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PY8 Evaluation Plan for the Illinois Power Agency Electric and Natural Gas Residential and Commercial Energy Efficiency Programs

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1. Introduction

Ameren Illinois Company (AIC) hired the team of Opinion Dynamics, The Cadmus Group, Navigant Consulting, and Michaels Energy to perform impact and process evaluations for the stand-alone Illinois Power Agency (IPA) energy efficiency programs, implemented between June 2015 and May 2016 (Program Year 8 [PY8]).

Specifically, the team will assess the following programs in PY8:

- Residential
  - Lighting
  - Home Energy Reports (Behavioral Modification)[1]
  - Multifamily Major Measures[2]
  - Moderate Income Kits
  - Rural Efficiency Kits
- Business
  - Small Business Direct Install
  - Small Business Refrigeration

This document provides detailed evaluation plans for each of the seven 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 stand-alone IPA programs and to suggest improvements to the design and implementation of existing and future 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:

- **Illinois Statewide Technical Reference Manual for Energy Efficiency (IL-TRM).** The evaluation team will use the IL-TRM Version 4.0 (June 1, 2015) for its gross impact evaluation efforts, where appropriate.[3] For development of net-to-gross ratios (NTGRs) for prospective application, the evaluation team will

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

[2] There is also a Multifamily Program offered through Sections 8-103 and 8-104, which focuses on direct install measures (see the 8-103/8-104 Plan).

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

follow the IL-TRM V5.0 protocol (effective June 1, 2016) for estimating free-ridership and participant spillover.[4]

- **Precision Targets.** Unless explicitly mentioned, quantitative evaluation activities target 10% relative precision at 90% confidence or better (90/10 precision).
- **Net-to-Gross Ratios (NTGRs).** As specified in each program-specific plan, the evaluation team will apply NTGRs by program as outlined in the team's net-to-gross (NTG) Recommendations to the Stakeholder Advisory Group (SAG) to estimate net impacts for PY8. Data collected as part of the PY8 evaluation for the purpose of developing NTGRs will be applied prospectively for potential IPA programs approved by the Illinois Commerce Commission (ICC) in a docketed proceeding for implementation in PY10 (June 1, 2017–May 31, 2018).
- **Evaluation, Measurement, and Verification (EM&V) Coordination**. Consistent with prior years, the evaluation team is in ongoing communication with other Illinois evaluators to discuss evaluation approaches planned for PY8. These discussions ensure that, where appropriate, the evaluation approach is consistent.

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

2. Program-Specific Evaluation Plans

2.1 Residential Lighting

2.1.1 Program Description

The objective of the Residential Lighting Program is to increase awareness and sales of ENERGY STAR® lighting among residential customers. The program provides discounts through a variety of retail channels to reduce the cost of standard and specialty CFLs and LEDs. The program is available throughout the entire 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 ENERGY STAR lighting at a discount to bring the cost closer to that of traditional incandescent lighting. The implementer expects the discounts to encourage customers who are reluctant to pay full price for ENERGY STAR lighting to choose energy-efficient lighting over standard efficiency lighting.

According to the program implementation plan, the annual savings target for the PY8 Residential Lighting Program is 45,210 MWh.

2.1.2 Research Objectives

The main research objectives of the PY8 evaluation are to estimate gross and net program savings and assess program processes.

We will answer the following impact-related research questions:

1. What were the estimated program gross energy and demand savings from this program?
2. What were estimated program net energy and demand savings from this program?
3. What was the estimated impact of the program on energy efficient lighting purchases? How many customers would have purchased a less-efficient bulb if the program had not discounted the bulbs?
4. What was participant spillover from the program? How many customers purchased non-discounted energy efficient bulbs due to the program?
5. What types of customers were purchasing program-discounted bulbs? What percentage of bulbs were purchased by non-AIC customers? What percentage of bulbs were purchased for use in commercial settings?

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

6. Did the program change its design in PY8? If so, how and why and were those changes advantageous?
7. Was program implementation effective and smooth? Were the participation process and program requirements (such as providing sales information to the program, allowing point-of-purchase [POP] materials, and training of employees) clearly explained to participating retailers?
8. Were customers satisfied with the program, the products, and the process for participation?

9. In what areas could the program improve to increase its overall effectiveness? What could the program do to assist customers in understanding energy-efficient lighting options and how to achieve higher energy savings?

A larger portion of our evaluation research will focus on the different parts of the residential lighting market, and will address the following questions:

10. What screw-in lighting products were available for AIC customers to purchase? How has this changed over time? What was the availability of less-efficient lighting products compared to efficient products (i.e., incandescent and Energy Independence and Security Act [EISA)-compliant halogen bulbs versus CFLs and LEDs)?

11. What was the program's impact on the residential lighting market in terms of CFL penetration and saturation? How has CFL and LED usage changed since 2014, when we last conducted a lighting audit of AIC customers' homes?

12. What was the penetration and saturation by bulb type and room type? Did the program cause more customers to consider efficient light bulbs for every light socket in their homes, including specialty sockets? Did efficient lighting saturation lag behind for some uses?

13. What was the average hours of use (HOU) of LEDs installed in AIC customers' homes? How did HOU vary by room type and bulb type?

14. What was the profile of AIC customers whose homes have high efficient bulb saturation rates, compared to those who do not? Has that profile changed in the past few years? Was the program reaching new users of energy-efficient lighting products?

15. What were the barriers to purchasing efficient lighting? What factors were most important to customers when they purchase light bulbs? How can the program market efficient lighting to address the barriers?

2.1.3 Methodology

Given the large savings associated with this program, the evaluation employs multiple data sources and analyses to provide useful information and to build knowledge of the residential lighting market in AIC territory.

