Opinion Dynamics

Boston | Headquarters

617 492 1400 tel
617 497 7944 fax
800 966 1254 toll free

1000 Winter St
Waltham, MA 02451

PY7 Evaluation Plan for the Ameren Illinois Company Electric and Natural Gas Residential, and Commercial and Industrial Energy Efficiency Programs

Draft

May 31, 2015

CADMUS

NAVIGANT

MichaelsEnergy

Contributors

Hannah Arnold
Senior Project Manager, Opinion Dynamics

Jane Colby
Principal, The Cadmus Group, Inc.

Table of Contents

Table of Tables

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 the ActOnEnergy portfolio of energy efficiency programs implemented between June 2014 and May 2015 (program year (PY) 7). This is the first year in the three-year Plan 3 period, which began on June 1, 2014, and will continue until May 31, 2017.

As part of the PY7 evaluation effort, the team will assess the following programs (referred to as 8-103 and 8-104 programs per Order 13-0498):[1]

- Residential
  - Standard Lighting
  - HVAC
  - Behavioral Modification
  - Home Performance with ENERGY STAR®
  - Appliance Recycling
  - Multifamily
  - Moderate Income
  - ENERGY STAR® New Homes
  - Energy Efficiency School Kits
- Commercial and Industrial (C&I)
  - Standard
  - Custom
  - Retro-Commissioning

This document provides detailed evaluation plans for each of the 12 programs and serves as the evaluation framework to guide the effective evaluation of programs for impacts and program improvements. The overarching evaluation objectives are to determine gross and net energy and demand savings associated with the AIC portfolio, and suggest improvements to the design and implementation of existing and future programs.

[1] 8-103 covers AIC's electric programs, while 8-104 covers AIC's gas programs.

Overarching Evaluation Approach

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

- Statewide Technical Reference Manual (TRM) – The evaluation team will use the Illinois Statewide TRM for Energy Efficiency Version 3.0 (June 1, 2014) for its impact evaluation efforts, where appropriate.

- Net-to-Gross Ratios (NTGRs) – As specified in each program-specific plan, the evaluation team will apply NTGRs by program, as determined by March 1, 2014, to estimate net impacts for PY7. Data collected as part of the PY7 evaluation for the purpose of updating NTGRs will be applied prospectively in PY9. Further, the evaluation team will provide their initial NTG recommendations for PY9 by November 1, 2015 and final recommendations by December 1, 2015. The team will provide recommendations in memo format and will include information on the methodological approach used to arrive at the results.

- EM&V Coordination – Consistent with prior years, the evaluation team is in ongoing communication with other Illinois evaluators to discuss evaluation approaches planned for PY7. These discussions ensure that, where appropriate, the evaluation approach is consistent.

2. Program-Specific Evaluation Plans

2.1 Residential Lighting Program

2.1.1 Program Description

The objective of the Residential Lighting Program is to increase awareness and sales of ENERGY STAR® (ES) lighting among residential customers. The program provides discounts through a variety of retail channels to reduce the cost of standard CFLs. Specialty CFLs are discounted through the Illinois Power Authority (IPA) in PY7. The program is available throughout the entire Ameren Illinois Company (AIC) service territory through retail stores and an online store.

The program seeks to increase awareness of energy-efficient lighting and its benefits through marketing and outreach efforts at participating retailers and the AIC website. The program partners with retailers and lighting manufacturers to sell ES lighting at a discount to bring the cost closer to that of traditional incandescent lighting. AIC expects the discounts to encourage customers who are reluctant to pay full price for ES lighting to choose energy-efficient lighting over standard lighting.

The expected savings from this program represent 12% of the overall portfolio of electric savings and 0% of portfolio therm savings (including both residential and commercial).

2.1.2 Research Objectives

The main research objectives of the PY7 evaluation will be to estimate gross and net program savings and assess program processes.

We will answer the following impact-related research questions:

1. What are the estimated program gross energy and demand savings for this program?
2. What are estimated program net energy and demand savings for this program?
3. To what extent did AIC customers purchase and use energy-efficient bulbs incented by programs in neighboring territories? Such bulbs may be "leakage into" the AIC territory.

We will also answer the following process-related research questions:

1. Did the program change its design in PY7? If so, how, why, and were those changes advantageous?
2. Was program implementation effective and smooth?
3. What implementation challenges occurred in PY7, and what was done to address them?
4. What was the format of customer outreach? How often did the outreach occur?

2.1.3 Methodology

Below we provide a summary of the methods planned for the PY7 Residential Lighting Program evaluation.

Data Sources

Impact Analysis

To estimate PY7 ex post gross savings for the Residential Lighting Program, we will perform a database review and estimate savings using savings assumptions in the Illinois Statewide Technical Reference Manual (TRM) Version 3.0. Our database review will include an examination of the CFL baseline wattages used to calculate program ex ante savings to ensure that the wattages are consistent with the TRM. We will utilize the carryover savings method outlined in the TRM in which PY7 ex post gross savings is composed of bulbs sold over three years but installed in PY7. PY7 ex post gross savings will include bulbs sold and installed in PY7, as well as delayed installations of bulbs sold in PY5 and PY6 but not installed until PY7.

We will apply the program leakage rate that we estimated as part of the in-store customer interviews conducted in PY6. We will conduct research in PY7 to estimate a "leakage in" rate that represents the number of energy-efficient bulbs purchased by AIC customers in neighboring territories with lighting programs.

For net savings, we will use the net-to-gross ratio (NTGR) value estimated in PY5 (0.47).

Process Analysis

The process analysis will utilize information gained from interviews with program staff and review of program data and materials. The in-depth interviews with AIC and Conservation Services Group (CSG) implementation staff will provide the evaluation team with a comprehensive understanding of the program. We will also review marketing materials to understand the messages used promote the sale of efficient lighting.

Analysis Plan

Gross Impacts

For PY7, the baseline wattages for gross energy and demand savings are set by the Statewide TRM V3.0 and are shown in Table 2-1. The evaluation team will use these values and data from the program-tracking database to calculate gross program savings.

Table 2-1. Baseline Wattages for Calculation of Gross Savings

Minimum Lumens	Maximum Lumens	Incandescent Equivalent Post-EISA 2007 ($Watts_{Base}$)
5,280	6,209	300
3,000	5,279	200
2,601	2,999	150
1,490	2,600	72
1,050	1,489	53
750	1,049	43
310	749	29
250	309	25

We will use the leakage rate of 15% that we estimated in PY6 through in-store intercepts to represent "leakage out" of the program.

We will conduct a statistical and geographic information system (GIS) analysis to estimate leakage of program-discounted bulbs *into* AIC territory. As a first step, we will request store-level leakage results for the sample of stores that were part of in-store intercept studies conducted by Commonwealth Edison (ComEd) and Ameren Missouri. We will estimate a leakage model to determine the relationship between leakage rates, distance to territory borders, and other store and population characteristics. As a second step, we will request a list of all participating stores and sales from Ameren Missouri and ComEd. We will map all stores in relation to the same characteristics used in the leakage analysis in the first step. Once mapped, we will extrapolate the leakage results to all participating ComEd and Ameren Missouri stores. We will estimate AIC "leakage in" based on the leakage estimates for stores that lie close to AIC borders. We will determine a maximum distance threshold for possible leakage into AIC for each store using the model results conducted in the first step.

We will combine the leakage out and leakage in rates to produce an overall leakage rate that we will apply to gross savings.

Net Impacts

For PY7, we will use the NTGR value estimated in PY5 (0.47).

Process Analysis

We will present process and market-related findings based on our analysis of interviews with program staff, program materials, and databases.

2.1.4 Tasks

To answer the research questions listed above, we will complete the following tasks as part of the PY7 evaluation.

Task 1: Program and Implementation Staff Interviews

The evaluation team will conduct up to four in-depth phone interviews with program and implementation staff involved in the design and administration of the efficient lighting program (i.e., AIC, CSG, CLEAResult, and Energy Federation Incorporated [EFI] staff). These interviews will allow us to fully explore the details of the program design and implementation and examine the perspective of the people who are in direct contact with participating retailers. We conduct the interviews over the telephone using experienced Opinion Dynamics analysts. We will record and transcribe all interviews to facilitate analysis.

Deliverable: Conducted interviews *Deliverable Date:* June 2015

Task 2: Request and Review Program Materials

The evaluation team will conduct a comprehensive review of all program materials. This includes all materials provided to retailers, as well as mass marketing and in-store materials. These activities will inform our process assessment.

We will also request program-tracking data, the program's goals tracker, program marketing materials, and marketing plans (including the dates that materials were used).

Deliverable: Data requests *Deliverable Date:* June 2015

Task 3: Program Database Verification and Savings Analysis

The evaluation team will review all records in the program database. We will check to ensure that CSG applied the correct savings value for each product type to verify that the database is providing correct information. We will also assess the database to ensure that project data have been recorded sufficiently and correctly. We will resolve any discrepancies found in the database and report on findings.

To calculate gross savings, we will use the energy and demand savings formulas outlined in the Statewide TRM V3.0.

Deliverable: Data requests *Deliverable Date:* June 2015

Task 4: Leakage Analysis

We will conduct a statistical and GIS analysis to estimate leakage of program-discounted bulbs *into* AIC territory. The evaluation team will coordinate with the evaluation teams from Ameren Missouri and ComEd to obtain store-level leakage estimates and participating store sales data. We will estimate a statistical model of the characteristics associated with leakage for these two neighboring utilities and extrapolate the results to all participating stores near AIC borders.

Deliverable: Results provided in annual report *Deliverable Date:* September 2015

Task 5: Reporting

We will analyze and report the results of our evaluation of program impacts and processes in an annual report.

Deliverable: Draft report *Deliverable Date:* September 2015

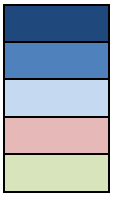
Deliverable: Final report *Deliverable Date:* October 2015

2.1.5 Budget and Schedule

Table 2-2 provides a schedule of evaluation tasks for PY7.

Table 2-2. Lighting Program PY7 Evaluation Timeline

Task #	Evaluation Task	2015							
		May	June	Jul	Aug	Sep	Oct	Nov	Dec
1	Program and Implementation Staff Interviews								
2	Request and Review Program Materials								
3	Program Database Verification and Savings Analysis								
4	Leakage Analysis								
5	Reporting								



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

Table 2-2 provides the budget for each evaluation task for PY7.

Table 2-3. Lighting Program PY7 Evaluation Budget

Task No.	Task Description	Deliverable Date	Cost by Task
1	Program and Implementation Staff Interviews	June 2014	$1,400
2	Request and Review Program Materials	June 2015	$1,000
3	Program Database Verification and Savings Analysis	June 2015	$5,000
4	Leakage Analysis	September 2015	$11,100
5	Reporting	September/October 2015	$14,000
		Total Cost	**$32,500**

2.2 Residential HVAC Program

2.2.1 Program Description

Through the Residential HVAC Program, AIC offers incentives for the purchase of high-efficiency air-source heat pumps (ASHPs), central air conditioners (CACs), and brushless motors when installed with a new Air-Conditioning, Heating, and Refrigeration Institute (AHRI)-rated furnace. An HVAC-registered program ally must perform the installation. AIC pays a higher incentive for ASHP and CAC installations that replace existing and functional systems with a seasonal energy efficiency ratio (SEER) rating of 10 or less (early replacement). AIC no longer offers program incentives for natural gas HVAC equipment (see the Plan 3 filing docket for more details).

AIC recruits contractors to the program who are receptive to a higher-quality approach when serving residential customers. Contractors are required to enter into a participation agreement that outlines the program requirements and contractor responsibilities. The program protocols specify sizing requirements, efficiency standards, and other elements, such as a matching indoor and outdoor coil requirement for new air conditioning equipment.

AIC provides sales and marketing training to educate the HVAC contractors on how to best promote the program. The training includes such topics as developing a simple payback analysis for high-efficiency HVAC systems, marketing high-efficiency equipment, the basics of building science, and methods for communicating the need for high-efficiency equipment to customers.

There are several ways that a homeowner can enter the HVAC Program and start saving:

- The homeowner follows a routine maintenance plan. During a routine maintenance visit, the contractor explains the program and incentive options to encourage participation, and, as a result, the customer installs high-efficiency equipment and is eligible for an early replacement rebate.
- The homeowner notices that equipment is not running as well as it used to, and calls a contractor. The contractor explains the program and incentive options to encourage participation, and, as a result, the customer installs high-efficiency equipment and is eligible for an early replacement rebate.
- The homeowner is aware of the incentives, and considers purchasing new high-efficiency equipment. The contractor further encourages the customer to select the high-efficiency equipment over standard equipment, then installs equipment, and the customer is eligible for an early replacement rebate.
- The homeowner decides to install new high-efficiency equipment because his or her old equipment is no longer functional or he or she had no pre-existing equipment. The contractor further encourages the customer to select high-efficiency equipment, then installs equipment at the customer's request. The customer is eligible for a replace-on-burnout rebate.

The expected savings from this program are 2% of the overall PY7 portfolio of electric savings.[2]

[2] Note that we calculated the percentage of expected savings based on AIC's Compliance Filing.

2.2.2 Research Objectives

The PY7 impact evaluation will answer the following questions about the HVAC Program:

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

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

1. Did the program implementation change compared to PY6? If so, how, why, and was this change advantageous?
2. Did customer participation meet expectations? If not, how was it different from expectations, and why?
3. What were the participant characteristics? How many HVAC units were installed, and at what SEER levels? What percentage was early replacement vs. replace-on-burnout? Did those ratios change from PY6?
4. What was the most effective way for AIC to collaborate with distributors? How interested were distributors in partnering with the HVAC Program to promote its rebates? What changes could be made to better serve distributors in promoting the HVAC Program?
5. Were the HVAC Program's operational and delivery processes adequately documented? Were program materials up to date to reflect program changes for PY7?
6. What were the incremental costs associated with high-efficiency HVAC equipment?

2.2.3 Methodology

In the sections below, we provide a summary of the methods planned for the PY7 HVAC Program evaluation.

Data Sources

Impact Analysis

To estimate PY7 ex post gross savings for the HVAC Program, we will use the appropriate Statewide TRM V3.0 savings algorithms to estimate gross savings for each measure; we will then multiply those savings by each measure installed, as tracked through the participant database. To estimate net savings, we will use the NTGRs agreed on by the Stakeholder Advisory Group (SAG) for PY7, as shown in Table 2-3.

Table 2-4. Residential HVAC Program NTGRs for PY7

Measure	Efficiency Level	Incentive Status	Free-Ridership	Participant Spillover	Non-Participant Spillover	NTGR
ASHP or CAC	SEER 16+	Replace-on-burnout	50%	0.1%	22%	0.72
		Early replacement	44%	0.1%	22%	0.78
Brushless motor	N/A	N/A	56%	0.1%	22%	0.66

Process Analysis

The team will collect and use data from three sources for the process evaluation: in-depth interviews with program staff, interviews with distributors, and a materials and invoice review. The in-depth interviews with AIC and implementation staff will provide the evaluation team with a comprehensive understanding of the program. The distributor interviews will improve our understanding of the most effective way for AIC to bring distributors in as program partners. We will also gather baseline and incremental equipment cost data to supplement the invoice review discussed below in Task 4. The materials review will allow us to assess the presence of relevant program information within critical program documents, such as participation processes, marketing strategies, and quality control procedures. In addition, reviewing submitted program invoices and the program-tracking database will provide the team with the opportunity to gauge the incremental equipment costs associated with program participation, providing input to the cost-effectiveness analysis.

Sampling Plan

Impact Analysis

The evaluation team will use the PY7 tracking database to calculate impacts for the HVAC Program. We will also verify 70 HVAC measure installations by reviewing all available project documents (invoices, AHRI numbers, etc.) and comparing our findings to the tracking database. Concurrent with the invoice verification, we will pull 170 additional invoices (reviewing 240 invoices in total), from which we will document equipment and installation costs for approximately 30 invoice samples by SEER and equipment type (SEER 16, 17, or 18 for each ASHP and CAC).

Process Analysis

For the PY7 evaluation, the team will focus on collecting information from program staff and local distributors. We will interview the key program manager and implementer, as well as a convenient sample of HVAC distributors (see Table 2-4).

Table 2-5. HVAC Program Interview Sampling Methods, Sources, and Targets

Data Collection Method	Population Source	Targeted Completes
Stakeholder Interviews	AIC and CSG	2
Distributor Interviews	Names provided by contractors during surveys conducted in PY6, along with current list from AIC and the implementer	10

Analysis Plan

The evaluation team will conduct a process and impact evaluation of the HVAC Program in PY7. During the distributor interviews, we will focus on obtaining input regarding a potential role as formal partners with AIC in promoting the HVAC Program and on updating assumptions around the incremental costs of high-efficiency equipment.

We will base gross impacts on the application of the Statewide TRM V3.0, as well as on a participation verification conducted by reviewing a sample of invoices against the tracking database. The invoice review will also allow us to analyze incremental equipment costs by SEER, We further outline our analysis plan below for determining gross savings and the NTGR.

Gross Savings

In PY7, the evaluation team will determine gross impacts by multiplying the number of verified participants for each measure by per-unit savings determined through the appropriate savings algorithm, as specified in the Statewide TRM V3.0. We will compare ex post gross savings to the ex ante savings provided in the tracking database.

