task	Deliverable Date	Budget
1	Program and Implementation Staff Interviews	May 2017	\$3,600
2	Program Materials Review	May 2017	\$5,000
3	Staffing Grant Participant Interviews	June 2017	\$17,000
4	CLIP Participant Interviews	June 2017	\$17,200
5	SEM Participant Interviews	July 2017	\$9,900
6	Site Visits and Gross Impact Analysis	Rolling	\$143,500
7	Draft Report	October 1, 2017	\$30,800
	Comments from AIC and ICC Staff	October 15, 2017	
	Final Report	November 1, 2017	
<b>Total Budget</b>			<b>\$227,000</b>

new NTGR to all of the projects associated with that Staffing Grant. However, if the newly developed NTGR falls below the SAG-approved PY9 value, we will apply the SAG-approved PY9 value to each of the participant's projects.

## 2.11 C&I Retro-Commissioning

### 2.11.1 Program Description

The C&I Retro-Commissioning Program (“the 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 PY9, 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 two separate types of facilities: health care facilities and large commercial facilities (primarily offices). 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.
- **Grocery Store Retro-Commissioning.** The Grocery Store offering targets grocery stores, primarily focusing on grocery store refrigeration systems. To date, the offering has had no participation.



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 PY9 program projects. The Large Facilities offering also has a number of PY9 projects. As of the development of this evaluation plan, the Industrial Refrigeration offering had not yet produced any completed projects in PY9, but one potential project may be completed.

According to the PY9 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 Evaluation Approach

### Research Objectives

#### Impact Evaluation

The primary objective of the PY9 RCx Program evaluation is to provide estimates of gross and net electric and gas savings associated with the program. The team will use engineering reviews, engineering modeling, database and hardcopy verification, and onsite measurement and verification (M&V) to estimate PY9 ex post gross savings. The team will perform a desk review of each project completed in PY9 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 a subset of sampled sites to increase the accuracy of the gross savings estimates.

With one exception, we will calculate PY9 net savings by applying SAG-approved NTGRs to gross savings. For projects completed as part of a Staffing Grant, we will develop project-specific NTGRs based on interviews being conducted as part of the PY9 C&I Custom Program evaluation. In these cases, the team will apply these project-specific NTGRs retrospectively.

In particular, the PY9 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 participant spillover among PY9 program participants (for prospective application in calendar year 2019 (hereinafter referred to as PY2019)?

#### Process Evaluation

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:

4. Effectiveness of Program Design and Implementation
  - a. Did the program as implemented change compared to PY8? If so, how and why and was this an advantageous change?
  - b. What implementation challenges occurred in PY9, 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?

## 5. 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.

## Evaluation Tasks

Table 33 summarizes the PY9 evaluation activities proposed for the RCx Program.

**Table 33. Summary of C&I Retro-Commissioning Program Evaluation Activities for PY9**

Activity	Impact	Process	Forward Looking	Details
Program Staff Interviews		✓		Explore changes made since PY8 and gather information about program marketing and implementation.
Program Materials Review	✓	✓		Review of program data to assess any changes in program processes or impacts and to support evaluation planning, sampling, and reporting.
Participant Interviews	✓		✓	Gather attribution information for each project to support estimation of a NTG for prospective application in PY2019. Conduct limited exploration of program processes and areas for program improvement.
Site Visits and Gross Impact Analysis	✓			Collect data to inform measure verification and ex post gross impacts.
Net Impact Analysis	✓			Estimate net impacts using SAG-approved NTGR values for PY9.

We describe each activity below in detail.

### Task 1: Program and Implementation Staff Interviews

We conducted a brief interview with AIC and Leidos program staff in March 2017, to understand changes made to the program in PY9 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 two or three interviews.

*Deliverable:* Conducted interviews

*Deliverable Date:* June 2017

## Task 2: Program Materials Review

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 January 2017 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 PY9 (June 2017) and then again in August 2017, when the database is typically finalized for the previous program year. We will use the database as the sample frame for the participant surveys described below.

*Deliverable:* Data requests

*Deliverable Date:* Ongoing

## Task 3: Participant Interviews

The evaluation team will conduct telephone interviews with customers who have participated in the program in PY9. These interviews will focus on attribution (i.e., NTGR), but may include limited questions on program processes, including satisfaction with the program, barriers to participation, and areas for improvement. These interviews will also include targeted measure verification to help inform the engineering review and site visits.