Data Sources

Impact Analysis

To estimate PY8 ex post gross savings for the Residential Lighting Program, we will perform a database review and estimate savings using savings assumptions in the IL-TRM V4.0. Our database review will include an examination of CFL and LED baseline wattages used to calculate program ex ante savings to ensure that the wattages are consistent with the TRM. We will use in-store customer interviews conducted in PY8 to estimate a "leakage out" rate. We will use the PY7 evaluation estimate of "leakage in." Together, these two values will comprise an overall leakage rate. We will utilize the carryover savings method outlined in the TRM in which PY8 ex post gross savings is composed of bulbs sold over 3 years but installed in PY8. That is, PY8 ex post gross savings will include bulbs sold and installed in PY8, as well as delayed installations of bulbs sold in PY6 and PY7 but not installed until PY8.

We will calculate PY8 net savings by applying SAG-approved NTGRs to gross savings. We provide further detail in the Analysis Plan below. As part of this evaluation, we will also estimate free-ridership and spillover rates for CFLs and LEDs using the results of in-store customer interviews. The two estimates combined will form a NTGR (NTGR= (1 – Freeridership) + Spillover) for application in PY10.

Further, we will conduct a multi-year in-home lighting audit study to support multiple functions. This study is a statewide study, done in conjunction with ComEd, and will be conducted in PY8 and PY9. At a subset of audited homes, we will conduct a lighting HOU study to provide estimates of LED HOU. The results will be used to update the TRM, most likely TRM V7.0.

Process Analysis

The process analysis will utilize data from seven different data sources: 1) in-depth interviews with program staff, 2) a review of program data, 3) a review of program marketing materials, 4) in-store customer interviews, 5) retail lighting product shelf surveys, 6) in-depth interviews with retailers, and 7) a customer preference study.

Market Analysis

To understand the state of the lighting market in AIC territory, we will use the results from the in-store customer interviews, retail lighting product shelf surveys, and in-home lighting audits. The shelf surveys will show what products retailers are making available to customers to purchase (the assortment), while the in-store customer interviews will show what customers are actually purchasing. We will be able to present stocking and purchase information by technology (incandescent, halogen, CFL, and LED), type (standard and specialty), and wattage. We will compare the 2016 results to our results in 2014 and 2013 to see how the market has changed over the past several years. Additionally, the in-store customer interviews will provide information on customer awareness of marketing materials and barriers to the purchase of efficient lighting.

The primary focus of the in-home lighting audit study is to gather information on the number, type, and location of residential lighting products in each home. We will estimate the penetration and saturation of different light bulb types and compare these results to similar studies conducted for AIC in 2010, 2012, and 2014. For LEDs, we will conduct additional research to understand how customers are using the bulbs. When we find LEDs installed, we will ask customers to recall the bulb type that was in the socket prior to the LED to learn whether more customers are replacing CFLs with LEDs or whether they are installing LEDs in sockets that had a less efficient bulb. While in customer homes conducting the lighting audits, we will also collect data to conduct a customer preference study. This preference study will provide a deeper understanding of barriers to purchase.

Sampling Plan

In-Store Customer Interviews

Because of the timing of our PY8 research plan, we have already conducted in-store customer interviews. We completed the fieldwork on April 11, 2016. For completeness, we have included information about this research in this full PY8 plan.

We had to use a convenience sample of stores for budgetary reasons and because not all retailers allow in-store customer research. To gain access to the stores, we accompanied a program field representative who was conducting a lighting demonstration. We selected stores throughout AIC territory that had the most program sales and a demonstration day already scheduled or where one could be conducted. We also considered store location. Because one of the study's objectives is to estimate the percentage of program-

discounted bulbs sold to non-AIC customers, location was an important factor in selecting stores to include in the study. We considered the stores' location relative to the border of AIC territory and attempted to select stores whose locations were representative of the locations of the population of participating stores.

In total, we conducted interviews at five different retailers: Walmart, Home Depot, Lowes, Sam's Club, and Rural King. Based on partial-year sales data, these five retailers account for 73% of bulbs sold through the program. We conducted interviews with 853 customers at 25 participating retail locations. Table 1 shows the number of locations and completed interviews by retailer.

Table 1. Number of In-Store Customer Interview Locations and Completed Interviews

Retailer	Number of Locations	Number of Completed Interviews	Percent of All Program Sales
Walmart	12	462	45%
Lowes	5	222	5%
Sam's Club	3	72	6%
Home Depot	2	58	11%
Rural King	3	39	6%
Total	**25**	**853**	**73%**

We spent 3 days in each store: 2 were weekend days and the third was a weekday. The lighting demonstrations were held on Fridays or Saturdays. For Friday demonstrations, we conducted interviews from Friday through Sunday. For Saturday demonstrations, we conducted interviews from Saturday through Monday. The store environment during lighting demonstration days is not typical of what customers usually face when making a lighting purchase. We will analyze the interviews completed during demonstration hours and compare them to non-demonstration hours, but it is unlikely that those conducted during demonstration hours can be included in the final program free-ridership estimate.

In PY8, the program discounted standard CFLs, omnidirectional LEDs, and directional LEDs. Table 2 shows the number of completed interviews and bulbs purchased across different bulb categories. At the time of the fieldwork, the program had nearly exhausted its budget for directional LEDs so that discounts were present in only two stores for one weekend. As a result, we interviewed only two customers who purchased program-discounted directional LEDs. We have a sufficient number of interviews to produce separate NTGR estimates for standard CFLs and LEDs, but we cannot provide separate estimates for directional and omnidirectional LEDs.