Baseline

AIC offers incentives for new equipment replacing failed equipment, new equipment replacing existing equipment above 10 SEER (both considered replace-on-burnout), and new equipment replacing operating equipment with less than 10 SEER (considered early replacement). Therefore, the team will estimate savings using two different baselines:

- One that is based on the federal minimum standard (for replace-on-burnout).
- One that is based on the existing functioning equipment that was replaced (for early replacement) for the first 5.5 years, then based on the federal minimum standard thereafter. The team will report the value calculated for the first 5.5 years in the impact results, and we will use this value and the value based on federal minimum standards to calculate lifetime savings for the cost-effectiveness analysis. We will also verify through our database analysis that equipment purchased as early replacement meets the early replacement criteria (SEER <10 and in working condition). If equipment age is documented, we will assess the age distributions for informational purposes to ensure that the early replacement definition is most likely used for equipment with remaining rated life.[3]

Net Savings

The evaluation team will apply the SAG agreed-on NTGRs to estimate PY7 net impacts (0.72 for replace-on-burnout, 0.78 for early replacement, and 0.66 for brushless motors).

2.2.1 Tasks

This section outlines the planned tasks for our PY7 evaluation of the HVAC Program.

Task 1: Request and Review Program Materials and Database

The team will conduct a comprehensive review of all program materials and tracking data. This includes program rebate forms, implementer reports, program manuals, and program ally communications, as well as extracts from the program-tracking database. The evaluation team will randomly select equipment invoices for 70 installations, which we will compare to the program-tracking database to verify the measures. We will review these materials immediately to determine if there are any data gaps or potential issues, specifically with respect to the customer and measure data.

We will request program materials in June 2015, and will continue to communicate with AIC, Leidos (the "implementation contractor"), and CSG about data needs. At a minimum, we will make subsequent

[3] Note that AIC does not have an age requirement associated with the early replacement definition, as equipment life can vary significantly from expected life. This analysis is for informational purposes only.

requests at the close of PY7 (June 2015) and again in August 2015, when the database is typically finalized for the year. Table 2-5 provides a general summary of when we expect to make these requests.

Table 2-6. HVAC Program Summary of Expected Data Requests

Items Requested	Timeline
Program Materials	June 2015 and Ongoing
Preliminary Database Extract	June 2015
Final Database Extract	August 2015

Deliverable: HVAC Program data requests *Deliverable Date:* June 2015 and August 2015

Task 2: Program and Implementation Staff Interviews

The evaluation team will perform stakeholder interviews with AIC program and implementation staff, focusing on assessing the following:

- Program goals
- Program modifications and sources of change
- Program challenges and successes
- Program management
- Changes in program activity and trade ally involvement

Deliverable: Conducted interviews *Deliverable Date:* June 2015

Task 3: Distributor Interviews

We will attempt to interview approximately 10 local HVAC equipment distributors determined through contacts provided by contractors (during the PY6 contractor surveys), as well as those provided by AIC and the implementer (if any). We will ask distributors for their current market shares of different efficiency levels and for estimates of how those market shares would be different without the program. We will ask how the program has affected their purchasing and stocking of efficient HVAC equipment and whether other factors affect their purchase rates of different efficiency levels. We will also ask for their thoughts on how AIC can best collaborate with distributors.

Experienced evaluation team analysts will interview the HVAC distributors, focusing on assessing the following:

- Program awareness
- Perspective of program influence on customer purchasing trends
- Incremental cost of high-efficiency HVAC equipment by SEER

- Interest in and benefits of partnering with AIC
- Recommendations of ways AIC can collaborate with distributors to improve the program

Deliverable: Draft and final distributor interview guides ***Deliverable Date:*** July 2015

Task 4: Calculate Incremental Costs by SEER

The team will select a sample of approximately 30 invoices of each SEER level and equipment type for review for a total of 240. We will then document equipment costs by SEER and equipment type (SEER 16, 17, and 18 for ASHPs and CACs). We will use this information, along with cost-by-SEER information tracked in the program database (if available) to inform our cost-effectiveness calculations for the HVAC Program and other programs that AIC uses to promote high-efficiency HVAC equipment.

Deliverable: Interim memo ***Deliverable Date:*** July 2015

Deliverable: Provide analysis again in final report ***Deliverable Date:*** September–October 2015

Task 5: Impact Analysis

The evaluation team will analyze the tracking database and Statewide TRM V3.0 to calculate HVAC Program impacts. We will apply the agreed-on NTGRs to determine PY7 net impacts.

Deliverable: Provide analysis in final report ***Deliverable Date:*** September–October 2015

Task 6: Reporting

The evaluation team will write a draft report of findings, including the process and impact evaluation analysis results and conclusions from Task 1 through Task 5. After AIC and stakeholder review, we will deliver a final report that incorporates comments.

Deliverable: Draft report ***Deliverable Date:*** September 2015

Deliverable: Final report ***Deliverable Date:*** October 2015

2.2.2 Budget and Schedule

Table 2-7 below outlines the schedule for the HVAC Program evaluation.

Table 2-7. HVAC Program PY7 Evaluation Timeline

Task	Evaluation Activity	2015							
		May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	Request and Review Program Materials and Database								
2	Program and Implementation Staff Interviews								
3	Distributor Interviews								
4	Calculate Incremental Costs by SEER								
5	Impact Analysis								
6	Reporting								

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

Table 2-6 shows a budget summary by task, for a total of $79,000.

Table 2-8. HVAC Program PY7 Evaluation Budget

Task No.	Task Description	Deliverable Date	Cost by Task
1	Request and Review Program Materials and Database	June 2015 and August 2015	$10,000
2	Program and Implementation Staff Interviews	June 2015	$3,000
3	Distributor Interviews	July 2015	$16,000
4	Calculate Incremental Costs by SEER	July 2015 September–October 2015	$12,000
5	Impact Analysis	September–October 2015	$18,000
6	Reporting	September/October 2015	$20,000
		Total Cost	**$79,000**

2.3 Residential Behavioral Modification Program

2.3.1 Program Description

The Behavioral Modification Home Energy Report (HER) Program began with a pilot cohort mid-year in AIC's PY3 with a group of approximately 50,000 dual-fuel customers.[4] Since that time, the program has grown to reach almost one-third of AIC's 1 million residential customers. Most of the current participants are in their fourth year with the program, although about 26,000 residential customers are in their second year, and the newest cohort, coming in during PY7, have been in the program only about 1 year.

The program's primary tool for encouraging energy-efficient behaviors is the HER, which includes the following information:

- A comparison of the customer's current and past energy usage
- A comparison of the customer's energy usage to that of similar households in the same geographical area
- Tips for reducing energy consumption, tailored to the customer's home energy profile (e.g., type of home, square footage, and number of occupants)

The program has been progressively adding customers over the past 5 years, with a small percent of customers dropping out over time (see Table 2-7). A new cohort was added in June 2014, and has now been in the program for about a year.

Table 2-9. Behavioral Modification Program Participation in PY7

PY	Cohort Name	Fuel Type	Number of Treated Customers in PY7	Start Date	# of Years Participating
3	Original Pilot Cohort	Dual Fuel	41,787	August 2010	5th year in the program
4	Expansion Cohort 1	Dual Fuel	63,232	April 2011	4th year in the program
5	Expansion Cohort 2	Dual Fuel	82,043	November 2011	4th year in the program
5	Expansion Cohort 3	Gas Only	10,672	November 2011	4th year in the program[a]
6	Expansion Cohort 4	Dual Fuel	26,696	June 2013	2nd year in the program
7	Expansion Cohort 5	Dual Fuel	60,000	June 2014	1st year in the program
	Total	**Electric**	**273,758**		
	Total	**Gas**	**284,430**		

[a] Notably, Expansion Cohort 3 (the gas-only cohort) stopped receiving program offerings in April 2012, and resumed receiving reports in April 2013. This cohort continued receiving treatment in PY6.

The program offers three treatment types: a printed report mailed to the customer's billing address; an electronic copy of the same report sent to the customer's email address (if one is on file); and the online portal, which customers can log onto to view the same report and access additional information. The implementation team sends monthly reports to treated customers during the first 3 months of program treatment. After that period, the customers receive bimonthly reports (i.e., six reports in 1 year). The gas-

[4] "Duel fuel" means that AIC provides both electric and gas utilities to the customer. AIC also provides single fuel services to customers.

only cohort, Expansion Cohort 3, received four clustered reports during the heating season. In addition, about 5% or 10,000 participants logged onto the online portal in PY6.

The PY7 evaluation focuses on the period from June 2014 through May 2015. Based on the 3-Year Plan, the expected energy savings from this program are 29,350 MWh and 1,887,500 therms for PY7, representing 13% of electric savings and 35% of gas savings for the overall portfolio.[5]

2.3.2 Research Objectives

As part of the most recent evaluation, the evaluation team completed an assessment of energy impacts (including equivalency analysis, adjustment for double-counted savings, and review of program participation over time) coupled with a survey of treatment and control customers. Our evaluation approach for PY7 will build on prior evaluation findings, provide additional insights regarding program effects, and address key questions regarding the benefits of offering behavioral programs over time.

The PY7 Behavioral Modification Program impact evaluation is structured to answer the following general research questions:

1. Were the new treatment and control groups equivalent?
2. What are the estimated MWh and therm savings from this program for all cohorts in PY7?
3. Did the program achieve savings year-over-year for each of the cohorts?
4. Do program savings need to be adjusted due to the treated population's participation in other AIC programs?

The PY7 process evaluation will explore the following research questions:

1. Who were the high savers, low savers, negative savers? Can we isolate top-tier savers and lower-tier savers, to better understand who is driving savings, and potentially, through leveraging secondary data, what their characteristics are?
2. What types of actions did customers take because of the program?
3. Did the HERs improve participants' energy-related self-efficacy?
4. How satisfied were participants with the program, and how satisfied were respondents with AIC?

2.3.3 Methodology

The following sections outline the proposed methodological approach for the PY7 Behavioral Modification Program evaluation.

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

Data Sources

Impact Evaluation

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

Given that the evaluation team did not assign the customers to treatment and control groups in the new Expansion Cohort 5, we will conduct an equivalency analysis to ensure that the treatment and control groups are comparable. This review will strengthen the internal validity and defensibility of the research design. To assess equivalency, we will utilize Experian data appended to the treatment group's and the control group's monthly usage data.

Data sources for the PY7 impact evaluation include:

- Program-tracking databases for all AIC residential programs from June 2014 to May 2015
- For all customer treatment and control groups, electric and gas consumption/billing data from June 2013 to May 2015
- Experian data (including demographic data, housing characteristics, and psychographic data)

Process Evaluation

The process evaluation will utilize data from our impact efforts, as well as three additional data collection activities: a review of program data, in-depth interviews with program and implementer staff, and rolling Internet surveys with program participants and control group customers timed to coincide with having received a recent home energy report. We plan a multilevel billing analysis to separate the customer savings into three categories (high, medium, and low savers) and analyze the correlation of these categories with demographics and household characteristics. In-depth interviews with AIC, CSG, and OPower implementation staff will provide the evaluation team with a comprehensive understanding of the program and its implementation. The treatment and control group survey effort will provide insights into energy-saving actions taken by customers, and will build on insights derived from a participant/control group survey conducted in PY6.

Program data used for the PY7 process evaluation will include:

- Email contact information, where available, for all customer treatment and control groups
- HERs sent to cohorts in PY7, including tips provided to customers in the treatment group; this should tie the specific savings tips to specific customers so that we can assess how different the tips are across customers
- Dates when HERs were sent to program participants in PY7 and equivalent dates for control group members; anticipated dates when HERs will be sent to participants in PY8
- List of energy "tips" that will be provided in HERs in PY7 and PY8[6]

[6] We plan to continue to field rolling surveys into PY8, so we will request this information in an ongoing fashion.

We will collect data from customers in the treatment and control groups with an Internet survey. The survey content for the treatment group and the control group will be identical when possible. Our team will develop questions that can be meaningfully asked of both groups. The exceptions will be that control group customers will not be asked questions about their reactions to the report itself, or their recall of it. Questions about actions taken, behavior and equipment decisions, and the time frame in which they were taken can and will be phrased exactly the same way for both groups. Actions that are tied to the report recommendations can be the same, i.e., what is in the report need not be called out to the respondent.

We will use the list of tips provided to participants in PY7 to guide survey question development. If there is sufficient budget and we find that tips vary substantially by customer, we will tie survey questions to specific tips provided to individual customers. We will cover up to four recommendations for any given customer if they are tied to specific customers. We will use two separate surveys, one for electric and gas customers and one for gas-only customers. Naturally, the actions recommended will be somewhat different for gas-only customers, but their control groups will also be gas-only customers, so the comparisons of treatment to control will be appropriate.

Sampling Plan

Billing Analysis – Impact

The billing analysis will include all cohorts. For the new Expansion Cohort 5, 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 populations of treatment and control group members for this analysis.

For the cohorts previously evaluated—Original Cohort, Expansion Cohort 1, Expansion Cohort 2, Expansion Cohort 3, and Expansion Cohort 4—the treatment and control groups have been verified as essentially equal. However, some attrition might have occurred. Therefore, we will compare the treatment and control groups on usage only to ensure continued equivalence.

Internet Survey – Process

We will recruit all treatment and control customers for whom email addresses are available to participate in an Internet survey.[7] This approach may cause some concern about the fact that we are surveying only those who provided email addresses. Historically, this concern centered on the possibility that customers with convenient Internet connections would be different from those without. However, convenient Internet access is now close to ubiquitous in this country, allaying that concern to a considerable degree. Still, we do know from experience that the issue is more that customers who choose to share their email address with their utility have some differences from those who do not, and those who did share them produced more savings than those who did not. This is likely traceable to a closer connection to the utility that exists for the customers sharing their email address than for those who do not. A somewhat reassuring factor in this design is that the same biases will be present for both the treatment group and control customers, making the comparison between the two groups less of a problem than one might think at first. However, this approach will limit the external validity of the results. Nevertheless, even here, it is not obvious that the differences in actions and attitudes between the treatment group and the control group for those *within*

[7] We will work with AIC and Leidos to determine the best sampling approach pending receipt of customer contact information.

the email group will be substantially different than differences between the groups among those who did not share email addresses. In any case, as this is an exploratory study, this design is sufficient to produce valuable insights.

Recruiting all available participants and non-participants means that there will be no sampling error, but we may still face non-response biases. The treatment and control group respondents may not be entirely equivalent, as treated customers may be more willing to complete the survey than control customers. After the survey is completed, we will check for non-response predictors that may be different for treatment and control groups. If we find differences, this will tell us the limits of the internal validity of the findings. To the extent possible, we will control statistically for differences that we find. Thus, in the end, this may simply be a quasi-experimental design with the strengths and weaknesses of that approach. This design is often used and accepted for impact analyses, and is even more satisfactory for this exploratory process study. It will produce valuable insights into the kinds of actions treated customers take to achieve their savings beyond the naturally occurring actions as reported by the control group.

Since the Opinion Dynamics team will survey all cohorts currently receiving reports, some respondents will have been receiving reports for up to 5 years at the time of the survey, while others will have received them for about a year, and still others will have received them for 2–4 years. We will time the recruitment of treatment and control group respondents such that the treatment group will have received their latest report about a week prior to the survey. This will minimize the problem of recall. If they have taken actions or changed their behavior early in the participation process, the earliest participants may experience some recall problems about those actions. But for all respondents, what is in the report and their reactions to it will be fresh, as will actions begun recently.

Surveying all cohorts of participants will allow us to tie some responses to how long customers have been in the program. Of course, this is not the same as a longitudinal study where the same respondents are surveyed multiple times over the post-participation period. That design would be costly and would have to be carried out over 4–5 years to capture the same time periods that our proposed cross-sectional design will do. Nevertheless, the ability to cover different participation periods in the same study is a benefit of the fact that we have these multiple cohorts available.

Analysis Plan

Impact Evaluation

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

Equivalency Analysis

We will compare the Expansion Cohort 5 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

Psychographic characteristics

Behavior bank (Social causes and concerns – environment)	Behavior bank (Computers – Internet/online subscriber or use Internet services)

Estimate Net Impacts

The evaluation team will use an approach for PY7 that adds to the PY6 approach. We will estimate savings using a difference-in-differences (DID) approach, which uses fixed-effects regression analysis of the monthly gas and electric bills of treatment and control group customers, focusing on the savings period from June 2014 through May 2015 (i.e., the PY7 period) compared to usage occurring in the 2013–2014 period. The DID refers to the model's implicit comparison of consumption before and after treatment of both treatment and control group customers. The model includes customer-specific intercepts (i.e., fixed effects) to capture unobserved differences between customers that do not change over time and that affect customers' energy use. We will report savings from two different models to aid comparisons to previous evaluations:

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

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

Model 1: Overall Model

Equation 2-1. 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 (kWh or therms) for household *i* at time *t*

α_i= household-specific intercept

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

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

$Treatment$ = 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. This also improves the precision in the modeled results by modeling to account 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°F for HDD and 75°F for CDD.

Equation 2-2. 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 (kWh or therms) for household *i* at time *t*

α_i= household-specific intercept

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

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

β_3= coefficient for HDD

β_4= coefficient for CDD

$Post$ = 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 HDD (base 65°F)

CDD_{it}= sum of CDD (base 75°F)

ε_{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 comparisons.