The number of interviews will depend on the final level of participation in PY9, but will target a sample that is sufficiently large to provide representative information for process analysis. For budgeting purposes, we assume that we will conduct approximately 15 interviews.

*Deliverable:* Draft and final participant survey instrument

*Deliverable Date:* June 2017

## Task 4: Site Visits and Gross Impact Analysis

### Gross Impacts

Consistent with prior years, the gross impact analysis for the RCx Program in PY9 is based on site-specific M&V results, which we will use to verify savings through the RCx Program. The impact analysis for the PY9 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. We expect to complete desk reviews for a census of RCx projects in PY9. We will also conduct onsite verification with a subsample of the impact sample. 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. 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 and 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.<sup>11</sup> 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 also adjust the sample size depending on participation in order to achieve the statistical targets if necessary.

Based on the results from both activities, we will calculate the gross impacts 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 5. Ratio Estimate of Population Total<sup>12</sup>

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

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

With two exceptions, we will calculate PY9 net savings by applying SAG-approved NTGRs to gross savings highlighted in Table 34. We will develop project-specific NTGRs for the two exceptions: Custom Program projects implemented by CLIP or Staffing Grant participants. For these participants, the team will conduct NTGR interviews to develop NTGRs that will be applied retrospectively to those PY9 projects.<sup>13</sup>

Table 34. C&I RCx Program PY9 NTGRs

Project Description	Electric NTGR	Gas NTGR
All Projects	0.914	0.914
Staffing Grant Projects <sup>a</sup>	Retrospective research	

<sup>a</sup> Per agreement, retrospective research is applied to staffing grant projects in cases where retrospective research indicates a higher NTGR than the deemed value.

<sup>11</sup> Based on the most recent available database extract, we expect to review a census of projects with gas savings.

<sup>12</sup> Cochran, William. 1977. *Sampling Techniques*. New York: John Wiley & Sons.

<sup>13</sup> For projects associated with a Staffing Grant, the evaluation team will use the same NTGR approach as past years. We will compare the NTGR developed through the PY9 interviews with the SAG-approved PY9 NTGRs. The SAG-approved PY9 NTGR will be used as a floor and, if the NTGR developed through the Staffing Grant interviews exceeds the SAG-approved PY9 value, then we will apply the new NTGR to all of the projects associated with that Staffing Grant. However, if the newly developed NTGR falls below the SAG-approved PY9 value, we will apply the SAG-approved PY9 value to each of the participant’s projects.

The team will share the site visit results with AIC and ICC staff in advance of submitting the draft annual report. The Excel file 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:* Impact analysis summary spreadsheet

*Deliverable Date:* October 2017

*Deliverable:* Final analysis in annual report

*Deliverable Date:* November 2017

### Task 5: Reporting

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

*Deliverable:* Draft report

*Deliverable Date:* October 2017

*Deliverable:* Final report

*Deliverable Date:* November 2017

## 2.11.3 Evaluation Budget and Timeline

Table 35 summarizes the timeline and budget for each evaluation activity. In total, the PY9 budget for the RCx program is \$103,000.

**Table 35. C&I RCx Program PY9 Evaluation Timeline**

Task	Evaluation Task	Deliverable Date	Budget
1	Program and Implementation Staff Interviews	May 2017	\$2,200
2	Program Materials Review	May 2017	\$2,000
3	Participant Interviews	June 2017	\$18,700
4	Site Visits and Gross Impact Analysis	October 2017	\$63,300
5	Draft Report	October 1, 2017	\$16,800
	Comments from AIC and ICC Staff	October 15, 2017	
	Reporting	November 1, 2017	
<b>Total Budget</b>			<b>\$103,000</b>

### 3. Cross-Cutting Evaluation Activities

Within the following section, we outline evaluation activities that support the entire AIC portfolio.

#### 3.1 Small Business Research

AIC serves a large number of small businesses, which are generally defined as those with the DS2<sup>14</sup> and/or GDS2<sup>15</sup> rates representing over 100,000 unique accounts in the service territory. Over the past several years, AIC has delivered a variety of energy efficiency programs to its small business customers. These programs include AIC's existing C&I portfolio of programs (Standard, Custom, and Retro-Commissioning), which are available to small business customers, as well as the stand-alone, small business-specific programs offered by the IPA described in earlier sections of this plan.