Table 2. Number of In-Store Interview Completes by Bulb Type

Customer Type	Bulb Type	Customers		Bulbs	
		Number	Percentage	Number	Percentage
Non-Program	All	553	65%	2,523	55%
Program	All	334	39%	2,104	45%
	CFL – Standard	*188*	*22%*	*1,609*	*35%*
	LED – Omnidirectional	*149*	*17%*	*491*	*11%*
	LED – Directional	*2*	*0.2%*	*4*	*0.1%*
Total	**All**	**853**	**104%**	**4,627**	**100%**

Note: The percentages of customers sum to greater than 100% because some purchased more than one bulb type.

Retail Lighting Product Shelf Survey

While in the stores conducting lighting customer interviews, we conducted shelf surveys of the lighting products that were on the shelves. We conducted the surveys at ten locations, two of each retailer. In the past when we have conducted shelf studies, we have found little variation in product at different locations of the same retailer. Given this, these small sample sizes should be sufficient to characterize all participating locations of these retailers.

In-Home Lighting Audits and Lighting Hours of Use Study

We will conduct in-home lighting audits with a random sample of AIC customers to estimate penetration and saturation of different lighting technologies. For homes with LEDs installed, we will estimate LED HOU by installing light loggers on LED bulbs in use. This study will be part of a statewide study conducted in conjunction with ComEd. We will begin work on the study as part of our PY8 evaluation work and complete the study and report on results as part of the evaluation of the PY9 program.

We will complete audits in 140 AIC homes. The estimates of AIC lighting saturation and penetration will meet or exceed 90/10 precision. For the LED HOU study, we will log LEDs in 60 homes in AIC territory and 60 homes in ComEd territory for a total of 120 homes. Together, the 120 homes will provide a statewide estimate of LED HOU, which will meet 90/10 precision. HOU estimates for AIC territory will be less precise. Estimates by demographic subgroup, room type, and bulb type will also be less precise. We will provide a separate sampling plan for the lighting audit and HOU studies for AIC review.

Residential customers can have a variety of lighting products, including linear lighting and specialty lighting (accent lighting, specialty downlighting, track lighting, etc.). This study will inventory lighting products in all screw- or pin-based sockets (both medium screw-based and small screw-based sockets) located in both conditioned and unconditioned spaces (including outside). We will also inventory lighting. We will deploy loggers only on switches that control sockets with LEDs.

For logger deployment purposes, during the site visits, technicians will classify rooms into the following seven distinct room types[5]:

- Kitchen
- Living room
- Bedroom
- Bathroom
- Dining room
- Basement
- Other

For each room, technicians will collect the information on the total number of switches, switch controls, total number of light sockets controlled by each switch, lighting technology (CFL, LED, incandescent, halogen, empty socket), and bulb shape (twist, reflector, globe) in each socket.

[5] Note that the list of room types for lighting inventory will be more detailed and includes 16 unique room types.

To capture lighting usage, we will deploy up to seven loggers per home, one in each distinct room type. For homes with fewer than seven rooms, we will deploy more than one logger per room (but no more than three loggers per room) to increase the overall precision, as well as to act as a backup logger. Within each room and room type, we will randomly select the light switch to log. As previously mentioned, we will place lighting loggers only on switches that control at least one LED installed in a conditioned space. For each logger, we will record the switch it was placed on and the count of light bulbs, by technology, it controls. We will also record a detailed description of the logger placement to aid in subsequent retrieval visits (e.g., light above master bathroom mirror).

Consumer Preference Study

We will conduct the consumer preference study while we are in customer homes conducting the in-home lighting audits. We will conduct the study with all customers who participate in the home study (n=140). Thus, the sampling plan will be the same as that for the home study.

Analysis Plan

Gross Impacts

For PY8, the baseline wattages for gross energy and demand savings are set by the IL-TRM V4.0 and are shown in Table 3. The evaluation team will use these values, other key savings assumptions provided by the TRM, and data from the program tracking database to calculate gross program savings.

Table 3. 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 in-store customer interview results to estimate leakage of program-discounted bulbs *out of* AIC territory. During these interviews, we asked customers purchasing program-discounted bulbs for the name of the utility that provides electricity to their home or business (depending on where they said that they would install the bulbs). Bulbs purchased by customers who do not receive electricity from AIC will be considered leakage out.[6] We will use the Geographic Information Systems (GIS)-based estimate of leakage *into* AIC territory from the PY7 evaluation. Overall leakage will be leakage out minus leakage in.

[6] We understand that many AIC customers identify with a legacy company (e.g., CILCO) and may not name AIC as their provider. We also understand that some customers get their electricity from third-party providers and may consider these providers their electric provider. AIC still delivers their electricity, and these customers pay into the energy efficiency fund. Our survey instrument can identify these various customer types, and our analysis will correctly assign their purchases to AIC and not as leaked bulbs.

Net Impacts

For net savings from CFLs, we will use the NTGR values estimated in the PY6 evaluation presented in Table 4. Because AIC did not discount LEDs in PY6 when we last conducted in-store customer interviews, we lack an AIC-specific NTGR for LEDs. For LEDs, we will use the estimate from the PY7 evaluation of the Commonwealth Edison Residential Lighting Program.

Table 4. Lighting Program PY8 NTGRs

Measure Description	NTGR
Standard CFLs	0.63
Specialty CFLs	0.72
LEDs	0.73

Process and Market Analysis

We will present process- and market-related findings based on our analysis of the program materials, databases, in-store customer interviews, and retail lighting product shelf surveys. We will present the results from the home lighting audits and customer preference study in PY9. We will make use of descriptive statistics and hypothesis testing to answer the research questions in these areas.

2.1.4 Tasks

Task 1: In-Depth Interviews with Program Staff

The evaluation team will conduct up to three in-depth phone interviews with program and implementation staff involved in the design and administration of the Residential Lighting Program (i.e., Leidos, CLEAResult, and EFI staff). These interviews will allow us to fully explore the details of the program design and implementation and to examine the perspective of the people who are in direct contact with participating retailers. We will schedule these in-depth interviews toward the end of the program year and will conduct them over the telephone using experienced Opinion Dynamics analysts. We will record and transcribe all interviews to facilitate analysis.