Equation 2-3. Post-Only Model Estimating Equation

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

where:

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

α_i= household-specific intercept

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

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

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

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

β_5= vector of coefficients for month-year dummies

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

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

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

$Treatment_i$ = 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

ε_{it} = error

Channeling Analysis

We will calculate a savings adjustment to account for the portion of net savings estimated from the billing analysis that has been claimed by other AIC programs. Savings from the Behavioral Modification Program reflect both non-purchase behavioral changes, such as turning off lights in unoccupied rooms and adjusting thermostat settings, and investments in energy-saving equipment, such as high-efficiency furnaces and CFLs, or other purchase behaviors. Savings from measures that were rebated through AIC's energy efficiency programs appear in both the Behavioral Modification Program and the rebate programs, and thus would be double-counted if an adjustment were not made.

This component 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 PY6. Because channeling adjustments are such a small portion of overall savings, and in some cases are negative, we propose applying PY6 channeling estimates[8] by cohort (to account for the amount of time participants have received reports) to calculate adjusted net impacts.

Process Evaluation

The main objectives of the process evaluation are to understand the program and the changes that may have occurred in PY7, what energy-saving actions participating customers perform, and how participation affects satisfaction and self-efficacy, and to identify high savers, low savers, and negative savers. To address these issues, we will conduct four primary evaluation tasks.

Analysis of Program and Implementation Staff Interviews

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

Survey Analysis

Simple cross-tabs and comparisons of means from the Internet survey described above will help identify the various energy-saving actions taken by participants compared to controls, and will provide context to the energy-savings actions that may drive changes in usage (e.g., lighting, heating, and cooling, including purchase and non-purchase behaviors). We will categorize a list of energy behaviors (purchase and non-purchase) by how often they are included in HER tips. A comparison of HER-relevant behaviors between treatment and control, and a similar comparison of behaviors not usually included in HER tips, will provide insight into whether the changes in behavior experienced by participants are due to the program. In addition, comparing average self-efficacy levels of treatment and controls will tell us whether the reports increase customers' energy-related self-efficacy. Similarly, a comparison of treatments and controls on their average satisfaction with AIC and participants' satisfaction with the program will allow us to gain insight into whether the program increases customer satisfaction.

Multilevel Modeling

The evaluation team will also develop a multilevel model designed to estimate individual savings for each participant. Multilevel modeling allows us to include demographics and household information in the model, in addition to weather. This model will allow us to describe the differences in savings that are related to demographic and household variables and to find participants with low or negative savings, comparing them to those who save more. If there could be significant value added, we may augment impact results by incorporating data collected through Experian or our survey, allowing further differentiation of participants in high and low or negative savings groups. We can discuss this additional scope with AIC as we conduct our analysis.

[8] In PY6, we conducted a DID analysis to estimate the net savings gained by the treatment group in excess of the comparison group (from the pre-treatment period to the post-treatment period), to analyze the savings attributed to other AIC programs and subtract it from the savings estimates based on billing analysis (DID). This analysis captured any double-counting of savings that need to be removed from the billing analysis results.

The individual savings estimates will not exactly sum to the impact estimates from the models in the Impact Evaluation section. We are using the individual savings estimates from the multilevel model as a tool to investigate which households are saving the most energy and how their demographics and household characteristics are related to that savings, not to estimate program impacts.

The evaluation team will use the savings estimates from the multilevel model to assign the participants into high, moderate, low, and negative savings groups for each PY and will describe each group by its demographics and household characteristics. We will investigate whether participants tend to stay in the same group from year to year or move into a higher or lower savings group. This year-to -year comparison will help us understand whether participants are taking further energy-savings actions as they continue to receive HERs.

Equation 2-4. Example Multilevel Model

$$ADC_{it} = \alpha_i + \beta_1 Treatment + \beta_2 HDD_t + \beta_3 CDD_t + \varepsilon_t$$

$$\alpha_i = U_i\gamma + \eta_i$$

where:

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

α_i= household-specific intercept for household *i*

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

β_2= coefficient for HDD

β_3= coefficient for CDD

U_i= vector of demographic and household variables for household *i*

γ= vector of coefficients for demographic and household-specific variables

ε_t= error distributed $N(0, \sigma_t^2)$

η_i= error distributed $N(0, \sigma_\alpha^2)$

2.3.4 Tasks

We plan to perform the following tasks in support of the PY7 evaluation.

Task 1: Review Program Materials and Database

The evaluation team will review the program-tracking database and any available program materials, including the PY7 HERs. We will review these materials to determine if there are any data gaps, as well as to inform our research efforts.

Deliverable: Data request ***Deliverable Date:*** June 2015

Deliverable: Review materials ***Deliverable Date:*** July 2015

Task 2: Program and Implementation Staff Interviews

We will conduct telephone interviews with key program staff from AIC, CSG, and OPower. The purpose of these interviews is to learn about any changes to the program in PY7 and to uncover areas of success and challenges. The interviews will provide a rich source of key insights into the daily workings of the program.

Deliverable: Conducted interviews *Deliverable Date:* June 2015

Task 3: Treatment and Control Group Surveys

The evaluation team will gather data through Internet surveys with customers from the treatment and control groups. Recent research suggests spikes in energy usage shortly after reports are delivered. Recruiting respondents very soon after receiving the most recent reports will capture those actions. Our surveys will be designed to provide context to the energy-savings actions that may drive changes in usage (e.g., lighting, heating, and cooling behaviors; equipment purchases). We will work with AIC and the program implementers to field the survey to coincide with when reports are delivered to each cohort (depending on fuel type and wave). We understand that there will be approximately four HERs delivered per year beginning in PY7. As such, we anticipate conducting two surveys in the PY7 period. We anticipate that these surveys will be collected beginning in late July 2015 and September 2015 (depending on report dates).

Deliverable: Draft and final survey #1 instrument *Deliverable Date:* July 2015

Deliverable: Draft and final survey #2 instrument *Deliverable Date:* August 2015

Deliverable: Survey analysis results *Deliverable Date:* September 2015

Task 4: Equivalency Analysis

For the new Expansion Cohort 5 added to the program in PY7, we will evaluate the equivalency of the treatment and control groups. This analysis will entail statistical comparison of baseline household energy consumption and household characteristics. For this analysis, the evaluation team will purchase customer data—including demographic, household, and psychographic information—and, by reviewing the data, we will be able to understand whether there are any key differences between the treatment group and the control group. If differences do exist, then appropriate adjustments will be made in the billing analysis to account for these differences.

Deliverable: Initial data requests *Deliverable Date:* June 2015

Deliverable: Equivalency analysis results *Deliverable Date:* August 2015

Task 5: Billing Analysis

This task accurately estimates net savings. We will clean data and run the three models specified above within this task. Additionally, we include the process-oriented multilevel effort in this task as it builds from the previously cleaned billing data.

Deliverable: Data request *Deliverable Date:* June 2015

Deliverable: Billing analysis results *Deliverable Date:* September 2015

Task 6: Reporting

The evaluation team will write a draft report of findings for stakeholder review. We will then deliver a final report that incorporates any comments from the review.

Deliverable: Draft report *Deliverable Date:* October 2015

Deliverable: Final report *Deliverable Date:* November 2015

2.3.5 Budget and Schedule

Table 2-8 below outlines the schedule for the Behavioral Modification Program evaluation.

Table 2-10. Behavioral Modification Program PY7 Evaluation Timeline

Task	Evaluation Task	2015							
		May	June	Jul	Aug	Sept	Oct	Nov	Dec
1	Review Program Materials and Database								
2	Program and Implementation Staff Interviews								
3	Treatment and Control Group Surveys								
4	Equivalency Analysis								
5	Billing Analysis								
6	Reporting								

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

The overall budget for the evaluation of the Behavioral Modification Program is $110,800. Table 2-9 below outlines the evaluation budget for each task.

Table 2-11. Behavioral Modification Program PY7 Evaluation Budget

Task No.	Task Description	Deliverable Date	Cost by Task
1	Review Program Materials and Database	June 2015 and July 2015	$1,000
2	Program and Implementation Staff Interviews	May 2015 and June 2015	$800
3	Treatment and Control Group Surveys	July 2015, August 2015, and September 2015	$35,000
4	Equivalency Analysis	June 2015 and August 2015	$9,000
5	Billing Analysis	June 2015 and September 2015	$37,000
6	Reporting	October 2015 and November 2015	$28,000
		Total Cost	**$110,800**

2.4 Residential Home Performance with ENERGY STAR Program

2.4.1 Program Description

The Residential Home Performance with ENERGY STAR Program (HPwES) works with the Midwest Energy Efficiency Alliance (MEEA) and the U.S. Department of Energy to help AIC customers reduce their energy consumption through home diagnostics and home improvements. The program also educates homeowners on cost-effective energy-savings strategies that they can apply throughout their home. Previously, the program included the Electric Space Heating Pilot (ESHP), but, in PY7, this program was moved to the IPA All- Electric Homes Program.

The HPwES program includes two components: in-home audits with the direct install of measures eligible to all residential AIC customers, and incentives for additional energy efficiency opportunities for AIC heating fuel customers. A customer can participate in the program either by receiving an audit from an HPwES Energy Advisor or by contacting a program ally to make shell measure improvements, such as insulation.

For those customers receiving an energy audit, an energy advisor will produce a custom report with a set of recommended energy efficiency improvements. Energy advisors will also provide direct install measures, such as CFLs, faucet aerators, and low-flow shower heads during the home visit. Customers are encouraged to make recommended installations using network program allies. Customers who use program allies are also eligible for the program insulation and air sealing incentives if the measures meet program guidelines and are properly reported. All projects are subject to program quality assurance (QA) inspections.

The expected savings from this program is 2.4% of the overall PY7 portfolio of electric savings and 14.8% of overall PY7 portfolio therm savings (including both residential and commercial).[9] Per the HPwES Program Implementation Plan, AIC estimates that they will perform 2,100 audits in PY7, with 1,500 homes receiving retrofits.

2.4.2 Research Objectives

The objective of the PY7 evaluation is to provide estimates of gross and net electric and gas savings associated with the program. We will determine gross savings from the program by conducting an engineering analysis of the program-tracking database and will calculate net savings using the NTGR from PY6. This task is designed to answer the following impact-related research questions:

1. What are the estimated gross energy and demand savings from this program?
2. What are the estimated net energy and demand savings from this program?

Based on the PY6 evaluation results and the objectives noted by program staff, the evaluation team will conduct process research on trade ally satisfaction and customer conversions from audits to retrofits. To help carry out this research, the evaluation team will conduct program manager interviews, administer a program ally survey, and develop a predictive model to estimate the likelihood of program participant

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

conversion from audit to retrofits projects. These tasks help answer the following process-related research questions:

1. 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 PY7 and how were they overcome?
2. Program Ally Experience and Satisfaction
    a. What barriers to entry did potential program allies face?
    b. What challenges did program allies face as part of their participation in the program?
    c. Were program allies satisfied with the program implementation?
    d. What factors would help improve program ally satisfaction?
    e. Did program allies see potential spillover from the program?
3. Opportunities for Program Improvement
    a. Which of AIC's HPwES program participants are more likely to act on HPwES audit recommendations? Which program participants are least likely to do so?
    b. What customer and demographic characteristics are the best predictors of a program participants' conversion from an HPwES audit to retrofit projects?
    c. What specific barriers prevented AIC HPwES participants from completing retrofit projects?

2.4.3 Methodology

Data Sources

Impact Analysis

The evaluation team will use an engineering analysis to estimate gross and net energy and demand savings for program participants. The impact evaluation team will use savings algorithms from the 2014 Illinois Statewide TRM V3.0 and data inputs from the program-tracking database to estimate ex post gross savings. For net impact estimation, the team will apply the NTGRs developed in the program's PY6 evaluation, as outlined in Table 2-10 below.

Table 2-12. HPwES Program NTGRs for Application in PY7

Measure Category	Electric			Gas		
	Free-Ridership	Spillover	NTGR	Free-Ridership	Spillover	NTGR
CFLs	0.12	0.09	0.97	–	0.025	–
Faucet Aerator	0.23		0.86	0.28		0.75
Shower Head	0.04		1.05	0.21		0.82
Air Sealing	0.21		0.88	0.20		0.83
Insulation	0.21		0.88	0.23		0.80

Thermostat	–		–	0.13		0.90

Data sources for the PY7 impact evaluation include:

- Program-tracking databases and ex ante savings for PY7 participants
- 2014 Illinois Statewide TRM V3.0

Process Analysis

The process analysis will leverage data from four different data collection methods: a review of program materials, in-depth interviews with program and implementation staff, a survey with program allies, and a review of historical program data and secondary data. The evaluation team will use historical program data as well as secondary data as inputs to a predictive model to understand customer conversion rates.

Data sources for the PY7 process evaluation include:

- Program materials, including implementation plans and marketing materials
- Information on key program efforts and dates gathered through stakeholder interviews
- Program-tracking databases from PY3 through PY7
- Participating program ally data and contact information
- Secondary data sources (housing stock characteristics, census data, etc.) to the extent available

Sampling Plan

The program ally survey is the only survey the evaluation team will field for PY7. Because of the relatively small number of program allies in the HPwES Program (approximately 60), we will attempt to contact all program allies (i.e., perform a census attempt) for this survey effort.

Analysis Plan

The PY7 evaluation will build on previous evaluation activities for this program. Specifically, the evaluation team will apply PY6 NTGRs to assess net savings. In previous years, the process evaluation work consisted of a participant survey and review of the program documents and processes. The evaluation team will incorporate aspects of previous evaluations, including survey questions and analysis frameworks where appropriate.

Gross and Net Impacts

The impact evaluation team will use savings algorithms from the 2014 Illinois Statewide TRM V3.0 and data inputs from the program-tracking database to estimate ex post gross savings. The evaluation team will report savings by energy source, both electricity and gas. We will review program records to determine the fuel type of each participant and the gas or electric incentives available per measure to allocate energy savings appropriately for each program by participant type.

To determine net savings, the evaluation team will apply the PY6 NTGRs to ex post gross savings. Our team developed NTGRs based on responses from the participant survey conducted in PY6.

Process Findings

The main objectives of the process evaluation are to assess the effectiveness of program design and implementation, detail program ally experience and satisfaction, and identify opportunities for program improvement.

To assess the effectiveness of program design and implementation, the evaluation team will conduct program and implementation staff interviews and review all relevant program data and materials. This effort will help explore program changes, successes, and challenges, and identify potential areas for program improvement.

To examine program ally experience and satisfaction with the program, the evaluation team will develop and administer a program ally survey to explore barriers to program ally participation in the program, satisfaction with program components (including incentive levels, training, and the scheduling process), and any challenges faced. The evaluation team will also include a battery of questions on potential program spillover.

To help identify opportunities for program improvement, the evaluation team will develop a predictive model using both historical program participation data and secondary data sources to identify what customer and demographic characteristics are the best predictors of a program participant's conversion from an HPwES audit to a retrofit project.

2.4.4 Tasks

To answer our research questions, we will complete the following tasks as part of the PY7 evaluation.

Task 1: Program Material Review

The evaluation team will review program materials, including program design, implementation plans, marketing and outreach efforts, and program databases, to assess program implementation and provide recommendations for improvement, where applicable. We will also review the program-tracking database to assess program participation as an input to the impact evaluation and our predictive analytics research.

Deliverable: Data request *Deliverable Date:* June 2015

Task 2: Program and Implementation Staff Interviews

We will conduct interviews with the AIC program managers and CSG implementation staff in PY7 to understand changes to program design, implementation, and evaluation priorities. We anticipate conducting two interviews.

Deliverable: Conducted interviews *Deliverable Date:* June 2015

Task 3: Program Ally Survey

The evaluation team will conduct a survey with program allies to establish their barriers to participation, their satisfaction with the program, and potential spillover effects. The evaluation team will present these findings to AIC in the draft and final report.

Deliverable: Draft and final trade ally survey *Deliverable Date:* July 2015

Task 4: Predictive Analytics Research

The evaluation team will develop a predictive model to analyze program participation data from PY3 to PY7. This model will identify the customer and demographic characteristics that best predict conversions from audits to retrofits. We will develop our predictive model using a Random Forests prediction algorithm. Random Forests is a machine-learning algorithm based on classification and regression trees (CART) and it is typically used to solve binary classification problems.

A binary classification problem is one where a researcher must determine whether an observation belongs to one group or another based on whatever observable information is available. The CART algorithm solves the binary classification problem by repeatedly partitioning data (in the form of a decision tree) in a way that minimizes the likelihood of misclassification error in the outcome variable. In other words, the CART algorithm continually subsets the data (using a decision tree) until it identifies parameter values that maximize the chances for correct classification. As part of this modeling process, CART identifies the predictor variables that yield the largest decrease in the error rate.

The Random Forests prediction algorithm generalizes the idea of a single decision tree (i.e., CART) into a collection of trees (i.e., a forest). The Random Forests algorithm estimates each tree in the forest as described in the section above, and it classifies observations by holding a vote over all trees. More specifically, the Random Forests algorithm performs the following steps:

Overview of Random Forests Prediction Algorithm

1. Specify the total number of trees to build (N).
2. For each N_i, i=1,...,N:
    a. Draw a bootstrapped sample from the observations, leaving a random subset of observations out of the bootstrapped sample ("out-of-bag" sample)
    b. Grow decision tree by partitioning data until obtaining the optimal model parameters and use model to classify observations
3. Output ensemble of trees (i.e., produce all trees from Step 2)
4. Predict or classify "out-of-bag" observations (i.e., observations not used to develop the model) by:
    a. Counting the number of times (over trees) that each case is classified in each group
    b. Use majority voting rule to determine final classification

The Random Forests algorithm provides several important advantages compared to other prediction algorithms, including CART. First, this algorithm includes a measure of accuracy built directly into the algorithm. By predicting new observations using the "out-of-bag" observations, the Random Forests algorithm tests the validity of the model using data not involved in model development. This is an extremely important feature since it prevents from potential model overfitting and model dependency.[10] More generally, by incorporating information from multiple trees (and thus multiple random samples of the data), the Random Forests classifier produces more stable model estimates that are less susceptible to extreme values or missing data.