Given the patchwork nature of program delivery to date and the potential for more integrated small business program delivery in PY2018 and beyond, AIC expressed interest in gathering additional information to help them reach these customers with energy efficiency programming moving forward. As a result, we propose two activities to help characterize small business customers and the market for small business energy efficiency programming in AIC service territory.

- **General Population Survey:** We propose a small business general population survey and profiling activities to develop a deeper characterization of these customers.
- **Small Business Trade Ally Interviews.** Building off trade ally research we have conducted in past program years (related to the 8-103/8-104 Business Program offerings, as well as the SBDI Program), we propose conducting interviews with participating trade allies bridging all small business program offerings.

We describe each of these activities in greater detail below.

##### 3.1.1 Small Business Market Actor Interviews

Given the central role that market actors play in the implementation of small business programs, the evaluation team will conduct in-depth telephone interviews with participating and nonparticipating market actors active in the small business energy efficiency space. A central goal of these interviews is to determine best practices from an implementation perspective to support development of an effective trade ally network going forward. We will explore a range of key items as part of these interviews, including the following:

- The sources and extent of trade ally awareness of small business programs
- The likelihood of participation in future small business offerings by type
- An assessment of customer willingness to participate in small business programs at varying incentive levels

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<sup>14</sup> DS-2 is AIC's "Small General Delivery Service" rate class for electric service, and contains non-residential electric accounts with peak demand of less than 150 kW. IPA small business offerings are restricted to customers in this rate class.

<sup>15</sup> GDS-2 is AIC's "Small General Gas Delivery Service" rate class for gas service, and contains non-residential gas accounts with maximum Average Daily Usage of less than 200 therms per day.

- Satisfaction with existing AIC and IPA programs and suggestions for improvement
- Barriers to participation in energy efficiency programs

We will characterize market actors by type and size, and anticipate conducting interviews with approximately 30 market actors, including some from each of the following groups:

- Active trade allies (trade allies participating in AIC or IPA programs, who have completed projects in the past program year)
- Inactive trade allies (trade allies participating in AIC or IPA programs, who have not completed projects in the past program year)
- Nonparticipating market actors (market actors who have not participated in AIC or IPA programs in the past)

We will analyze our interview results and present findings in a stand-alone memo geared toward providing AIC with actionable findings that can be used to develop a strong trade ally network to support small business programs in PY2018 and beyond.

*Deliverable:* Draft and final trade ally interview guides

*Deliverable Date:* July 2017

*Deliverable:* Memo summarizing trade ally interview results

*Deliverable Date:* August 2017

### 3.1.2 Small Business General Population Survey & Profiling

Small business customers have historically been a challenging group to successfully convert into energy efficiency program participants. Existing literature characterizes small business customers as highly price sensitive, and often too busy with the daily operations of their businesses to explore energy efficient upgrades. Energy efficiency programs are designed to overcome these barriers by providing free energy assessments, low or no cost upgrades, and full service installation, and participation among small business will continue to be critical for AIC.

As such, in PY9, we will conduct a general population survey with all DS-2 and GDS-2 customers (including participants and nonparticipants in AIC and IPA programs) to understand their constraints, business characteristics, attitudes towards energy efficiency, and level of interest in potential program offerings. We will combine results from this survey with CIS and usage data (and secondary sources, where possible) to characterize the small business customers by their usage, geography, business types, and program participation records. These business profiles can then be used to assist in targeting future small business offerings to AIC's customer base.

We expect to conduct approximately 140 interviews with DS-2 and GDS-2 customers as part of this research, including 70 participants and 70 nonparticipants.

We will analyze our survey results and existing data and present findings in a standalone memo. We expect to be able to provide a detailed profile of small business customers, including an assessment of their likelihood to participate in future AIC programs by key firmographic characteristics.

*Deliverable:* Draft and final general population survey instruments

*Deliverable Date:* July 2017

*Deliverable:* Memo summarizing general population survey results

*Deliverable Date:* September 2017

### 3.1.3 Evaluation Budget and Timeline

Table 36 summarizes the timing and budget associated with each cross-cutting small business evaluation activity. In total, the PY9 budget for cross-cutting small business evaluation tasks is \$80,600.