Deliverable: Interview guides *Deliverable Date:* June 2016

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.

Deliverable: Data requests *Deliverable Date:* June 2016

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 the correct savings value has been applied for each product type, to verify that the database is providing correct

information. We will also assess the database to ensure that project data has been recorded fully 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 IL-TRM V4.0.

Deliverable: Data requests *Deliverable Date:* June 2016

Task 4: In-Store Customer Interviews

We will conduct interviews with customers purchasing lighting in stores selling efficient bulbs discounted through the Residential Lighting Program. The goals of this effort are to estimate program free-ridership through a self-report survey, estimate the influence of price reduction and program marketing on efficient bulb purchases, and estimate leakage rates. We will attempt to interview all customers purchasing lighting during our in-store visits. Our priority will be conducting interviews with customers purchasing program-discounted bulbs. We will also interview customers purchasing non-program bulbs or other alternatives, such as incandescent, halogen, or non-ENERGY STAR LED bulbs. Interviewing customers purchasing non-program lighting will allow us to assess program awareness, the impact of program marketing, and barriers to efficient bulb purchases.

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

Task 5: Retail Lighting Product Shelf Survey

While in the stores conducting customer interviews, we will conduct surveys of the lighting products that are on the shelves. The purpose of this study is to gather information about the lighting market, in terms of the types of products being sold and their price points. We will compare the results to the shelf studies we conducted in PY5 and PY6 to determine how the lighting market has changed in response to EISA and technological developments.

We will conduct the surveys at 10 different participating retailer locations, collecting information on all products discounted through the program, as well as on any products that could be purchased instead (i.e., incandescents, EISA-compliant halogens, and non-ENERGY STAR LEDs). For each product, we will record the bulb type, bulb shape, actual wattage, incandescent-equivalent wattage (if applicable), lumens, number of bulbs in the package, manufacturer, model number, product location in the store, price, original price if discounted, and the source of the discount. We will also record information on the presence and sponsor of lighting marketing materials.

Deliverable: Draft and final data collection instruments *Deliverable Date:* February 2016

Task 6: In-Home Lighting Audits

In October and November 2016, we will visit 140 homes to conduct in-home lighting audits. We will develop the sampling plan, draw the sample, and develop the data collection instruments as part of our PY8 evaluation and report the results in PY9. A detailed lighting study of this nature provides the most accurate “snapshot” of the number, type, and location of residential lighting products. This study will build on similar studies conducted in 2010, 2012, and 2014, and will provide information on the change in the lighting market in AIC territory over that time period. We will calculate penetration and saturation rates for all of the different lighting technologies installed in AIC homes. This study will provide information about the rooms and types of sockets where consumers are using these newer lighting technologies.

We will also use this study to gain information on how customers are using LEDs. As a newer technology, most LEDs will have been installed during the past 2 years, so it is reasonable to ask customers about the type of bulb that was in the socket before the LED. We want to determine the extent to which customers are replacing CFLs with LEDs or whether they are primarily replacing less-efficient bulbs.

We expect the study to provide insights into the best program design to reach customers and sockets with low efficient bulb saturation. For example, our analysis will examine the correlation between efficient lighting and a number of household and demographic variables, including homeownership, housing type (e.g., single-family vs. multifamily), income, and education. This will help the program understand the customers who are lagging behind in adoption of efficient lighting technologies. The consumer preference study (described in more detail in Task 8) will be tied to the home study results and will provide information on why these customers lag behind and how the program may adjust to reach them.

In addition, recent saturation studies have found that socket type—rather than household or demographic characteristics—may be more important in predicting usage of efficient lighting products. Sockets with control capabilities (e.g., dimmers or three-way) or sockets with specialty bulbs (e.g., globes or reflectors) lagged behind in adoption of CFLs. We will determine if LEDs, a more desirable technology, are filling this gap.

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

Task 7: LED HOU Study

A key input to estimating energy savings is the number of hours a day that bulbs discounted through the program are in use. As the lighting programs shift from CFLs to LEDs, it is important to conduct an LED HOU study because customers may be using LEDs differently than CFLs or other bulbs. During the in-home lighting audits in October and November 2016, we will place DENT lighting loggers on LEDs in 60 AIC customer homes. We will place loggers in another 60 ComEd customer homes for a total of 120 homes. We will place the loggers as close to the light source as possible, without compromising the aesthetics of the lighting. We will calibrate each logger's sensitivity setting to make sure it captures lighting only from the dedicated fixture and does not accidentally capture ambient sources of lighting, such as daylight. We will keep the loggers in place for approximately 6 months. After 6 months, we will schedule return visits, during which we will remove lighting loggers. We will remove the loggers using standard procedures for logger testing prior to removal. We will also conduct a closing interview with the homeowner about any changes in lighting usage over the course of the logging period.

In PY9 after we remove the loggers, we will perform data cleaning, analysis, and modeling to estimate HOU and coincidence factors. Given the number of planned site visits, we will develop a statewide estimate of the HOU and coincidence factors that will meet the desired 90/10 precision for LEDs as a category. Estimates for AIC territory or by room type or bulb type will likely be less precise due to smaller sample sizes.

Deliverable: Sampling plan and data collection instruments *Deliverable Date:* August 2016

Task 8: Consumer Lighting Preference Study

While we are in customers' homes conducting the in-home lighting audits, we will conduct a consumer lighting preference study with the resident. The objective of the study is to predict future lighting purchase behavior based on customer preferences for lighting products with different features. The study will make use of discrete choice analysis. This analysis relies on responses to survey questions about different product trade-offs. The survey asks respondents to select the product that they would purchase from a group of products with different attributes. By varying the products and attributes a number of times, the relative importance of the attributes is revealed. We can use this stated-preference information to predict what customers would buy when faced with actual product choices in the real world. One of the advantages is that we can vary the product features and come up with different predictions. For lighting products, we can vary the price and produce different purchase predictions. The program could use this information to adjust program incentive levels.