Deliverable: Draft and final report *Deliverable Date:* September–October 2015

[10] Overfitting is a condition where a statistical model describes random error and not the underlying relationship within the data.

Task 5: Impact Analysis

We will determine gross impacts by reviewing the program database and applying algorithms from the Statewide TRM V3.0 to all projects. To estimate net savings, we will apply the PY6 NTGRs to the adjusted gross savings.

Deliverable: Draft and final report *Deliverable Date:* September–October 2015

Task 6: Reporting

We will summarize data from the PY7 evaluation activities in a report that we will deliver in fall 2015.

Deliverable: Draft report *Deliverable Date:* September 2015

Deliverable: Final report *Deliverable Date:* October 2015

2.4.5 Budget and Schedule

The figure below outlines the schedule for the HPwES Program evaluation.

Table 2-13. HPwES Program PY7 Evaluation Timeline

Task	Evaluation Task	2015							
		May	June	July	Aug	Sept	Oct	Nov	Dec
1	Program Material Review								
2	Program and Implementation Staff Interviews								
3	Program Ally Survey								
4	Predictive Analytics Research								
5	Impact Analysis								
6	Reporting								

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

The overall budget for the evaluation of the HPwES program is $82,000. The table below outlines the evaluation budget for each task.

Table 2-14. HPwES Program PY7 Evaluation Budget

Task No.	Task Description	Deliverable Date	Cost by Task
1	Program Material Review	June 2015	$2,000
2	Program and Implementation Staff Interviews	June 2015	$2,000
3	Program Ally Survey	July 2015	$18,000
4	Predictive Analytics Research	September–October 2015	$25,000
5	Impact Analysis	September–October 2015	$10,000
6	Reporting	September–October 2015	$25,000
		Total Cost	**$82,000**

2.5 Residential Appliance Recycling Program

2.5.1 Program Description

With the Residential Appliance Recycling Program (ARP), AIC promotes its electric customers retiring and recycling primary and secondary inefficient refrigerators and freezers. AIC offers a program turn-in incentive and free pickup of working equipment, as well as information and education on the cost of keeping an inefficient unit in operation. The target market for this program is residential electric customers with working refrigerators and freezers that are between 10 and 27 cubic feet in size. In the seventh year of operation, the program has experienced reduced participation in recent years, as the number of secondary refrigerators has been reduced.

The expected savings from this program are 1.8% of the overall PY7 portfolio of electric savings.

2.5.2 Research Objectives

With the PY7 evaluation, the team will answer the following research questions:

1. What are the estimated gross energy and demand impacts from this program?
2. What are the estimated net energy and demand impacts from this program?
3. What are the standard practices of retailer haul-away programs?
4. Were the ARP operational and delivery processes adequately documented? Were program materials up to date to reflect program changes for PY7?
5. Did the program implementation change since PY6? If so, how, why, and was this change advantageous?
6. Did program participation reach saturation within AIC's territory? Were cost-effective marketing options available to increase participation, or should the program marketing goal transition to increasing savings rather than participation?

The PY7 evaluation will build on research we conducted in previous evaluations, and we will apply the Statewide TRM V3.0 regression equation to calculate savings.

2.5.3 Methodology

Data Sources

The team will use the program-tracking database and participant surveys to determine the input values for the Statewide TRM V3.0 gross savings algorithms. The tracking database contains relevant physical characteristics of the appliances recycled through the program, including capacity (in cubic feet), year of manufacture, and unit configuration.

In PY6, survey participants mentioned that, absent the program, they would have had their appliance picked up by a retailer. We applied ComEd-focused research on how specific retailer chains traditionally dispose of these appliances to calculate the ARP NTGR in PY6.[11] This involved applying the retailer-specific[12] free-ridership ratio to appliances that survey respondents indicated would have been picked up by a retailer had they not been recycled.

The ComEd-focused research did not include surveys with some retailers, specific to AIC-only customers. To fill gaps in the retailer-specific free-ridership estimates, we will primarily survey smaller, local retailers specific to AIC customers. We will focus only on those retailers not already represented in the ComEd research, and will adjust the overall retailer NTGR.

We will also interview AIC program staff, the implementer staff, and marketing and program management staff from Leidos (the "implementation contractor") to ask for perspectives on how the program performed in PY7, any challenges in implementing the program, or any upcoming changes to the program design.

Sampling Plan

For PY7, the evaluation team will focus on collecting information from program staff and local retailers. We will interview key program and implementer staff, as well as the program manager at Appliance Recycling Centers of America. We will also interview retailers to assess their actions with replaced units (see Table 2-13).

Table 2-15. ARP Interview Sampling Methods, Sources, and Targets

Data Collection Method	Population Source	Targeted Completes
Retailer Interviews	List of retailers mentioned by participants during PY6 surveys.	4

Analysis Plan

The evaluation team will interview stakeholders about their opinions of how well the program is performing and of opportunities for improvement. We will also review critical program documentation, including marketing materials, implementation plans, program manuals, and any additional materials provided by AIC or Leidos.

Below we outline our analysis plan for determining gross savings and the NTGR.

Verification

We will apply a verification rate based on self-report responses from the PY6 participant surveys (100%), combined with a review of the program-tracking data and the percentage of appliances picked up that meet the program requirements.

[11] http://ilsagfiles.org/SAG_files/Evaluation_Documents/ComEd/ComEd%20EPY6%20Evaluation%20Reports/ComEd_PY6_Fridge_Freezer_Recycle_Rewards_Evaluation_Report_2015-03-24_Final.pdf.

[12] The team asked survey participants if they replaced their appliance, then asked which retailer they bought their replacement appliance from.

Gross Savings

In PY7, the evaluation team will determine the gross ARP impacts by multiplying the sample-based verification rate for each measure (determined by assessing PY7 program-tracking data and PY6 participant survey responses) by the unit savings estimated through applying the Statewide TRM V3.0 algorithm.

Net Savings

To determine net savings, the evaluation team will use the SAG agreed-upon NTGRs for PY7, as shown in Table 2-14.

Table 2-16. ARP NTGRs for PY7

Measure	Free-Ridership	Participant Spillover	NTGR
Refrigerator	47%	3%	0.56
Freezer	39%	1%	0.62

2.5.4 Tasks

Task 1: Request and Review Data from Utility

The team will conduct a comprehensive review of all program materials and tracking data. This includes program marketing and implementation plans, as well as the program-tracking database. We will request program materials in June 2015, for planning and to inform program staff interviews. We will make subsequent requests in August 2015, to obtain the final program-tracking database.

We will rely on participant data from the tracking database that includes contact information and relevant data for estimating gross savings using the Statewide TRM V3.0 algorithm. The tracking data also contain measure data, including the ex ante savings and incentives.

We will also request program materials, including marketing materials and information regarding the program process. We will use these materials to inform our design of interview instruments.

Deliverable: Data requests *Deliverable Date:* June 2015 and August 2015

Task 2: Program and Implementation Staff Interviews

The evaluation team will interview stakeholders, including program managers, implementers, and Appliance Recycling Centers of America staff. We will focus these interviews on changes in the program design or marketing strategy since PY6; specific marketing tactics and perceived results; how well the program is performing; and how the transition to Leidos has affected the program, if at all. These interviews will also provide stakeholders with an opportunity to ensure that the team has an up-to-date understanding of how the program operated in PY7.

Deliverable: Conducted interviews *Deliverable Date:* June 2015

Task 3: Retailer Interviews

To establish the baseline market conditions prior to any intervention by the program, the evaluation team will research how the retail haul-away market operates without any utility intervention. We will determine the general processes retailers follow when they remove appliances from customer homes in the absence of any utility interventions.

The evaluation team will review the most recent available research and interview local appliance retailers in AIC's service territory to determine the likely fate of appliances that participants say would have been picked up by a retailer absent the program. We will then use this information to inform the NTGR analysis for those units. We will combine this analysis with the ComEd-focused retailer research and with our AIC PY6 participant survey results to inform the PY7 NTGR.

Deliverable: Draft and final retailer interview guides *Deliverable Date:* July 2015

Task 4: Impact Analysis

The evaluation team will analyze program-tracking data and PY6 survey data to estimate PY7 gross savings.

Deliverable: Provide analysis in final report *Deliverable Date:* September–October 2015

Task 5: Reporting

The evaluation team will write a draft report of findings for stakeholders' review. We will then deliver a final report that incorporates updates from those reviews.

Deliverable: Draft report *Deliverable Date:* September 2015

Deliverable: Final report *Deliverable Date:* October 2015

2.5.5 Budget and Schedule

Table 2-15 outlines the schedule for the ARP Program evaluation.

Table 2-17. ARP PY7 Evaluation Timeline

Task	Evaluation Activity	2015							
		May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	Request and Review Data from Utility								
2	Program and Implementation Staff Interviews								
3	Retailer Interviews								
4	Impact Analysis								
5	Reporting								

Data Request
Create Data Collection Instruments
Collect Data
Analyze Data

Milestone Deliverables

Table 2-16 outlines the PY7 ARP evaluation budget by task, for a total of $47,000.

Table 2-18. ARP PY7 Evaluation Budget

Task No.	Task Description	Deliverable Date	Cost by Task
1	Request and Review Data from Utility	June 2015 and August 2015	$1,000
2	Program and Implementation Staff Interviews	June 2015	$1,000
3	Retailer Interviews	July 2015	$17,000
4	Impact Analysis	September–October 2015	$8,000
5	Report Results	September/October 2015	$20,000
		Total Cost	**$47,000**

2.6 Residential Multifamily Program

2.6.1 Program Description

The Residential Multifamily Program offers incentives and services that enable energy savings and lower operating costs in market rate multifamily housing. The program consists of three components[13]:

- **Direct install measures:** The program offers CFLs, shower heads, faucet aerators, and programmable thermostats in tenant units and common areas. The implementation contractor determines the number of measures installed based on the available opportunities at the property, and the measures are provided free of charge.
- **Common areas:** Within the 8-103/8-014 Multifamily Program, this component offers fixture replacements and T-8 retrofits in common areas of multifamily buildings. During PY7, the common area lighting component included the replacement of incandescent or halogen lamps with CFLs. The IPA program covered all other common area lighting measures.
- **Major measures:** This component of the program offers insulation and air sealing to customers with gas heating.

Program delivery varies based on the component, but, overall, involves a hybrid approach that leverages program implementation staff from CSG and program allies in outreach to customers, as well as measure installation. In particular, CSG account managers market the program to prospective participants, and conduct walk-through audits to assess the potential for direct install and common area measures. While CSG field staff play a key role in installing direct install measures in tenant units (except thermostats) and CFLs in common areas, program allies play the central role in the delivery of the major measures component: They identify project leads, perform walk-through audits, and install the program measures.

The expected savings from this program are 2.4% of the overall PY7 portfolio's electric savings and 2.2% of the portfolio's gas savings.

2.6.2 Research Objectives

The objective of the PY7 Multifamily Program evaluation is to provide estimates of gross and net electric and gas savings associated with the program. In particular, the PY7 impact evaluation will answer the following questions:

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

The evaluation team will also explore a number of market and process-related research questions as part of the PY7 evaluation. These questions are aimed at exploring key changes to the program from PY6 to PY7, as well as the remaining market potential for the program in future years.

1. Program Participation

[13] There is also a Multifamily Program offered through the IPA. It focuses on common areas and major measures (see the IPA Plan).

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

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

c. How many customers participated in more than one component?

2. Program Design and Implementation

d. Did the program as implemented change compared to PY6? If so, how, why, and was this an advantageous change?

e. What implementation challenges occurred in PY7, and how did the program overcome them?

3. Opportunities for Program Improvement

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

4. Market Characterization

a. What is the size of the multifamily market in the AIC service territory?

b. What are the characteristics of multifamily buildings in the AIC service territory?

c. How do property managers and owners make decisions about building improvements?

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

2.6.3 Methodology

Below we provide a summary of the methods planned for the PY7 Multifamily Program evaluation.

Data Sources

Impact Analysis

The team will estimate ex post gross impacts by reviewing program-tracking data and confirming correct application of the Illinois Statewide TRM V3.0. For ex post net impacts, we plan to apply the NTGR from PY5 and PY6 evaluations to calculate PY7 net impacts. Table 2-17 shows the NTGR for PY7 by component.

Table 2-19. PY7 Multifamily Program NTGR by Component

Component	Measure	Electric NTGR			Gas NTGR		
		Free-Ridership	Participant Spillover	NTGR	Free-Ridership	Participant Spillover	NTGR
Common Area Lighting	All measures	0.23	0.06	0.83	N/A	N/A	N/A
In-Unit	CFLs	0.11	0.06	0.95	N/A	N/A	N/A
	Programmable Thermostats	0.02	0.06	1.04	0.02	0.00	0.98
	Faucet Aerators	0.00	0.06	1.06	0.00	0.00	1.00

	Low-Flow Shower Heads	0.06	0.06	1.00	0.06	0.00	0.94
Major Measures	Insulation	0.12	0.00	0.88	0.25	0.00	0.75
	Air Sealing	0.04	0.00	0.96	0.19	0.00	0.81

Market Characterization

The market characterization will draw on data from a number of primary and secondary data sources. In terms of secondary data, the evaluation team will draw on AIC customer data, as well as publicly available information related to housing types and installed equipment, such as the following:

- **The American Housing Survey (2013):** This survey provides data on units, stories, year built, HVAC equipment, fuel type, appliances, and other demographics.
- **The American Community Survey (2009–2013):** This survey provides data about the number of units per multifamily structure, year built, housing tenure, and socio-demographic data on occupants.
- **The Residential Energy Consumption Survey (2009):** This survey provides housing characteristics, including information on fuel type, structural and geographic characteristics, appliances, air conditioning, and space and water heating.

The team will also gather primary data through quantitative surveys with participating and non-participating property managers and in-depth interviews with participating program allies. The data from these sources will provide valuable information on the services sought and provided to multifamily buildings in the AIC service territory, as well as on the decision-making process and key decision makers.

Process Analysis

The process analysis will utilize data from two data collection methods: a review of program data and in-depth interviews with program staff. In-depth interviews with AIC and CSG implementation staff will provide the evaluation team with a comprehensive understanding of the program.

Sampling Plan

Participating Property Manager/Owner Survey

We will conduct a telephone survey with property managers who participated in the Multifamily Program. For this task, we will attempt to survey a census of participating property managers based on our knowledge of past participation, as shown in Table 2-18.

Table 2-20. Property Manager Survey Sampling Plan

Component	PY6 Property Manager/ Owner Count[a]	Sampling Approach
In-Unit	190	Census
Common Area Lighting	79	Census
Major Measures	3	Census

[a] Individual property managers/owners may participate in multiple components.

Non-Participating Property Manager/Owner Survey

The team also plans to speak with property managers and owners who have not participated in AIC's Multifamily Program. Overall, we anticipate conducting up to 50 interviews from a list created from AIC's commercial customers, as well as discussions with CSG about property managers in the AIC service territory. However, we will explore the sources of property manager and owner names and contact information and provide AIC and ICC staff with a detailed memo outlining our sampling approach for this survey effort.

Process Analysis

We do not anticipate conducting any sampling for the staff in-depth.

Analysis Plan

The PY7 evaluation will include a gross and net impact evaluation, as well as a market characterization for the Multifamily Program. We outline our analysis plan for key evaluation activities below.

Gross and Net Impacts

To determine gross impacts associated with the Multifamily Program, we plan to conduct a review of the program-tracking database to ensure the accurate application of the Statewide TRM V3.0. We plan to apply the NTGR from PY5 and PY6 evaluations to calculate net impacts.

Market Characterization

We will base the Multifamily Program market characterization on a review and analysis of AIC customer data, publicly available national studies, and surveys with participating and non-participating property managers and owners. In addition, we may leverage interviews with participating program allies. We will present the analysis of AIC customer data, other secondary data sources, and survey data using descriptive statistics. Depending on the available data, we may also provide maps of key data using GIS.

Process Evaluation

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

2.6.4 Tasks

This section outlines the planned tasks for our PY7 evaluation of the Multifamily Program.

Task 1: Program and Implementation Staff Interviews

We will conduct interviews with AIC and CSG staff to understand the Multifamily Program design and implementation in PY7. In total, we expect to complete two interviews, one with the AIC program manager and one with the CSG program manager.

Deliverable: Conducted interviews *Deliverable Date:* May 2015

Task 2: Review Program-Tracking Data and Materials

The team will conduct a comprehensive review of all program materials and tracking data. This includes program marketing and implementation plans, customer and program ally communications, and extracts from the program-tracking database. We will review all program materials to document the design and implementation of the PY7 program.