**Table 36. Small Business Cross-Cutting Activities PY9 Evaluation Budget**

Activity	Task	Deliverable Date	Budget
Trade Ally Interviews	Trade Ally Interview Guide	July 2017	\$28,000
	Results Memo	October 2017	
General Population Survey	General Population Survey Instrument	July and August 2017	\$53,000
	Results Memo	November 2017	
<b>Total Budget*</b>			<b>\$81,000</b>

\*Note: Funds for these tasks come from both the AIC and IPA evaluation budgets. Here we show the total combined budget from both sources.

## 3.2 Residential General Population Survey

Currently in its ninth 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 result in energy savings outside of programs that could count as spillover. Spillover among program participants is captured in individual program evaluation efforts, but nonparticipant spillover is not captured. In PY9, 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, estimating spillover requires a sample of at least 350 respondents to ensure acceptable precision at a desired confidence level.<sup>16</sup> The team will draw a random 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).

The survey will contain 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 the associated 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. Installed measures will only qualify as spillover if customers rated AIC's influence as greater than 7 (on a scale of 0 to 10).

As part of the survey, the evaluation team will also ask questions about motivations and barriers to program participation, preferred communications channels, existing levels of awareness, and satisfaction with AIC. The team will compare the PY9 results with similar surveys that we conducted in PY7 and PY8 and assess any trends.

<sup>16</sup> Illinois Statewide Technical Reference Manual for Energy Efficiency Version 5.0. Volume 4: Cross-Cutting Measures and Attachments. February 11, 2016.



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 to program savings going forward.

### 3.3 IL 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. The former includes participation in weekly calls, as well as reviewing and commenting on IL-TRM update items presented to the TAC. The latter includes participation in periodic calls with working group members to discuss any pending issues.

### 3.4 Review of Cost Effectiveness Test Results

As in prior program years, the evaluation team will work with AIC to audit the company's cost-effectiveness analysis based on PY9 program results. As part of this process, we will prepare evaluation-based model inputs, which include evaluated program savings as determined through the PY9 evaluation effort. Once AIC's contractor, AEG, has conducted the cost effectiveness analysis, we will review the results and the assumptions for avoided costs, discount rates, measure cost information, administrative costs, and other relevant data.

### 3.5 Quality Assurance and Control Process

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 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 PY9 evaluation effort, Dr. Ridge will continue to (1) discuss portfolio evaluation plans with the evaluation team, providing advice as needed; (2) participate in ongoing sampling and evaluation design efforts as requested; (3) review draft evaluation reports to ensure quality and accuracy; and (4) provide the ICC with a report on the efforts in which he was involved.

### 3.6 Integrated Reporting

The evaluation team will provide an annual integrated report with impact findings for all AIC programs. This report will include detailed EM&V tables, as well as a high impact measure summary table.



## 4. PY9 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 37. PY9 AIC Evaluation Budget**

Program/Task	Estimated Budget
<b>Program-Specific Activities</b>	
Residential Behavioral Modification	\$42,000
Residential HVAC	\$186,000
Residential Multifamily	\$40,000
Residential Home Efficiency Standard	\$28,000
Residential Home Efficiency Income Qualified	\$80,000
Residential Appliance Recycling	\$28,000
Residential ENERGY STAR New Homes	\$30,500
Residential School Kits	\$47,000
C&I Standard	\$130,000
C&I Custom	\$227,000
C&I Retro-Commissioning	\$103,000
<b>Total Program-Specific Efforts</b>	<b>\$941,500</b>
<b>Non-Program Activities</b>	
Small Business Research	\$46,500
Residential General Population Survey	\$34,500
IL Statewide Technical Reference Manual	\$57,000
Cost-Effectiveness Analysis	\$20,000
QA/QC Coordination	\$17,200
Other Non-Program Activities (i.e., SAG, Planning Integrated Reporting, etc.)	\$243,800
<b>Total Non-Program Efforts</b>	<b>\$419,000</b>
Contingency	\$69,364
<b>Total</b>	<b>\$1,429,864</b>

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