To understand and predict customer purchase behavior, a discrete choice analysis is superior to traditional surveys that directly ask customers what lighting products they will purchase in the future. Until recently, customers did not have a choice of technology when purchasing light bulbs. At most retailers today, customers can still purchase incandescents as well as EISA-compliant halogens, CFLs, and LEDs. It is not possible to describe the four different bulb types in a survey question and get an accurate answer of what customers will purchase in the future. The products are too new and too unknown. Instead, through the conjoint survey we can describe light bulbs with different attributes and, through several iterations, can determine what attributes are most important and thus what types of bulbs customers are likely to purchase when, in the future, they have more information.

A conjoint survey must be an electronic self-administered survey. It cannot be properly conducted over the telephone. Our in-home lighting audits provide an ideal situation to conduct a conjoint survey. We will ask residents to take the survey on a tablet when we are in their homes to conduct the lighting audit. Another strength of this research design is that we will be able to compare the conjoint results to the lighting products that customers have actually installed in their homes. For customers who have low efficient bulb saturation, we will determine if price is the real barrier or are there other factors that might require more emphasis in marketing and information sharing. The program will be able to use the results to better target customers and sockets that are low on efficient bulb saturation.

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

Task 9: 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 2016

Deliverable: Final report *Deliverable Date:* October 2016

2.1.5 Budget and Schedule

Figure 1 and Table 5 summarize the timing of each evaluation activity. Table 5 also lists the budget associated with each task. In total, the PY8 budget for the Residential Lighting Program is $290,000.

Figure 1. Lighting Program PY8 Evaluation Timeline

Task	Evaluation Activity	2016									
		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	In-Depth Interviews with Program Staff										
2	Request and Review Program Materials										
3	Program Database Verification and Savings Analysis										
4	In-Store Customer Interviews										
5	Retail Lighting Product Shelf Survey										
6	In-Home Lighting Audits*										
7	LED HOU Study*										
8	Consumer Lighting Preference Study*										
9	Reporting										

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

* The evaluation team will provide results from these tasks in separate deliverables throughout PY9.

Table 5. Lighting Program PY8 Evaluation Budget

Task	Evaluation Activity	Deliverable Date	Cost by Task
1	In-Depth Interviews with Program Staff	June 2016	$1,000
2	Request and Review Program Materials	June 2016	$1,000
3	Program Database Verification and Savings Analysis	June 2016	$15,000
4	In-Store Customer Interviews	February 2016	$150,000
5	Retail Lighting Product Shelf Survey	February 2016	$20,000
6	In-Home Lighting Audits	August 2016	$17,000
7	LED HOU Study	August 2016	$17,000
8	Consumer Lighting Preference Study	August 2016	$18,000
9	Reporting	September 2016	$51,000
		Total Cost	**$290,000**

2.2 Residential Home Energy Reports (Behavioral Modification)

2.2.1 Program Description

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

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

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

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

Table 6. Approximate Behavioral Modification Program Participation in PY8

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

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

According to the Plan 3 filing, the expected savings from this program in PY8 are 21,688 MWh.

2.2.2 Research Objectives

As part of the most recent evaluation, the evaluation team completed an assessment of energy impacts (including equivalency analysis, adjustment for double-counted savings, and review of program participation over time) coupled with a survey of treatment and control customers. In addition, we conducted a multi-level modeling analysis to identify high, medium, and negative savers. Our evaluation approach for PY8 will build

on prior evaluation findings, provide additional insights regarding program effects, and address key questions regarding the benefits of offering behavioral programs over time.

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

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

The PY8 process evaluation will explore the following research questions:

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

2.2.3 Methodology

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

Data Sources

Impact Analysis

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

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

Data sources for the PY8 impact evaluation include:

- Program tracking databases for all AIC residential programs from June 2015 to May 2016
- For all customer treatment and control groups, gas consumption/billing data from June 2013 to May 2016

- Experian data (including demographic data, housing characteristics, and psychographic data)

Process Analysis

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

Program data used for the PY8 process evaluation will include:

- Email contact information, where available, for all customer treatment and control groups
- HERs sent to cohorts in PY8, including tips provided to customers in the treatment group; this should tie the specific savings tips to specific customers so that we can assess how different the tips are across customers
- Customer segmentation information
- Target Rank campaign[7] recipients
- Aclara web portal visitors who also receive HERs

Sampling Plan

Billing Analysis

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

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

Internet Survey

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

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

questions of interest. Depending on the incidence of Target Rank campaign customers and Aclara web portal visitors, we may include these groups within our sample frame.

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

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

Prior to fielding the survey, we will assess whether there is any potential for bias across the savings groups in terms of their incidence of email addresses. If there are, our team will work to address these biases using post-stratification methods. Post-stratification can also support our ability to generalize survey results to program participants. After the survey is completed, we will check for non-response predictors that may be different for the five savings groups. If we find differences, we will seek to assess the extent to which non-response bias may limit internal validity. To the extent possible, we will control statistically for differences that we find.