Deliverable: Data request *Deliverable Date:* June 2015

Task 3: Secondary Data Review and Analysis

We will review the AIC customer database, as well as publicly available data from the American Housing Survey, the American Community Survey, and the Residential Energy Consumption Survey, to assess the size and characteristics of the multifamily market in the AIC service territory.

Deliverable: Results provided in annual report *Deliverable Date:* September 2015

Task 4: Participating Property Manager/Owner Survey

We plan to complete approximately 40 interviews with participating multifamily property managers/owners in AIC's service territory. The interviews will explore the property managers'/owners' decision-making process related to performing energy efficiency upgrades, the barriers to performing these upgrades, and barriers to participating in AIC's Multifamily Program.

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

Task 5: Non-Participating Property Manager/Owner Survey

We plan to complete up to 50 interviews with non-participating multifamily property managers/owners in AIC's service territory. The interviews will gather information similar to that collected from participating property managers and owners (i.e., the decision-making process and barriers to participation).

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

Task 6: Impact Analysis

The team will use the Statewide TRM V3.0 to calculate ex post gross savings associated with the measures installed through the program in PY7. For net impacts, we will apply the NTGRs listed in Table 2-17. We anticipate conducting this analysis in July and August 2015, depending on when the final program-tracking data become available.

Deliverable: Results provided in annual report *Deliverable Date:* September 2015

Task 7: Reporting

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

Deliverable: Draft report *Deliverable Date:* September 2015

Deliverable: Final report *Deliverable Date:* October 2015

2.6.5 Budget and Schedule

Table 2-19 and Table 2-20 summarize the timing of each evaluation activity, as well as the budget associated with each task.

Table 2-21. Multifamily Program PY7 Evaluation Timeline

Task	Evaluation Activity	2015								
		Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	Program and Implementation Staff Interviews									
2	Review Program-Tracking Data and Materials									
3	Secondary Data Review and Analysis									
4	Participating Property Manager/Owner Survey									
5	Non-Participating Property Manager/Owner Survey									
6	Impact Analysis									
7	Reporting									

Data Request
Create Data Collection Instruments
Collect Data
Analyze
Milestone Deliverables

Table 2-22. Multifamily Program PY7 Evaluation Budget

Task No.	Task Description	Deliverable Date	Cost by Task
1	Program and Implementation Staff Interviews	May 2015	$1,500
2	Review Program-Tracking Data and Materials	June 2015	$2,500
3	Secondary Data Review and Analysis	September 2015	$11,000
4	Participating Property Manager/Owner Survey	June 2015	$12,000
5	Non-Participating Property Manager/Owner Survey	June 2015	$12,000
6	Impact Analysis	September 2015	$9,000
7	Reporting	September/October 2015	$12,000
		Total Cost	**$60,000**

2.7 Residential Moderate Income Program

2.7.1 Program Description

The Residential Moderate Income Program is a home diagnostic and whole-house retrofit program that focuses on serving AIC customers who do not qualify for low-income weatherization assistance and cannot afford to pay market prices for energy efficiency retrofit improvements to their homes. The target market is existing homes heated by an AIC fuel source (electricity or natural gas) and owned by customers with a household income up to 300% of the federal poverty level guidelines for household size. In previous years, customers were directed to the program via general outreach/direct mail from the Energy Assistance Foundation (EAF), a non-profit organization funded through donations by AIC employees and customers. Starting in PY7, customers can access the program through two additional channels: customers can apply to the program directly through a program ally or they can be directed to the program through an HPwES audit referral.

CSG implements the Moderate Income Program. It includes a no-cost energy audit and the direct installation of measures at the time of the audit. These measures include CFLs and/or water conservation savings measures. As part of the participation process, homeowners receive a custom report with a work order of recommended energy efficiency improvements that they are encouraged to install. Homeowners meet with a program ally to develop the scope of the work to be performed for their home and, upon approval by AIC, the improvements are installed.

The program requires customers to pay only a portion of the overall project cost, with AIC covering the remainder of project costs after program incentives are applied. In PY7, AIC introduced an On-Bill Financing program to help customers cover their portion of the project costs. The program also conducts general outreach to customers and educates them on AIC's existing suite of residential programs.

The expected savings from this program is 0.5% of the overall PY7 portfolio of electric savings and 4.2% of PY7 portfolio therm savings (including both residential and commercial).[14] Per the Moderate Income Program Implementation Plan, AIC estimates that they will perform 735 home audits in PY7, with 439 homes receiving retrofits.

2.7.2 Research Objectives

The objective of the PY7 evaluation is to provide estimates of gross and net electric and gas savings associated with the program. We will determine gross savings attributable to the program by conducting an engineering analysis of the program-tracking database and calculate net savings using the agreed NTGR of 1.0. This task answers the following impact-related research questions:

1. What are the estimated program gross energy and demand savings from this program?
2. What are the estimated program net energy and demand savings from this program?

Based on the PY6 evaluation results and the objectives noted by program staff, the evaluation team will conduct process research on program ally satisfaction and identify opportunities for improvements to

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

program design and implementation. To help carry out this research, the evaluation team will conduct program manager interviews and administer a program ally survey (in conjunction with the HPwES Program evaluation). These tasks answer the following process-related research questions:

1. Program Design and Implementation Effectiveness
    a. Was the program implemented according to design?
    b. What implementation challenges occurred in PY7 and how were they overcome?
    c. Are there opportunities for program improvement?
2. Program Ally Experience and Satisfaction
    a. What barriers to entry did potential program allies face?
    b. What challenges did program allies face as part of their participation in the program?
    c. Were program allies satisfied with the program implementation?
    d. What factors would help improve program ally satisfaction?

2.7.3 Methodology

Data Sources

Impact Analysis

The evaluation team will use an engineering analysis to estimate gross and net energy and demand savings for program participants. The impact evaluation team will use savings algorithms from the 2014 Illinois Statewide TRM V3.0 and data inputs from the program-tracking database to estimate ex post gross savings. The evaluation team will not perform a NTGR analysis for this program; rather, we will apply an agreed-on NTGR of 1.0.

Data sources for the PY7 impact evaluation include:

- Program-tracking databases and ex ante savings for PY7 participants
- 2014 Illinois Statewide TRM V3.0

Process Analysis

The process analysis will leverage data from three different data collection methods: a review of program materials, in-depth interviews with program and implementation staff, and a survey with program allies.

Data sources for the PY7 process evaluation include:

- Program materials, including implementation plans and marketing materials
- Information on key program efforts and dates gathered through stakeholder interviews
- Participating program ally data and contact information

Sampling Plan

The program ally survey is the only survey the evaluation team will field for PY7. Because of the relatively small number of program allies in the Moderate Income Program (approximately 60), we will attempt to contact all program allies (i.e., perform a census attempt) for this survey effort. Please note that the evaluation team will field this survey in conjunction with the HPwES evaluation.

Analysis Plan

The PY7 evaluation will build on previous evaluation activities for this program. In previous years, the process evaluation work consisted of a participant survey and a review of the program documents and processes. The evaluation team will incorporate aspects of previous evaluations, including survey questions and analysis frameworks where appropriate.

Gross and Net Impacts

The impact evaluation efforts will estimate gross impact savings for Moderate Income Program participants by applying savings algorithms from the 2014 Illinois Statewide TRM V3.0 to the information in the program-tracking database. The evaluation team will not perform a NTGR analysis for this program; rather, we will apply an agreed-on NTGR of 1.0, given our understanding of program design and targeted customers. This approach is the result of discussions between AIC, ICC staff, and the evaluation team.

Process Findings

The main objectives of the process evaluation are to assess the effectiveness of program design and implementation, detail trade ally experience and satisfaction, and identify opportunities for program improvement.

To assess the effectiveness of program design and implementation and identify opportunities for improvement, the evaluation team will conduct program and implementation staff interviews and review all relevant program data and materials. This effort will help explore program changes, successes, and challenges, and identify potential areas for program improvement. Further, to examine program ally experience and satisfaction with the program, the evaluation team will develop and administer a program ally survey to explore barriers to program ally participation in the program, satisfaction with program components (including incentive levels, training, and the scheduling process), and any challenges faced.

2.7.4 Tasks

To answer our research questions, we will complete the following tasks as part of the PY7 evaluation.

Task 1: Program Material Review

The evaluation team will review program materials, including program design, implementation plans, marketing and outreach efforts, and program databases, to assess program implementation and provide recommendations for improvement, where applicable.

Deliverable: Data request *Deliverable Date:* June 2015

Task 2: Program and Implementation Staff Interviews

We will conduct interviews with the AIC program managers and CSG implementation staff in PY7 to understand changes to program design, implementation, and evaluation priorities. We anticipate conducting two interviews.

Deliverable: Conducted interviews *Deliverable Date:* June 2015

Task 3: Program Ally Survey

The evaluation team will conduct a survey with program allies to establish their barriers to participation and satisfaction with the program. The evaluation team will present these findings to AIC in the draft and final report.

Deliverable: Draft and final trade ally survey *Deliverable Date:* July 2015

Task 4: Impact Analysis

The impact evaluation efforts will estimate gross impact savings for Moderate Income Program participants by applying savings algorithms from the Illinois Statewide TRM V3.0 to the information in the program-tracking database. The evaluation team will use a NTGR of 1.0 for the impact analysis.

Deliverable: Results in the draft and final reports *Deliverable Date:* September–October 2015

Task 5: Reporting

We will summarize and report on data from the PY7 evaluation activities in a report that we will deliver in fall 2015.

Deliverable: Draft report *Deliverable Date:* September 2015

Deliverable: Final report *Deliverable Date:* October 2015

2.7.5 Budget and Schedule

The figure below outlines the schedule for the Moderate Income Program evaluation.

Table 2-23. Moderate Income Program PY7 Evaluation Timeline

Task	Evaluation Task	2015							
		May	June	July	Aug	Sept	Oct	Nov	Dec
1	Program Material Review								
2	Program and Implementation Staff Interviews								
3	Program Ally Survey								
4	Impact Analysis								
5	Reporting								

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

The overall budget for the evaluation of the Moderate Income Program is $35,000.

Table 2-24. Moderate Income Program PY7 Evaluation Budget

Task No.	Task Description	Deliverable Date	Cost by Task
1	Program Material Review	June 2015	$2,000
2	Program and Implementation Staff Interviews	June 2015	$2,000
3	Program Ally Survey	July 2015	$3,000
4	Impact Analysis	September–October 2015	$11,000
5	Reporting	September–October 2015	$17,000
		Total Cost	**$35,000**

2.8 Residential ENERGY STAR New Homes Program

2.8.1 Program Description

Through the Residential ENERGY STAR New Homes Program, AIC works with Home Energy Rating System (HERS) raters to target builders with a package of services, including training, technical information, marketing assistance, and incentives for the construction of ENERGY STAR new homes or building homes to a specified minimum HERS rating. The incentive is intended to defray the cost of the required home energy rating. In addition, AIC provides cooperative program marketing support for builders.

Implemented by CSG, the program is targeted to builders of new, single-family and multifamily homes heated with a fuel (natural gas or electricity) that is provided by AIC.

AIC uses a tiered program incentive structure, such that builders may qualify for additional financial incentives by achieving higher levels of efficiency in the new homes that they construct.

The expected savings from this program are 0.4% of the overall PY7 portfolio of electric savings and 0.5% of PY7 portfolio of natural gas savings.

2.8.2 Research Objectives

For the PY7 impact evaluation, the team will answer the following questions:

1. What are the estimated gross energy and demand impacts from this program?
2. What is the appropriate baseline for estimating program savings?
3. What are the estimated net energy and demand impacts from this program?

With the process evaluation, the team will seek to understand program changes, program progress, trade ally interactions, and new home market observations. We will specifically design the process evaluation to answer the following questions:

1. How well did the program perform against its goals and in the context of the Illinois new home market?
2. How did the level of builder participation and engagement change in PY7?
3. What other program changes occurred in PY7? What were the impacts of those changes?
4. How well did program processes work? What opportunities for improvement exist?
5. How did the level of understanding and enforcement of the recently adopted 2012 International Energy Conservation Code (IECC) change since PY6 among market actors, such as building officials?
6. How satisfied were HERS raters with the program? How do HERS raters think the program could be improved?
7. What program changes could AIC make to improve customer or trade ally experiences and generate greater participation or savings?

2.8.3 Methodology

Below we provide a summary of the team's planned evaluation methods for the PY7 New Homes Program.

Data Sources

Impact Analysis

The team will use REM/Rate files to estimate the savings associated with each home. REM/Rate is the software HERS raters use after inspecting a home during construction to create an energy analysis model to estimate the home's energy savings compared to the reference home. For PY7, the team will use REM/Rate to predict savings for these homes, using the reference home of comparison to the code being enforced by jurisdiction (whether IECC 2012 or an earlier code).

The evaluation team will review a random sample of up to 70 files (or the number required to achieve 90% confidence with ±10% precision) to ensure that homes are characterized consistently with information in the tracking database and to verify that predicted savings are reasonable. We will develop sets of baselines based on the information we gather from building official and HERS rater interviews. We will compare these data to the submitted REM/Rate files using the User Defined Reference Home feature in REM/Rate. The team will develop ex post savings based on a realization rate of the reviewed REM/Rate files, applying the SAG agreed-on NTGR of 0.80 to determine PY7 program net impacts.

Process Analysis

For the process analysis, the evaluation team will use data from three collection methods: in-depth interviews with AIC and CSG program staff, interviews with participant HERS raters and building officials in areas of concentrated program activity, and a review of program operational and marketing materials.

Sampling Plan

REM/Rate Review

The team will review the REM/Rate models' inputs to make sure that the homes adhere to program requirements. We will sample up to 70 homes and review the REM/Rate files or, if the overall participation is relatively low, we will sample the number needed to achieve 90% confidence with ±10% precision. We will stratify the sample by HERS rating level to ensure representation at all savings levels.

Market Actor Interviews

In PY6, we interviewed building officials in five jurisdictions in AIC territory. While these conversations generated useful insights, more data points are needed to establish a baseline for the impact evaluation. We plan to survey building officials from 10 additional jurisdictions in PY7, in areas with PY7 program participation, with a sampling plan that targets areas of high program participation.

In addition, we will interview up to five HERS raters to gain their perspectives for our ongoing evaluation.

Table 2-25. New Homes Program Interview Sampling Methods, Sources, and Targets

Data Collection Method	Population Source	Targeted Completes
HERS Rater Interviews	CSG	5
Code Official Interviews	CSG and publicly available data	10

Analysis Plan

For the PY7 evaluation, the team will follow up on findings from earlier evaluations, such as the inconsistent application of the 2012 IECC by jurisdictions with program participation and low builder program awareness.

We will focus the gross impact evaluation on reviewing program records and confirming ex ante savings through a limited engineering review. This will involve reviewing the REM/Rate files for some (or all, depending on the final participation count) of the program homes. The team will seek to assign an accurate energy code baseline to each program home.

The team will conduct a more comprehensive analysis for the PY7 program than in past evaluations. This will allow us to explore the impact and adoption of the 2012 IECC (to establish an appropriate baseline) and to gather feedback from HERS raters, who have not been included in previous evaluation efforts.

Gross Savings

The PY7 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. We will first compare program-tracking data against the HERS raters' home characterizations in the REM/Rate models to verify participation and appropriate incentive levels. Then we will use REM/Rate model-predicted savings to compute the gross program electricity and natural gas energy savings. We will apply average program savings by HERS level to the program population to estimate overall program savings. We will coordinate this evaluation with evaluators of other, similar Illinois utility programs.

Net Savings

To determine net savings, the evaluation team will use the deemed NTGR agreed on by the SAG for PY7, as shown in Table 2-23.

Table 2-26. New Homes Program NTGRs for PY7

Measure	Free-Ridership	Participant Spillover	NTGR
All measures	N/A	N/A	0.80

Process Analysis

The evaluation team will interview HERS raters and building officials who enforce the IECC to explore builder engagement and the enforcement of the 2012 IECC, which was adopted in 2013 and is the program baseline code. The team will also analyze building activity in AIC territory to assess the program market share of residential new construction.

2.8.4 Tasks

This section outlines the team's planned tasks for the PY7 New Homes Program evaluation.

Task 1: Request and Review Data from Utility

The evaluation team will conduct a comprehensive review of all program materials and program-tracking data. This includes program marketing and implementation plans, customer and program ally communications, REM/Rate files, and the program-tracking database. We will make an initial data request in June 2015 and subsequent requests in August 2015 to obtain the final program-tracking database.

Deliverable: New Homes Program data requests *Deliverable Date:* June 2015 and August 2015

Task 2: Program and Implementation Staff Interviews

We will conduct telephone interviews with program managers from both AIC and CSG, exploring such topics as program outreach and implementation processes, the participant database, ex ante savings estimates, and PY7 marketing efforts.

Deliverable: Conducted interviews *Deliverable Date:* June 2015

Task 3: Building Official and HERS Rater Interviews

Evaluation team analysts will conduct telephone interviews with up to 10 building officials who enforce the IECC in areas of high program activity and with up to five HERS raters who support the participating builders. During the interviews, we will cover such topics as the use and enforcement of the 2012 IECC, program satisfaction, program processes, standard market practices, and familiarity with energy-efficient building practices.

Deliverable: Draft and final building official and HERS rater interview guides *Deliverable Date:* July 2015

Task 4: Market Share Assessment

The evaluation team will analyze the market share of new homes participating in the New Homes Program in the AIC service territory during PY7.

Deliverable: Provide analysis in final report *Deliverable Date:* September–October 2015

Task 5: Review REM/Rate Files and Conduct Impact Analysis

We will request a random sample of up to 70 REM/Rate files from AIC to compare to the tracking database. This will allow us to verify participants and ensure that savings are consistent with rating results.

Deliverable: Sample request *Deliverable Date:* August 2015

Deliverable: Provide analysis in final report *Deliverable Date:* September–October 2015

Task 6: Reporting

The team will incorporate the data collection and analysis results into a draft evaluation report for AIC and stakeholder review. We will then incorporate comments into our final report.

Deliverable: Draft report *Deliverable Date:* September 2015

Deliverable: Final report *Deliverable Date:* October 2015

2.8.5 Budget and Schedule

Table 2-27 summarizes the timing of each evaluation activity, and Table 2-28 shows the PY7 budget associated with each New Homes Program task, for a total of $54,000.

Table 2-27. New Homes Program PY7 Evaluation Timeline

Task	Evaluation Activity	2015							
		May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	Request and Review Data from Utility								
2	Program and Implementation Staff Interviews								
3	Building Official and HERS Rater Interviews								
4	Market Share Assessment								
5	Review REM/Rate Files and Conduct Impact Analysis								
6	Reporting								

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

Table 2-28. New Homes Program PY7 Evaluation Budget

Task No.	Task Description	Deliverable Date	Cost by Task
1	Request and Review Data from Utility	June 2015 and August 2015	$1,000
2	Program and Implementation Staff Interviews	June 2015	$2,000
3	Building Official and HERS Rater Interviews	July 2015	$16,000
4	Market Share Assessment	September–October 2015	$2,000
5	Review REM/Rate Files and Conduct Impact Analysis	August 2015 and Sept/Oct 2015	$16,000
6	Reporting	September/October 2015	$17,000
		Total Cost	**$54,000**

2.9 Residential Energy Efficiency School Kits Program

2.9.1 Program Description

The Residential Energy Efficiency Schools Kits (School Kits) Program was implemented for the first time in PY6 as one of five IPA programs. Through the program, AIC distributes kits containing energy-efficient items to eighth-grade students and their families at schools. The program goal is to increase sales and awareness of ENERGY STAR-qualified lighting products, along with other AIC energy efficiency offerings that reduce energy consumption.

AIC uses CSG, Applied Proactive Technologies (APT), and EFI to deliver the program and achieve program energy-savings goals. CSG implements the program, APT develops the curriculum and presents the program to eighth-graders in eligible schools, and EFI mails branded kits and marketing materials directly to students' families. CSG uses web surveys to verify kit item installations and to collect home characteristics.

2.9.2 Research Objectives

The team's objective for the PY7 School Kits Program evaluation will be to provide estimates of program gross and net electric and natural gas savings. We will design the PY7 impact evaluation to answer the following questions:

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

The evaluation team will also conduct a process evaluation to explore how the program performed in its second year, addressing the following process-related questions:

1. Program Participation
    a. How many kits were distributed to participants?
    b. What were the installation rates for each measure?
2. Program Design and Implementation
    a. Did AIC make any program changes since PY6? How have these changes affected program performance or delivery?
    b. What implementation challenges occurred in PY7?
    c. What changes could AIC make to improve program effectiveness?

2.9.3 Methodology

Below we provide a summary of the team's planned methods for the PY7 School Kits Program evaluation.

Data Sources

Impact Analysis

The evaluation team will use the program-tracking database to estimate the PY7 ex post gross savings for the School Kits Program. We will review all data in the program-tracking database and will apply the deemed unit savings values provided in the Statewide TRM V3.0. We will determine electric water heater saturation (to appropriately attribute electric savings to AIC), where possible, based on information in the tracking database, and use this to adjust ex post savings. We will determine net savings using the NTGR agreed on by the SAG for PY7.

Process Analysis

The team will use additional data sources for our process evaluation, including interviews with program management and implementation staff and an examination of program materials and marketing documents.

Analysis Plan

The evaluation team will conduct limited impact and process evaluations of the School Kits Program in PY7 due to the low budget and savings expected from this program. Our analysis plan is outlined below.

Installation Rates

The team will analyze a census of the implementer's school-based surveys to assess measure installation rates (i.e., the numbers of measures received and installed). We will use the resulting installation rates to inform possible TRM updates.

Gross Savings

The team will use the program-tracking database to verify program participation, then will apply the Statewide TRM V3.0 to estimate gross savings.

Net Savings

The evaluation team will use the NTGR agreed on by the SAG for PY7, as shown in Table 2-26, to estimate net savings for the School Kits Program.

Table 2-29. School Kits Program NTGRs for PY7

Measure	Electric NTGR			Natural Gas NTGR		
	Free-Ridership	Participant Spillover	NTGR	Free-Ridership	Participant Spillover	NTGR
CFLs	22%	7.1%	0.85	N/A	N/A	N/A
Shower Heads	13%	7.1%	0.94	13%	7.6%	0.95
Faucet Aerators	6.7%	7.1%	1.00	6.7%	7.6%	1.00
Water Heater Setback	0%	N/A	1.00	0%	7.6%	1.00

Process Analysis

For the process analysis, we will summarize information gathered from the program staff interviews and materials review, and analyze results from the school-based student surveys provided by the implementers.

2.9.4 Tasks

This section describes the team's planned tasks for our PY7 evaluation of the School Kits Program.

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, results of the school-based verification surveys, and all other paperwork. We will request specific data, such as:

- Program-tracking database (all available data)
- Verification and installation rate results from the school-based surveys conducted by implementers
- Specification sheets for each item included in the energy-efficient kits
- Program instructional materials
- All program marketing materials
- Any documentation of implementation processes

Deliverable: School Kits Program data requests *Deliverable Date:* June 2015 and August 2015

Task 2: Program and Implementation Staff Interviews

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

- Program changes since PY6
- Program design versus program implementation

- Program strengths and weaknesses
- Outreach and marketing

Deliverable: Conducted interviews *Deliverable Date:* June 2015

Task 3: Impact Analysis

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

- Analyze tracking database at the end of PY7
- Apply Statewide TRM V3.0 unit savings to verified participation numbers to develop gross savings
- Determine electric water heater saturation where possible, based on information in the tracking database, and use this to adjust ex post savings
- Apply deemed NTGR to calculate net savings

Deliverable: Provide analysis in final report *Deliverable Date:* September–October 2015

Task 4: Reporting

We will summarize and report results from the PY7 evaluation activities in a draft report for AIC and stakeholder review. The team will address comments in the final report.

Deliverable: Draft report *Deliverable Date:* September 2015

Deliverable: Final report *Deliverable Date:* October 2015

2.9.5 Budget and Schedule

Table 2-30 summarizes the timing of each evaluation activity, and Table 2-27 shows the PY7 budget associated with each School Kits Program task, for a total of $14,500.

Table 2-30. School Kits Program PY7 Evaluation Timeline

Task	Evaluation Activity	2015							
		May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	Request and Review Data from Utility								
2	Program and Implementation Staff Interviews								
3	Impact Analysis								
4	Reporting								

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

Table 2-31. School Kits Program PY7 Evaluation Budget

Task No.	Task Description	Deliverable Date	Cost by Task
1	Request and Review Data from Utility	June 2015 and August 2015	$500
2	Program and Implementation Staff Interviews	June 2015	$2,000
3	Impact Analysis	September–October 2015	$5,000
4	Reporting	September/October 2015	$7,000
		Total Cost	**$14,500**

2.10 Commercial and Industrial Standard Program

2.10.1 Program Description

The Commercial and Industrial (C&I) Standard Program (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.[15] Lighting projects have traditionally generated the largest amount of savings within the Standard Program, and early program-tracking data show similar participation and savings levels in PY7. Table 2-28 summarizes program activity through April 14, 2015.

Table 2-32. C&I Standard Program Ex Ante Gross kWh and Therm Savings for Core Program[a]

(As of April 14, 2015)

Projects	Ex Ante kWh Savings	Ex Ante Therm Savings	Percent of Total kWh	Percent of Total Therms
Lighting	34,245,104	–	73%	0%
VFD	9,105,068	–	19%	0%
HVAC	1,696,015	34,355	4%	3%
Leak Survey and Repair	1,210,059	–	3%	0%
Specialty Equipment	970,649	3,535	2%	<1%
Steam Trap	–	1,235,840	0%	97%
Total	**47,226,896**	**1,273,729**	**100%**	**100%**

[a] Total Core Program savings do not include savings for the online store.
Note: Columns may not sum due to rounding.

The program has made changes in PY7 to streamline implementation, including use of the AMPMagic application format for the Standard Lighting Program. This improvement was piloted in the final months of PY5 and was originally planned to be implemented fully in PY6. However, due to high levels of program participation, rollout was delayed until PY7.

According to the PY7 Implementation Plan, the expected savings from this program are 35% of the overall portfolio of electric savings and 16% of overall portfolio therm savings (including both residential and commercial programs).

2.10.2 Research Objectives

This evaluation addresses the program's performance in PY7, which began in June 2014 and ends in May 2015. The objective of the PY7 Standard Program evaluation is to provide estimates of gross and net electric and gas savings associated with the program. We will determine gross savings at the 90% confidence level with a relative precision of 10% or better. In addition, we will assess PY7 changes

[15] The program also includes an online store available to all business customers (DS-2, DS-3, and DS-4) that offers a variety of energy saving products, including CFLs, LEDs, and occupancy sensors, in a convenient and easy-to-use delivery mechanism. The online store accounts for less than 0.5% of the PY7 Standard Program budget and planned savings.

designed to improve the program participation process. In particular, the PY7 impact evaluation will answer the following questions:

1. What are the estimated gross energy and demand impacts from this program?
2. What are the estimated net energy and demand impacts from this program?
3. What is the level of participant free-ridership and spillover (for prospective application)?
4. What is the level of non-participant spillover (for prospective application)?

The evaluation team will also explore a limited number of process-related research questions as part of the PY7 evaluation. These questions are aimed at exploring the impact of changes made from PY6 to PY7, which focused on application design and process improvements.

1. 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?
2. Program Design and Implementation
    a. Did the program as implemented change compared to PY6? If so, how, why, and was this an advantageous change?
    b. What implementation challenges occurred in PY7, 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. How satisfied were participating customers with different aspects of their participation in the program?
    b. How did participants become aware of the program?
4. Non-Participant Awareness and Barriers
    a. What was the level of program awareness and familiarity among key sectors targeted by the program?
    b. What was the level of knowledge of and attitude toward energy efficiency among non-participants?
    c. What were the barriers preventing customers from participating in the program?
5. Lighting Distributor Trends
    a. What was the availability of T-12 linear fluorescent bulbs through local lighting distributors?
    b. Were lighting distributors familiar with the ActOnEnergy C&I programs?

c. Did the program have any effect on their sales and stocking practices of high efficiency lighting?

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

2.10.3 Methodology

Below we provide a summary of the methods planned for the PY7 Standard Program evaluation.

Data Sources

Impact Analysis

The team will estimate ex post gross impacts by reviewing program-tracking data and confirming correct application of the Statewide TRM. We will also utilize a telephone survey of program participants (see description below) to verify installed measure inventory for a sample of projects.

We plan to apply the NTGRs from the PY4 and PY5 evaluations for this program. More specifically, we plan to apply PY4 NTGRs for motor, HVAC, and specialty measures and PY5 values to lighting and steam traps, as shown in Table 2-29 below.[16]

Table 2-33. Standard Program Core NTGR

End Use	Electric NTGR	Gas NTGR
Lighting[a]	0.78	–
HVAC[b]	0.44	0.80
Motor[b]	0.81	–
Specialty[b]	0.83	0.90
Steam Trap[b]	–	0.90

[a] Source: AIC PY5 C&I Standard Report, Table 53
[b] Source: AIC PY4 C&I Standard Report FINAL 2013-03-20, Table 46

As part of this evaluation, we will also develop estimates of free-ridership and participant and non-participant spillover (for prospective application in PY9). These analyses will be based on data collected in the participant and non-participant telephone surveys.

Process Analysis

The process analysis will utilize data from four data sources: a review of program data, in-depth interviews, a participant survey, and a non-participant survey. In-depth interviews with AIC and Leidos implementation staff will provide the evaluation team with a comprehensive understanding of the program. The participant survey will provide insights into such areas as the application process and program satisfaction. The non-participant survey will provide insights into such topics as program awareness and barriers to participation.

[16] The NTGRs are based on primary data collection efforts for the AIC program.

Sampling Plan

Participant Survey

The evaluation team will conduct a quantitative telephone survey with PY7 participants in the Core Program. We will sample projects by ex ante savings in order to meet the 90/10 level of confidence and precision for questions relating to NTG and installation verification. Based on the large number of lighting projects completed in PY7, we will divide the sample frame into lighting and non-lighting components. We will further stratify the lighting sample by ex ante savings, using the Dalenius-Hodges method to determine strata boundaries and the Neyman allocation to determine the optimal allocation of the available interviews to the strata. The purpose of stratifying the sample of lighting projects is to ensure that the sample design is as efficient as possible (i.e., projects under study represent a sufficiently large proportion of lighting savings, so savings-related results are representative of the population at the 90/10 level of confidence and precision with the smallest possible sample size).

The sample unit for the 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 project in a given program year. In addition, given that historically there have been significantly more projects in the Standard Program than in the Custom Program, the team will remove all customers in both frames from the Standard frame and place them in the Custom frame to be able to capture a sufficient number of Custom projects.[17]

We expect to attempt a census of the largest lighting projects and all non-lighting projects and draw a random sample of small and medium-sized lighting projects. Overall, we expect to conduct 180 interviews.

Additionally, the 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.

[17] Given the two-wave approach to Custom Program survey work in PY5, some customers may already have been called about the Custom Program at the time of the Standard Program survey sample development. When developing the Custom sample, we will compare it to the population of Standard projects to ensure that selecting those projects will not adversely affect the Standard sample.

Non-Participant Survey

The evaluation team will conduct a telephone survey with non-participants in the Standard Program. The interviews will explore barriers to participation and program awareness among key sectors targeted by the ActOnEnergy program, as well as questions designed to assess non-participant spillover. To ensure that we achieve a representative sample for potential participants in all AIC C&I programs, ranging from SBDI to retro-commissioning, we will sample non-participants by their rate class and business segment, if available. We plan to conduct a total of 200 interviews in June 2015. If needed, we will conduct site visits with non-participants identified to have high levels of spillover from complex projects that cannot be easily verified over the phone.

Analysis Plan

The evaluation team will conduct gross impact, net impact, and process evaluations for the Standard Program in PY7. We outline our analysis plan for key impact- and process-related evaluation activities below.

Gross Impacts

Prescriptive measures incented through the Core Program during PY7 include lighting, HVAC, VFDs, steam traps, and other measures. In general, where available, we will use the Statewide TRM and program-tracking data to estimate ex post gross impacts. While not expected, if measures are installed during PY7 that are not included in the Statewide TRM, we will perform an engineering analysis for those measures. In particular, we will check to ensure that the correct savings value has been applied for each measure or product type, to verify that the database is providing correct information. We will also assess the database to ensure that project data have been recorded sufficiently and correctly. We will resolve any discrepancies found in the database, and report on findings.

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

As per our contract, we must verify participation each year. For this program, we will verify measure installation through the telephone survey of program participants for a sample of Standard Program projects. To verify the online store program offerings, the evaluation team will review all projects in the program database.

Net Impacts

In terms of net savings, the team will apply NTGRs from PY4 and PY5 for both gas and electric programs, depending on measure type. The team will also conduct new NTGR research as part of the participant and non-participant surveys for prospective application in PY9.

Process Findings

We will present process-related findings based on our analysis of the program materials, databases, participant survey research, and non-participant survey research. We will generally present survey data using descriptive statistics, such as frequency distribution and central tendency.

2.10.4 Tasks

This section outlines the planned tasks for our PY7 evaluation of the Standard Program. Some of the planned data collection activities will overlap with the Custom Program and with the other C&I programs in AIC's portfolio. We will coordinate sampling and data collection across the various C&I programs, as necessary.

Task 1: Review Utility Data

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 program materials in April 2015 for 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 PY7 (June 2015) and then again in August 2015, when the database is typically finalized for the previous program year. Table 2-30 provides a general summary of when we expect to make these requests.

Table 2-34. C&I Standard Program Summary of Expected Data Requests

Items Requested	Timeline
Program Materials	April 2015 and Ongoing
Preliminary Amplify Extract	April 2015
Year-End Amplify Extract	June 2015
Final Amplify Extract	August 2015

As described above, we will use the database as the sample frame for our onsite visit and telephone data collection efforts.

Deliverable: Data requests *Deliverable Date:* Ongoing

Task 2: Program and Implementation Staff Interviews

We conducted interviews with AIC and Leidos program staff in April and May 2015, to understand changes made to the program in PY7 and to discuss the evaluation priorities, if any, of program and implementation staff. The interviews explored the design and implementation of any special promotions or bonus incentive/coupon offers. In total, we completed three interviews.

Deliverable: Conducted interviews *Deliverable Date:* May 2015

Task 3: Core Program Participant Survey

The evaluation team will conduct quantitative telephone interviews with customers who have participated in the program in PY7. These interviews will focus on measure installation, free-ridership and spillover, and a limited number of process questions. The NTGR questions will be used to develop a NTGR value for the Standard Program for application in PY9.