Analysis Plan

Net Impacts

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

Equivalency Analysis

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

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

Demographic Characteristics

Age	Education
Dwelling type	Homeowner/renter indicator

Estimated household income	Number of adults
Occupation group	Number of children

Household Characteristics

Building square footage	Year built

Psychographic characteristics

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

Estimate Net Impacts

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

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

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

Equation 1: Overall Model

Equation 1. Overall Model Estimating Equation

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

Where:

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

α_i = Household-specific intercept

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

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

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

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

ε_{it} = Error

Equation 2: Weather-Adjusted Model

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

Equation 2. Weather-Adjusted Model Estimating Equation

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

Where:

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

α_i = Household-specific intercept

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

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

β_3 = Coefficient for HDD

β_4 = Coefficient for CDD

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

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

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

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

ε_{it} = Error

Equation 3: Post-Only Model

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

Equation 3. Post-Only Model Estimating Equation

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

Where:

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

α = Intercept

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

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

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

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

β_5 = Vector of coefficients for month-year dummies

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

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

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

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

$MonthYear_t$ = Vector of month-year dummies

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

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

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

ε_{it} = Error

Model 4: Standard Weather-Year-Adjusted Model

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

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

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

Where:

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

α_i = Household-specific intercept

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

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

β_3 = Coefficient for HDD for standard weather year

β_4 = Coefficient for CDD for standard weather year

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

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

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

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

ε_{it} = Error

Channeling Analysis

We will calculate a savings adjustment to account for the portion of net savings estimated from the billing analysis that has been claimed by other AIC or IPA 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 other AIC or IPA energy efficiency programs appear in both the Behavioral Modification Program and the rebate programs, and thus would be double-counted if an adjustment were not made.

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

Process Findings

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

Analysis of Program and Implementation Staff Interviews

Analysis of program and implementation staff interviews and review of program data and materials will help explore program changes, successes, and challenges, and identify potential areas for program improvement.

In addition, these interviews will help formulate appropriate questions for the treatment and control group surveys.

Survey Analysis

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

Customer Segmentation Analysis

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

2.2.4 Tasks

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

Task 1: Review Program Materials and Database

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

Deliverable: Data request *Deliverable Date:* June 2016

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

Task 2: Program Staff Interviews

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

Deliverable: Conducted interviews *Deliverable Date:* June 2016

Task 3: Participant Survey

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

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

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

Task 4: Equivalency Analysis

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

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

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

Task 5: Billing Analysis

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

Deliverable: Data request *Deliverable Date:* June 2016

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

Task 6: Channeling Analysis

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

Deliverable: Data request *Deliverable Date:* June 2016

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

Task 7: Reporting

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

Deliverable: Draft report *Deliverable Date:* October 2016

Deliverable: Final report *Deliverable Date:* November 2016

2.2.5 Budget and Schedule

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

Figure 2. Behavioral Modification Program PY8 Evaluation Timeline

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

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

Table 7. Behavioral Modification Program PY8 Evaluation Budget

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

2.3 Residential Multifamily Major Measures

2.3.1 Program Description

The IPA Multifamily Program offers incentives and services that enable energy savings and lower operating costs in market-rate multifamily housing. The program has two components: common area lighting direct install and major measures.[8] Measures offered through the common area lighting component include LED exit

[8] There is also a Multifamily Program offered through AIC (see the AIC plan). The AIC program focuses on in-unit direct-install measures, common area lighting (medium screw-based CFLs only), and major measures for customers with gas heating (see the 8-103/8-104 Plan). Projects in the AIC program achieve a minority of the combined IPA and AIC programs' total electric and demand savings from major measures.

signs, modular CFLs, T8 lights for common areas, and, where appropriate, occupancy sensors. Under the major measures component, program administrators offer air sealing and attic insulation.

Program administrators deliver direct installation and major measures using a hybrid approach that leverages program implementation staff from CLEAResult as well as program allies. For the common area lighting direct install component, the implementation contractor conducts outreach, recruits participants, and installs the lighting upgrades. Program allies deliver the major measures component, which includes identifying project leads, performing walkthrough audits, and installing the program measures.

According to the program implementation plan, the savings target for the PY8 Multifamily Program is 36,334 MWh.[9]

2.3.2 Research Objectives

The objective of the PY8 Multifamily Program evaluation is to provide PY8 estimates of gross and net electric savings associated with the program's two components (common area lighting direct install and major measures). In particular, the PY8 impact evaluation will answer the following questions:

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

The evaluation team will also explore a number of process-related research questions as part of the PY8 evaluation.[10] Through these questions, we will explore key changes to the program, as well as the remaining market potential for the program in future years.

4. Program Participation
    a. How many projects were completed? By how many different customers? What types of projects?
    b. Did customer participation meet expectations? If not, how different was it and why?
    c. How many customers participated in more than one component?
5. Program Design and Implementation
    a. Did the program implementation change compared to PY7? If so, how and why was this an advantageous change?
    b. What implementation challenges occurred in PY8, and how did the program overcome them?

[9] This figure does not reflect any subsequent adjustments made to the program's goals.

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

6. Opportunities for Program Improvement

    a. What changes could the program make to improve the customer experience?

    b. What additional measures could the program offer to generate additional program savings? Which of these measures provide a relatively greater savings opportunity? Which are of greatest interest to participants?

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

2.3.3 Methodology

Below we provide a summary of the methods planned for the PY8 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 IL-TRM V4.0. We will calculate PY8 net savings by applying SAG-approved NTGRs to ex post gross savings.

Process Analysis

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

NTGR Updates

We will develop updated estimates of free-ridership and participant spillover for the Multifamily Program using self-reported data from quantitative surveys of property owner/managers. These values will be recommended for prospective application in PY10.

Sampling Plan

Participating Property Manager/Owner Survey

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

We will attempt a census of all property managers/owners who participated during PY8, based on our knowledge of program participation and anticipated response rates. For budgeting purposes, we assume that the census attempt will result in 70 completed interviews across both the IPA and AIC Multifamily programs. Based on the breakdown of PY7 participants across IPA and AIC programs (48% participated in the IPA program or both the IPA and AIC programs), we expect that about half of the respondents will have completed upgrades through the IPA program.