As in previous years, the sample design is chosen to support the gross and net impact analysis. The number of interviews will depend on the level of participation in PY7, but will be sufficiently large to provide 90±10 confidence/precision levels for the verification and NTG values used in the impact analysis. For budgeting purposes, we assume we will conduct 180 interviews.

Deliverable: Draft and final participant survey instrument ***Deliverable Date:*** June 2015

Task 4: Non-Participant Survey

In coordination with the other AIC C&I programs, the evaluation team will conduct quantitative telephone interviews with program non-participants. These interviews will explore barriers to participation, program awareness, and energy efficiency knowledge and attitudes among key sectors targeted by the ActOnEnergy program. Additionally, this effort will quantify non-participant spillover motivated by the program. We plan to conduct a total of 200 interviews.

Deliverable: Draft and final non-participant survey instruments ***Deliverable Date:*** June 2015

Task 5: Lighting Distributor Interviews

The team will conduct in-depth interviews with local lighting distributors to provide insight into the availability of T-12 linear fluorescent bulbs. We will also ask about their familiarity with the ActOnEnergy C&I programs, the effect of the programs on their sales and stocking practices, and trends in the market. We plan to conduct up to 10 distributor interviews.

Deliverable: Interview Guide ***Deliverable Date:*** June 2015

Task 6: Non-Participant Site Visits

We will conduct onsite data collection with non-participants, as needed, to verify savings for spillover identified through the non-participant survey. More specifically, the engineer visiting each site will verify installation of the measures for which the respondent reported program influence and will confirm that the measures, efficiency levels, and quantities are consistent with the information reported in the telephone survey.

Based on the anticipated low level of non-participant spillover, we expect to conduct a maximum of 10 site visits.

Deliverable: Results provided in annual report ***Deliverable Date:*** November 2015

Task 7: Gross Savings Analysis

The team will use the Statewide TRM to calculate ex post gross savings associated with the measures installed through the program. In addition, we will draw on participant survey results to verify the installed measure inventory for a sample of projects.

Deliverable: Results provided in annual report ***Deliverable Date:*** November 2015

Task 8: Net Savings Analysis

For PY7 net savings, the team will apply the PY4 NTGR for motor, HVAC, and specialty equipment and the PY5 NTGR for lighting and steam traps, per the NTG framework. Through the participant and non-participant surveys, the team will also develop new NTGRs for prospective application in PY9.

Deliverable: Results provided in annual report ***Deliverable Date:*** November 2015

Task 9: Reporting

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

Deliverable: Draft report *Deliverable Date:* November 2015

Deliverable: Final report *Deliverable Date:* December 2015

2.10.5 Budget and Schedule

Figure 2-5 and Table 2-31 summarize the timing of each evaluation activity, as well as the budget associated with each task. In total, the PY7 budget for the Standard Program is $140,800.

Table 2-35. C&I Standard Program PY7 Evaluation Timeline

Task	Evaluation Activity	Apr	2015							
			May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	Review Utility Data									
2	Program and Implementation Staff Interviews									
3	Core Program Participant Survey									
4	Non-Participant Survey									
5	Lighting Distributor Interviews									
6	Non-Participant Site Visits									
7	Gross Savings Analysis									
8	Net Savings Analysis									
9	Reporting									

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

Table 2-36. C&I Standard Program PY7 Evaluation Budget

Task No.	Task Description	Deliverable Date	Cost by Task
1	Review Utility Data	Ongoing	$4,700
2	Program and Implementation Staff Interviews	May 2015	$3,500
3	Core Program Participant Survey	June 2015	$22,900
4	Non-Participant Survey	June 2015	$14,000
5	Lighting Distributor Interviews	June 2015	$11,200
6	Non-Participant Site Visits	November 2015	$10,300
7	Gross Savings Analysis	November 2015	$27,100
8	Net Savings Analysis	November 2015	$11,600
9	Reporting	November/December 2015	$35,500
		Total Cost	**$140,800**

2.11 Commercial and Industrial Custom Program

2.11.1 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.

As in prior years, program staff have focused on overcoming barriers to participation in the Custom Program, such as lack of program awareness and the time and effort involved in gaining corporate project approval. The program also continues to provide special program offerings, such as the Competitive Large Incentive Project (CLIP) initiative and Staffing Grants.

Table 2-37. C&I Custom Program Ex Ante Gross kWh and Therm Savings[a]

(As of April 14, 2015)

Projects	Number of Projects	Ex Ante kWh Savings	Ex Ante Therm Savings	Percent of Total kWh	Percent of Total Therms
Custom Incentives (Core Program)	55	13,941,977	287,312	54%	58%
CLIP Incentives	5	7,270,397	203,992	28%	42%
New Construction Lighting	24	4,375,137	–	9%	0%
Total	**84**	**25,587,511**	**491,304**	**100%**	**100%**

[a] This table does not include savings associated with Staffing Grants and the Metering & Monitoring Pilot, which are not yet available.
Note: Columns may not sum due to rounding.

According to the PY7 Implementation Plan, the expected savings from this program are 32,716 MWh and 1,139,309 therms, representing 15% of the overall portfolio of electric savings and 22% of overall portfolio therm savings (including both residential and commercial).

2.11.2 Research Objectives

This evaluation addresses the program's performance in PY7, which began in June 2014 and ends in May 2015. The objective of the PY7 Custom Program evaluation is to provide estimates of gross and net electric and gas savings associated with the program. We will estimate gross savings at the 90% confidence level with a relative precision of 10% or better. In addition, we will assess the performance of special initiatives (such as CLIP and Staffing Grants) designed to improve the participation process and the uptake of the program, as well as participation by customers with new construction lighting projects. We will apply program-level NTGRs from PY5. As in previous evaluations, we will also use interviews with Staffing Grant participants to develop NTGRs for retrospective application to PY7 savings from associated projects. Starting in PY7, we will use a similar methodology to develop project specific NTGRs for CLIP. This section outlines the planned tasks for our PY7 evaluation of the program. In particular, the PY7 evaluation of the Custom Program will focus on the research questions presented below.

The PY7 impact evaluation will answer the following questions:

1. What are the estimated gross energy and demand impacts from this program?
2. What are the estimated net energy and demand impacts from this program?
3. What are the levels of free-ridership and spillover among customers with Staffing Grant and CLIP program participants?

The evaluation team will also investigate several of the Custom Program's special initiatives and program components, including CLIP, the Staffing Grants, and the Strategic Energy Management (SEM) pilot. We will explore a number of process-related research questions outlined below.

1. For the Custom Program's special initiatives (CLIP and Staffing Grants), how many projects were completed? By how many unique customers?
2. Did customer participation meet expectations? If not, how different was it, and why?
3. How did participants become aware of these initiatives and program components?
4. Were participants in the special initiatives (CLIP and Staffing Grants) satisfied with their experiences? What aspects of program design or implementation could AIC change to improve program effectiveness and participant satisfaction?
5. What barriers to participation existed for the special program offerings such as CLIP? How was the program seeking to overcome them?

These questions are based on a review of PY7 program implementation and marketing plans, as well as a check-in interview with program staff at both AIC and Leidos, the program implementer.

2.11.3 Methodology

Below we provide a summary of the methods planned for the PY7 Custom Program evaluation.

Data Sources

Impact Analysis

The team will use an engineering review, engineering modeling, database and hardcopy verification, and onsite measurement and verification (M&V) to estimate PY7 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.

We plan to apply the NTGR of 0.75 for electric and 0.74 for gas from PY5 for this program. We do not plan to perform additional participant NTGR research in PY7, but will include spillover questions in the non-participant survey outlined in the C&I Standard Program evaluation plan.

Process Analysis

The process analysis will utilize data from multiple data collection methods and sources: in-depth interviews with AIC and Leidos program staff, interviews with Staffing Grant participants and CLIP participants, and a review of program implementation and marketing materials. The process analysis in PY7 will be limited and will primarily assess special initiatives and components of the Custom Program, including CLIP and Staffing Grants. We will also conduct secondary research to support the new SEM pilot.

Additionally, coordinating with the evaluations for the other C&I programs, we will conduct non-participant research to explore such topics as program awareness and barriers to participation among key sectors targeted by the ActOnEnergy programs.

Sampling Plan

Site Visits

Similar to prior evaluations, we will conduct 40 site visits with separate samples for gas and electric projects. We expect that this sample size will be sufficient to provide 90±10 precision for our ex post gross impact estimates. We will tailor the scope of each audit to the specific measures installed at the site. We will develop our site visit sample in two waves, using the program-tracking database as a sample frame. The first wave will include projects completed between June 1, 2014 and January 31, 2015. The second wave will include projects completed between February 1, 2015 and May 31, 2015. For each wave, we will stratify the Custom Program projects included in the program-tracking database in terms of ex ante savings, and select approximately 20 projects.

As in prior years, if we determine that our site visit sample size is not sufficient to provide 90±10 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 precision for our impact estimates when combined with our site visit results.

CLIP Interviews

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

Staffing Grant Interviews

As in prior evaluations, we will also use interviews with Staffing Grant participants to focus specifically on the potential spillover from this program offering. We will attempt a census of projects for the Staffing Grant offering.

Non-Participant Survey

The evaluation team will conduct a telephone survey with non-participants in the Custom Program. Interviews will explore barriers to participation and program awareness among key sectors targeted by the ActOnEnergy program, as well as questions designed to assess non-participant spillover. To ensure that we achieve a representative sample for potential participants in all AIC C&I programs, ranging from SBDI to retro-commissioning, we will sample non-participants by their rate class and business segment, if available. We plan to conduct a total of 200 interviews. We plan to conduct the survey in June 2015. If needed, we will conduct site visits with non-participants identified to have high levels of spillover from complex projects that cannot be easily verified over the phone.

Analysis Plan

The PY7 Custom Program evaluation will focus on program impacts and will include an assessment of the processes of special initiatives.

Gross Impacts

Consistent with prior years, the gross impact analysis for the Custom Program in PY7 is based on site-specific M&V results, which we will use to verify measure installation and savings through the Custom Program. The team will develop site-specific M&V plans for each site evaluated with project complexity, savings magnitude, and access to critical parameter measurements in mind. Critical parameters include a combination of those that have a significant impact on the savings and/or have a high level of uncertainty. These plans will provide for internal QA and quality control by senior staff, who are licensed professional engineers. In addition, the team will submit formal M&V plans and reports for 10 of the largest Custom Program projects. No other M&V sites will have a written site-specific plan or report.

Within each of the 10 M&V plans, we will describe the International Performance Measurement and Verification Protocol (IPMVP) approach that we will use to verify the savings estimates. The IPMVP approach is typically chosen based on the type of project that was completed (new construction or replacement), the technology implemented, the level of savings relative to the billed history, and the information provided in the project documentation. For example, Option A, retrofit isolation with parameter measurement, may be used for a specific measure, but if the impacts are significant enough such that results should be apparent on billing data, analysis of billing data (Option C) will also be conducted as a cross-check. Similarly, if Option C, whole-building energy billing analysis, is the primary means of M&V, Option A or B may be used to verify savings from specific measures with a significant impact on the total billed savings.

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

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

Based on the results of our onsite sample, we will calculate the savings-weighted realization rate (total ex post gross savings divided by the total ex ante gross savings). This sample-based realization rate will be

used to adjust the ex ante savings for the population of Custom projects in Amplify. The ratio estimate of *y*, the ex post savings for the population of Custom projects in Amplify, is:

Equation 2-5. Ratio Estimate of Population Total[18]

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

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

For PY7 net savings, the team will apply the PY5 NTGR (0.75 for electric and 0.74 for gas) to all Custom Program projects, except those performed by CLIP participants, for which we will develop project-specific NTGRs. For these participants, the team will conduct NTG interviews to develop NTGRs that will be applied retrospectively in PY7.[19]

Process Findings

We will qualitatively report results from our interviews with program and implementation staff and participants in the CLIP and Staffing Grant parts of the program.

2.11.4 Tasks

This section outlines the planned tasks for our PY7 evaluation of the Custom Program.

Task 1: Review Utility Data

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 Amplify. We requested program materials in April 2015 for planning and onsite 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 PY7 (June 2015) and then again in August 2015, when the database is typically

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

[19] Please note that the Staffing Grant initiative is included under the Custom Program for planning, budgeting, and reporting purposes. However, we recognize that recipients complete a variety of different C&I projects.

finalized for the year. Table 2-33 below provides a general summary of when we expect to make these requests.

Table 2-38. C&I Custom Program Summary of Expected Data Requests

Items Requested	Timeline
Program Materials	April 2015 and Ongoing
Preliminary Amplify Extract	April 2015
Year-End Amplify Extract	June 2015
Final Amplify Extract	August 2015

As previously noted, we will use the Amplify data as the sample frame for our site visit data collection efforts.

Deliverable: Data requests *Deliverable Date:* Ongoing

Task 2: Program and Implementation Staff Interviews

We conducted interviews with AIC and Leidos program staff to understand changes made to the program in PY7, and to discuss the evaluation priorities of program and implementation staff. The interviews explored the design and implementation of special promotions, as well as the performance of CLIP incentives, the SEM Pilot, and Staffing Grant initiatives, among others. In total, we completed three interviews.

Deliverable: Conducted interviews *Deliverable Date:* May 2015

Task 3: CLIP Participant Interviews

We will conduct approximately 15 interviews with PY7 CLIP participants. Analyst staff will conduct the interviews and focus on gathering NTG information for each project. The interviews will also investigate ways that CLIP participants' projects differ from other Custom Program projects, and will explore satisfaction, program processes, and areas for program improvement.

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

Task 4: Non-Participant Survey

The evaluation team will conduct quantitative telephone interviews with program non-participants. These interviews will explore barriers to participation and program awareness among key sectors targeted by the ActOnEnergy program. Additionally, this effort will quantify non-participant spillover motivated by the program.

Deliverable: Draft and final non-participant survey instruments *Deliverable Date:* June 2015

Task 5: Staffing Grant Participant Interviews

The team will conduct interviews with AIC customers who participated in the Staffing Grant initiative. Analyst staff will conduct the interviews, which will focus on gathering information about the net impacts of this effort. We will also ask process-related questions about the initiative, including how participants became aware of the initiative, their level of satisfaction, challenges encountered, and recommendations

for improvement. The total number of interviews will depend on the final number of participants. However, we expect to conduct approximately 10 interviews with participants in this group, and will prioritize those participants with the largest grants.

Deliverable: Draft and final interview guide *Deliverable Date:* June 2015

Task 6: Strategic Energy Management Research

The team will conduct secondary research to support the SEM Pilot, helping AIC understand potential changes in participant behavior and to lay the groundwork for future evaluation efforts.

Deliverable: Memo of findings *Deliverable Date:* September 2015

Task 7: Site Visits

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

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

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

As described in the Methodology section, we will conduct onsite data collection in two waves. The anticipated sample design includes separate samples for gas projects and electric projects in each wave. We expect to stratify projects by energy savings and to attempt to visit a census of the largest projects and a sample of all other projects. Based on data available through April 2015, we expect to conduct up to 40 site visits. We will provide formal M&V plans outlining the onsite approach for 10 sites, likely the largest projects in our sample.

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

Deliverable: M&V plans *Deliverable Date:* June/August 2015

Deliverable: Summary of site visit results *Deliverable Date:* October 2015

Task 8: Reporting

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

Deliverable: Draft report — *Deliverable Date:* November 2015

Deliverable: Final report — *Deliverable Date:* December 2015

2.11.5 Budget and Schedule

Table 2-39 and Table 2-34 summarize the timing of each evaluation activity, as well as the budget associated with each task. In total, the PY7 budget for the Custom Program is $210,400.

Table 2-39. C&I Custom Program PY7 Evaluation Timeline

Task	Evaluation Activity	Apr	2015							
			May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	Review Utility Data									
2	Program and Implementation Staff Interviews									
3	CLIP Participant Interviews									
4	Non-Participant Survey									
5	Staffing Grant Participant Interviews									
6	SEM Research									
7	Site Visits									
9	Reporting									

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

Table 2-40. C&I Custom Program PY7 Evaluation Budget

Task No.	Task Description	Deliverable Date	Cost by Task
1	Review Utility Data	Ongoing	$4,300
2	Program and Implementation Staff Interviews	May 2015	$3,500
3	CLIP Participant Interviews	June 2015	$14,900
4	Non-Participant Survey	June 2015	$13,900
5	Staffing Grant Participant Interviews	June 2015	$10,600
6	SEM Research	September 2015	$14,300
7	Site Visits	June/August 2015 and October 2015	$117,200
8	Reporting	November 2015 and December 2015	$31,700
		Total Cost	**$210,400**

2.12 Commercial and Industrial Retro-Commissioning Program

2.12.1 Program Description

The primary objective of the C&I Retro-Commissioning Program is to implement low-cost and no-cost energy efficiency improvements among business customers using existing equipment. Over time, deferred maintenance and changing operating directives and practices 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:

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

In PY7, the Retro-Commissioning Program served large energy-consuming customers, including large industrial compressed air systems, the health care market segment (hospitals, medical office buildings, and skilled nursing facilities), large commercial office buildings, and industrial refrigeration. In addition, a new grocery store pilot was scheduled to start in late PY7.

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) surveys 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.

The expected savings from this program are 7.7% of the overall PY7 portfolio of electric savings and about 2.6% of the overall PY7 portfolio therm savings (including both residential and commercial).[20]

2.12.2 Research Objectives

The objective of the PY7 Retro-Commissioning Program impact evaluation is to provide estimates of gross and net electric and gas savings associated with the program. The evaluation will answer the following research questions through the PY7 impact evaluation:

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

[20] Note that the percentage of expected savings here and through the plan is calculated based on the AIC Filing dated January 20, 2011, which includes Non-Residential New Construction.

Key areas of inquiry for the process evaluation are as follows:

1. Effectiveness of Program Design and Implementation
    a. Did the program as implemented change compared to PY6? If so, how, why, and was this an advantageous change?
    b. What implementation challenges occurred in PY7, 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?
2. Program Participation
    a. What were the characteristics of participating and non-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? Were any changes in the mix of customers and projects desirable?
    c. What are the characteristics of participating RSPs? How many RSPs actively participated in the compressed air, commercial building, industrial refrigeration, and health care sectors? How many participated in the new grocery pilot?
3. Service Provider Feedback
    a. Did the effectiveness of the program improve over the past several years? What have been the improvements? What were the barriers to participation? What suggestions do RSPs have for program delivery and implementation?
    b. Were RSPs satisfied with the program?
    c. Is the scope of the program still appropriate for the market?
4. Participant Feedback
    a. Are the retro-commissioning reports sufficiently actionable to realize savings? Did the scope of work provided through the program meet the needs of participants?
    b. Were participants satisfied with the program?
    c. Was the AIC marketing adequate? What can AIC and the implementation contractor do to increase program outreach and penetration?
5. Non-Participant Feedback
    a. Why do eligible customers not participate in the Retro-Commissioning Program? What were the barriers to conducting retro-commissioning studies and implementing recommendations? Did the program adequately address these barriers? What types of changes can be made to reduce barriers to participation?

2.12.3 Methodology

Data Sources

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

We will calculate PY7 net savings by applying the PY4 NTGR of 0.95.

PY7 process research will include interviews with key program staff (AIC and implementer Leidos) and service providers and participants.

Sampling Plan

Engineering Analysis

For the impact evaluation, we will sample participants to achieve several goals: a target of 90% confidence and 10% precision, representation of market segments, and the inclusion of a large proportion of program savings. Retro-commissioning projects can have large variability in savings among participants. Sources of variability include the physical size of the participant site, the systems installed, the condition of systems prior to retro-commissioning, the extent of control capabilities, the scope and quality of the retro-commissioning study itself, and the willingness of customers to implement recommendations.

To accommodate this variability, the evaluation team will use a stratified ratio estimation technique, based on anticipated realization rates, to draw the impact sample for engineering analysis. We anticipate stratifying participants into small and large energy savers (or small, medium, and large savers, depending on the program results). 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. To ensure diversity of measures and market sector, we may supplement the impact sample with additional sites.

Onsite Visits

We will also conduct onsite verification with a subsample of the impact sample. The evaluation team will select sites for onsite verification by considering the degree of uncertainty within the supporting files, the magnitude of the project savings, and the prevalence of the measures among program participants. Depending on the status of the grocery pilot, we might also conduct one or two onsite visits to grocery stores to provide the program with early feedback on this new sector.

Participant Interviews

We expect to conduct 10–16 interviews with PY7 participants to provide representative information for the process analysis. Based on participation information from the preliminary database extract we received,

we expect to reach out to all program participants (census attempt) in order to reach our target number of interviews.

RSP Interviews

Based on prior RSP participation, we anticipate completing approximately 10 interviews. Given the small number of participating RSPs in PY7, we expect to reach out to all RSPs (census attempt) in order to complete the target number of interviews.

Non-Participant Survey

The evaluation team will conduct a telephone survey with non-participants in the Retro-Commissioning Program.[21] The interviews will explore barriers to participation and program awareness among key sectors targeted by the program and will include questions designed to assess non-participant spillover. To ensure that we achieve a representative sample for potential participants in all AIC C&I programs, ranging from SBDI to retro-commissioning, we will sample non-participants by their rate class and business segment, if available. We plan to conduct a total of 200 interviews in June 2015. If needed, we will conduct site visits with non-participants identified to have high levels of spillover from complex projects that cannot be easily verified over the phone.

Analysis Plan

Gross Savings

The impact analysis for the PY7 Retro-Commissioning Program will employ a bottom-up approach to estimating gross savings. We will determine realization rates from sampled sites for each impact metric—electric energy (kWh), demand (kW), and gas consumption (therms)—individually at the project level.

We will base the gross impact analysis on site-specific engineering desk reviews and site visits. Based on the results from both activities, we will calculate the gross impact for each site, compare the ex post site-specific impact to the ex ante site-specific impact to create a ratio, and extrapolate these findings to the participant population using the ratio adjustment method for each stratum.[22] For projects in the same sampling stratum, we will roll up savings to stratum-level realization rates for each metric. We will apply stratum-level realization rates to non-sampled projects in the respective stratum and weight overall program realization rates by stratum for each metric.[23]

[21] This survey will be a cross-cutting effort in support of all commercial programs. The budget for this program includes development of questions specific to retro-commissioning and analysis and reporting of results.

[22] Cochran, William. 1977.

[23] ComEd and northern Illinois natural gas utilities use this same methodology for their retro-commissioning programs.

The team will use the following algorithm to extrapolate savings to the program population.

Equation 2-6. Retro-Commissioning Program: Ratio Adjustment Algorithm

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

where:

I_{EP} = the ex post population impact
I_{EA} = the ex ante population impact
I_{EPS} = the ex post impact from the sample
I_{EAS} = the ex ante impact from the sample

Net Savings

We will estimate PY7 net savings by multiplying ex post gross savings by the PY4 NTGR of 0.95. Table 2-35 presents the values from the PY4 evaluation.

Table 2-41. C&I Retro-Commissioning PY7 NTG Values

Program	Free-Ridership	Participant Spillover	Non-Participant Spillover	NTGR
RCx	0.15	0.10	0.01	0.96

Source: PY4 C&I Retro-Commissioning Report.

Program Processes

The process evaluation will draw on quantitative and qualitative data from our various survey efforts. The participant interviews will provide insights into such issues as program satisfaction and usefulness of retro-commissioning reports. The interviews with RSPs will explore perceived program satisfaction, barriers to participation, and changes to business practices. The full set of primary research topics will be developed following our in-depth interviews with program and implementation staff.

Additionally, the survey of non-participants, conducted jointly with the other AIC commercial programs, will explore market characteristics, program awareness, interest in program offerings, and barriers to participation among key sectors targeted by the Retro-Commissioning Program.

Our process analysis will synthesize these data into a cohesive narrative that describes the program strengths and weaknesses according to the perspective of RSPs and participants and that provides recommendations for program improvement.

2.12.4 Tasks

This section outlines the planned tasks for our PY7 evaluation of the Retro-Commissioning Program.

Task 1: Review Program Materials and Tracking Data

The team will review all program materials and tracking data to document the design and implementation of the PY7 program. This includes program marketing and implementation plans, customer and program ally communications, and extracts from the program-tracking database (final data anticipated in May

2015). At this time, the team has received the PY7 implementation and marketing plans, as well as a preliminary database extract. We will continue to communicate with AIC and the implementation contractor about data needs.

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

Deliverable: Data requests *Deliverable Date:* May/July 2015

Task 2: Program and Implementation Staff Interviews

The evaluation team will develop an in-depth interview guide for PY7 that will explore topics relevant to our evaluation objectives. Following review of the program materials, we will prepare and implement the interview instrument in May 2015.

Deliverable: Conducted interviews *Deliverable Date:* June 2015

Task 3: Participant Interviews

The evaluation team will conduct telephone interviews with customers who have participated in the program in PY7. These interviews will focus on process questions, 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 level of participation in PY7, 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 10–16 interviews.

Deliverable: Draft and final participant survey instrument *Deliverable Date:* June 2015

Task 4: RSP Interviews

The evaluation team will develop an in-depth interview guide for PY7 that will explore topics relevant to our evaluation objectives. We will focus on program processes, marketing, and overall satisfaction with the program.

Based on prior RSP participation, we anticipate attempting interviews with a census of participating RSPs and completing approximately 10 interviews.

Deliverable: Draft and final interview guide *Deliverable Date:* July 2015

Task 5: Non-Participant Survey

As part of a joint effort with the C&I Standard, Custom, and SBDI programs, the team will field a survey to non-participating C&I customers to explore awareness of the ActOnEnergy Business Program, understanding of and interest in program offerings, and barriers to participation. Additionally, this effort will quantify non-participant spillover motivated by the program.

Deliverable: Draft and final non-participant survey instruments *Deliverable Date:* June 2015

Task 6: Engineering Review and Site Visits

The evaluation team will establish the final impact sample after the final program-tracking data are received. For each sampled project, we will review detailed project files. The review will include verification of calculation methods and input data and review of implementation records and costs. For a subset of sampled participants, we will conduct onsite verification of measure installation and savings. In some cases, these activities will entail monitoring over several weeks and/or taking other measurements. In other cases, simple visual verification will suffice. We have budgeted for 26 detailed reviews and 5 onsite visits based on sample optimization through stratification, but the achieved level of confidence and precision may not reach our 90%/10% target. Because this program is a small component of the overall portfolio, the fact that we may not reach the 90%/10% confidence and precision here will not adversely affect the overall portfolio precision.

Deliverable: Final analysis in annual report *Deliverable Date:* November 2015

Task 7: Reporting

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

Deliverable: Draft report *Deliverable Date:* November 2015

Deliverable: Final report *Deliverable Date:* December 2015

2.12.5 Budget and Schedule

Below are our schedule and budgets by task for this program.

Table 2-42. Retro-Commissioning Program PY7 Evaluation Timeline

Task	Evaluation Activity	Apr	2015							
			May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	Review Program Materials and Tracking Data									
2	Program and Implementation Staff Interviews									
3	Participant Interviews									
4	RSP Interviews									
5	Non-Participant Survey									
6	Engineering Review and Site Visits									
7	Reporting									

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

Table 2-43. C&I Retro-Commissioning Program PY7 Evaluation Budget

Task No.	Task Description	Deliverable Date	Cost by Task
1	Review Program Materials and Tracking Data	May/July 2015	$3,000
2	Program and Implementation Staff Interviews	June 2015	$3,000
3	Participant Interviews	June 2015	$14,000
4	RSP Interviews	July 2015	$7,000
5	Non-Participant Survey	June 2015	$5,000
6	Engineering Review and Site Visits	November 2015	$53,000
7	Reporting	November/December 2015	$16,000
		Total Cost	**$101,000**

3. Portfolio-Level Evaluation Activities

As part of the PY7 evaluation, the team will perform a number of portfolio-level activities. These tasks are described in detail in the following subsections.

3.1 Statewide Technical Reference Manual

The team will continue its involvement in the Illinois Statewide Technical Reference Manual (TRM) process, including participation in Technical Advisory Committee (TAC) meetings and NTG Methodology Working Group meetings. For the former, this will include participation in weekly calls, as well as reviewing and commenting on TRM update items presented to the TAC. For the latter, this includes participation in bi-monthly and monthly calls with working group members, as well as drafting methodological protocols for inclusion in the TRM.

3.2 Cost-Effectiveness Analysis

As in prior program years, the evaluation team will work with AIC, as needed, to audit the company's cost-effectiveness analysis based on PY7 programs' results. As part of this process, we will first prepare the model inputs, which consist of evaluated program savings as determined through the PY7 evaluation effort. Next, we will review AIC's assumptions for avoided costs, discount rates, measure cost information, administrative costs, and other relevant data. Below we present a discussion of the Total Resource Cost (TRC) test used by AIC.

Total Resource Cost Test

To assess cost-effectiveness, the team will begin with a valuation of each program's net total resource benefits, as measured by: (1) the avoided electric costs, (2) the total incremental costs of measures installed, and (3) administrative costs associated with the program. A program is cost-effective if its net total resource benefits are positive:

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

where:

$$\textit{Total Resource Benefits} = \text{PV}\left(\sum_{\text{year}=1}^{\text{measure life}}\left(\sum_{i}^{i=8760}\left(\text{impact}_i \times \text{avoided cost}_i\right)\right)\right)$$

and

$$\text{Total Resource Cost} = \text{PV}\left(\text{Incremental Measure Costs} + \text{Utility Costs}\right).$$

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

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

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

Table 3-1 outlines our understanding of the allocation of savings as incentive payments by fuel type. We understand that, from a goal attainment perspective, the AIC programs' savings by fuel type are driven by the type of customer account. From a cost-effectiveness perspective, however, AIC counts all measure savings regardless of the type of customer account. The team will assign saving credits according to the following table.

Table 3-1. Savings by Fuel Type

Type of Account with AIC	Electric Measures		Natural Gas Measures	
	Incentive Paid	Accrue Electric Savings	Incentive Paid	Accrue Therm Savings
Electric Only	Yes	Yes	No	For TRC only
Natural Gas Only	No	For TRC only	Yes	Yes
Both Electric and Natural Gas	Yes	Yes	No	Yes
	No	Yes	Yes	Yes

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

3.3 Residential Cross-Cutting Research Activities

3.3.1 General Population Surveys

AIC is currently in its seventh year of program operation and conducts general marketing and education in addition to providing incentives. This marketing and education, over time, can create spillover. In PY7, we will conduct a general population survey to quantify spillover and collect additional general information that may be beneficial (marketing preferences, existing saturations, etc.).

Since spillover is usually very small in the general population, we will need a large sample of approximately 350 to ensure a high level of confidence and precision (e.g., 95% and ±5%). The team will draw the general population sample from AIC's residential customer database, using customer identification numbers to remove those who have participated in any of AIC's energy efficiency programs (including the Behavioral Modification Program).

The general population surveys will contain modules with questions about all of AIC's residential energy efficiency programs. The team will ask residential respondents individual program module questions to determine whether they have made any upgrades offered through the program, then determine why they did not participate in that program. In addition, we will identify installed energy efficiency measures that are not part of AIC's programs and collect information to enable reliable savings estimates. For any potential spillover measures installed, we will ask the consumer about the importance of AIC's general marketing and education in their decision to install the measure. The team will include as spillover only the measures that consumers rated AIC's involvement with as "very important."

We will also use the surveys as an opportunity to identify customer motivators and barriers; preferred communications channels; and existing levels of awareness, satisfaction with AIC, and likelihood to recommend an AIC program to a friend.

If AIC uses customer segments to target its marketing messages, the team will request that the residential database include tags for these segments. Then we will select a stratified random sample, which will provide results at the segment level and allow us to understand how these customer segments behave in the energy efficiency market. In addition, the survey responses will help us identify residential market segments that are least likely to participate in AIC's energy efficiency programs and the barriers to participation for these market segments.

Once the surveys are complete, the evaluation team will analyze and report on the data in the PY7 draft and final reports.

3.3.2 Market Transformation and Market Effects Analysis

To qualitatively assess the likelihood of program market effects, the evaluation team will review previous program evaluations to identify the most appropriate indicators of market transformation across and within each of the residential programs. We will select indicators that we have consistently collected over time through survey response and program-tracking data. The evaluation team will then benchmark the historical trends for the indicators chosen and recommend those for continued monitoring. Market transformation indicators may include:

- Product saturation
- Trade ally participation
- Trade ally and consumer product familiarity
- Trade ally stocking
- Product availability
- Existing equipment age/efficiency
- Baseline technology

3.4 QA/QC Collaboration

Per our contract, the team must hire a separate entity for QA/QC review, and work collaboratively with this entity to ensure the quality of our evaluation plans, analysis, and reporting. Since PY4, the team has worked with Dr. Richard Ridge, who has a long and illustrative 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 Utility 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.

As part of the PY7 evaluation effort, Dr. Ridge will continue to:

- Discuss portfolio evaluation plans with the evaluation team, providing advice as needed
- Participate in ongoing sampling and evaluation design efforts as requested. The team will meet with Dr. Ridge at least once a quarter to discuss ongoing activities
- Review draft evaluation reports to assure quality and accuracy
- Provide the ICC with a report on the efforts in which he was involved. Dr. Ridge will provide this report as soon as the team has finalized all PY7 reports

4. Evaluation Budget

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

Table 4-1. PY7 AIC Evaluation Budget

Program/Task	Estimated Budget
Program-Specific Activities	
Residential Standard Lighting	$32,500
Residential Behavioral Modification	$110,800
Residential Home Performance with ENERGY STAR	$82,000
Residential Appliance Recycling	$47,000
Residential Multifamily	$60,000
Residential Moderate Income	$35,000
Residential ENERGY STAR New Homes	$54,000
Residential Energy Efficiency School Kits	$14,500
C&I Standard	$140,800
C&I Custom	$210,400
C&I Retro-Commissioning	$101,000
Total Program-Specific Efforts	**$967,000**
Non-Program Activities	
Statewide Technical Reference Manual	$60,000
Cost Effectiveness Analysis	$29,820
Residential Cross-Cutting Research Activities	$56,800
QA/QC Coordination	$24,850
Other Non-Program Activities (i.e., Planning, SAG, Collaboration etc.)	$198,800
Total Non-Program Efforts	**$370,270**
Contingency	$50,142
TOTAL	**$1,387,412**

For more information, please contact:

Hannah Arnold
Senior Project Manager

510 444 5050 tel
510 444 5222 fax
harnold@opiniondynamics.com

1999 Harrison Street, Suite 1420
Oakland, CA 94612