Analysis Plan

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

Gross Impacts

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

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

Net Impacts

We will calculate PY8 ex post net savings by applying SAG-approved NTGRs to ex post gross electric savings. Table 8 presents the NTGRs that we will apply to PY8 savings, by measure.

Table 8. Multifamily Program PY8 NTGRs

Measure Description	NTGR
Common Area Lighting	0.83
Major Measures – Insulation	0.88
Major Measures – Air Sealing	0.96

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

Process Research

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

- We will evaluate ways that the program can maintain or enhance the customer experience using feedback from the participating property manager/owner surveys. Generally, we plan to present survey data using descriptive statistics.
- We will assess the potential for new measures using several analytical steps. First, we will conduct program staff interviews to gain a preliminary sense of what types of measures may be of interest. We will then conduct a review of secondary materials (e.g., program implementation plans, marketing plans, and AIC's recent potential study) to better understand which measures of interest to program

staff are feasible given the program design, and the relative potential of each measure to increase the program's savings. Finally, we will also use the participating property owner/manager survey to gauge the level of interest among typical participants in receiving various additional types of common area or major measures through the program. The property owner/manager surveys will also collect limited information about their likelihood to conduct comprehensive measures if there was a co-pay. We expect to present thematic findings about program measure mix in terms of both of interest to typical participants and degree of program savings potential.

- Database review activities completed during the impact analysis and in preparation for the participant survey will provide a limited study of issues related to cross-program implementation and participation (i.e., across AIC and IPA). We will present summary statistics based on these steps to summarize property managers' experiences participating across the AIC and IPA programs.

2.3.4 Tasks

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

Task 1: Review Program Tracking Data and Materials

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

Deliverable: Data request *Deliverable Date:* June 2016

Task 2: Program and Implementation Staff Interviews

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

Deliverable: Conducted interviews *Deliverable Date:* June 2016

Task 3: Participating Property Manager/Owner Survey

We plan to complete approximately 70 interviews with participating multifamily property managers/owners in AIC's service territory. In preparing the sample we will analyze participation trends across AIC and IPA programs and measure components (i.e., direct install and major measures). The interviews will collect data needed to update direct install and major measure NTGRs and will explore the experiences of property managers/owners with the program and their interest in receiving additional energy efficiency measures. We will also collect limited information on property manager/owner likelihood to conduct comprehensive measures with a co-pay.

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

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

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

Task 4: Impact Analysis

The team will use the IL-TRM V4.0 to calculate ex post gross savings associated with the measures installed through the program in PY8. For net impacts, we will apply the NTGRs listed in Table 8. We anticipate conducting this analysis in September 2016 based on the expected timing of the final program tracking data.

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

Task 5: 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:* October 2016

Deliverable: Final report *Deliverable Date:* November 2016

2.3.5 Budget and Schedule

Figure 3 and Table 9 summarize the timing of each evaluation activity. Table 9 also lists the budget associated with each task. In total, the PY8 budget for the Multifamily Program evaluation is $47,300.

Figure 3. Multifamily Program PY8 Evaluation Timeline

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

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

Table 9. Multifamily Program PY8 Evaluation Budget

Task	Evaluation Activity	Deliverable Date	Cost by Task
1	Review Program Tracking Data and Materials*	June 2016	$1,700
2	Program and Implementation Staff Interviews*	October 2016	$1,900
3	Participating Property Manager/Owner Survey*	July 2016 and October 2016	$21,000
4	Impact Analysis*	October 2016	$5,900
5	Reporting*	October 2016 and November 2016	$16,800
		Total Cost	**$47,300**

* Note: All activities are conducted in conjunction with the AIC Multifamily Program.

2.4 Residential Moderate Income Kits

2.4.1 Program Description

The Moderate Income Kits Program was offered for the first time in PY8. The program provides kits containing energy-efficient items to AIC customers with a household income up to 300% of the federal poverty guidelines through an opt-in mail delivery approach. The program seeks to reduce energy consumption among a hard-to-reach population.

Leidos, AM Conservation Group, and Direct Options deliver the Moderate Income Kits program. Leidos implements the program, and AM Conservation Group provides program management and kit fulfillment services. Direct Options implements the program's marketing strategy, with oversight from AIC and the other program implementation staff.

According to the program implementation plan, the savings target for the PY8 Moderate Income Kits Program is 1,601 MWh.

2.4.2 Research Objectives

The PY8 Moderate Income Kits Program evaluation seeks to estimate gross and net electric and natural gas savings associated with the program. The evaluation team will use the PY8 impact evaluation to answer the following questions:

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

The team will also conduct a limited process evaluation, designed to explore how the program performed during its first year and to answer the following process-related questions:

3. Program Participation
    a. How many kits were distributed to participants throughout the year?
    b. Did the program achieve its PY8 participation and electric energy savings goals?
4. Program Design and Implementation
    a. How did the program operate in PY8?
    b. What implementation challenges occurred?
    c. How did program staff market the program?
    d. What changes could AIC make to improve the program's effectiveness?

e. What quality assurance and quality control processes does the program have in place? Are they sufficient to ensure high quality products and that measures are installed by moderate income customers?

2.4.3 Methodology

A summary follows of the evaluation team's planned methods for conducting the PY8 Moderate Income Kits Program evaluation.

Data Sources

Impact Analysis

The evaluation team will use the IL-TRM V4.0 to estimate PY8 ex post gross savings for the program. The team will review all data in the program tracking database to verify participation, apply the IL-TRM V4.0 to estimate gross savings, and apply the SAG-approved NTGR to estimate net savings. The evaluation team will apply verified installation rates from the PY7 Rural Efficiency Kits evaluation (except for CFLs for which the evaluation team will apply the prescribed installation rate indicated in IL-TRM V4.0), as listed in Table 10.

Table 10. Moderate Income Kits Program PY8 Installation Rates

Measure Description	Installation Rate
13-watt CFLs	66%
23-watt CFLs	66%
1.5 GPM Bath Faucet Aerator	17%
1.5 GPM Kitchen Swivel Faucet Aerator	20%
1.5 GPM Chrome High-Efficiency Showerhead	39%

Process Analysis

For the process evaluation, the team will draw on additional data sources, using data gathered from interviews with program management and implementation staff regarding program design and delivery, program strengths and weaknesses, and PY8 goal achievement.

Sampling Plan

Impact Analysis

The evaluation team will analyze the census of records provided in the program tracking database.

Analysis Plan

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

Gross Savings

The evaluation team will use the program tracking database to verify participation. The team will calculate gross impacts by multiplying the number of verified measures by the deemed unit savings for each measure, as indicated in the IL-TRM V4.0. The team will derive any gross savings inputs not tracked in the program database (e.g., electric water heater saturation, installation rates) from the IL-TRM V4.0.

Net Savings

To develop net savings for PY8, the team will apply the SAG-approved NTGR (listed in Table 11) to ex post gross savings.

Table 11. Moderate Income Kits Program PY8 NTGR

Measure Description	NTGR
All Measures	1.00

Process Findings

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

2.4.4 Tasks

This section describes the evaluation team's planned evaluation tasks in assessing the PY8 Moderate Income Kits Program.

Task 1: Request and Review Data from Utility

The evaluation team will review all program documents, including records of marketing and outreach efforts, instructional materials, and all other paperwork. The team's data request will include critical program documentation, such as:

- Program tracking database (all available data)
- Specification sheets for each item included in the energy efficiency kits
- Program instructional materials
- All program marketing and recruitment materials
- Any documentation of implementation processes

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

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

Task 2: Program and Implementation Staff Interviews

The evaluation team will perform qualitative interviews with AIC program staff, implementation contractors, and other relevant program stakeholders, focusing on assessing program goals and progress toward meeting these goals. Additionally, the evaluation team will explore the following:

- Program design and delivery
- Program strengths and weaknesses
- Outreach and marketing

Deliverable: Conducted interviews *Deliverable Date:* June 2016

Task 3: Impact Analysis

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

- Analyze program tracking database at the end of PY8 to verify participation
- Apply IL-TRM V4.0 unit savings to verified participation numbers to develop gross savings
- Apply verified installation rates and adjustment for deemed electric water heater saturation [i.e., 87%] from the PY7 Rural Efficiency Kits participant survey

- Apply SAG-approved NTGR to calculate net savings

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

Task 4: Reporting

The evaluation team will summarize and report on data drawn from the PY8 evaluation activities, provide a draft report for stakeholders' review, and incorporate responses into the final report.

Deliverable: Draft report *Deliverable Date:* November 2016

Deliverable: Final report *Deliverable Date:* December 2016

2.4.5 Budget and Schedule

Figure 4 and Table 12 summarize the timing of each evaluation activity. Table 12 also lists the budget associated with each task. The total budget for the PY8 evaluation of the Moderate Income Kits Program is $16,000.

Figure 4. Moderate Income Kits Program PY8 Evaluation Timeline

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

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

Table 12. Moderate Income Kits Program PY8 Evaluation Budget

Task	Evaluation Activity	Deliverable Date	Cost by Task
1	Request and Review Data from Utility	June 2016 and August 2016	$2,500
2	Program and Implementation Staff Interviews	June 2016	$1,500
3	Impact Analysis	September–October 2016	$5,000
4	Reporting	November 2016 and December 2016	$7,000
		Total Cost	$16,000

2.5 Residential Rural Efficiency Kits

2.5.1 Program Description

In PY6, AIC implemented the Residential Rural Efficiency Kits Program (Rural Kits Program) for the first time. The program provides unsolicited, direct-mail energy efficiency kits to its rural customers who may not have access to energy-efficient products (i.e., high efficiency light bulbs, faucet aerators, showerheads, and hot water temperature card thermometers [typically found in larger markets and big box stores]). The program seeks to increase sales and awareness of energy-efficient products, along with other energy-saving IPA program opportunities, and to reduce energy consumption.

CLEAResult and EFI deliver the Rural Kits Program. CLEAResult implements the program, and EFI mails branded kits and marketing materials directly to customers, drawing on lists created and screened by CLEAResult. The AIC logo brands each kit, which contains installation and usage instructions.

According to the program implementation plan, the savings target for the PY8 Rural Kits Program is 7,120 MWh.

2.5.2 Research Objectives

The PY8 Rural Kits Program evaluation seeks to estimate gross and net electric and natural gas savings associated with the program. The evaluation team will use the PY8 impact evaluation to answer the following questions:

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

The evaluation team also will conduct a limited process evaluation to explore how the program performed during its third year and to answer the following process-related questions:

3. Program Participation
    a. How many kits were distributed to participants?
4. Program Design and Implementation
    a. How did the program change since PY7?
    b. What implementation challenges occurred in PY8?
    c. What changes could AIC make to improve program effectiveness?

d. What quality assurance and quality control processes does the program have in place? Are they sufficient to ensure high quality products and that measures are installed by customers?

2.5.3 Methodology

A summary follows of the evaluation team's planned methods for conducting the PY8 Rural Kits Program evaluation.

Data Sources

Impact Analysis

The evaluation team will use the IL-TRM V4.0 to estimate the program's PY8 ex post gross savings. The team will review all data in the program tracking database (to verify participation), apply the IL-TRM V4.0 to estimate gross savings, and apply deemed NTGRs to participants. Using results from the PY7 participant survey the team will determine electric water heater saturation (87%) and installation rates (except for CFLs for which the evaluation team will apply the prescribed installation rate indicated in IL-TRM V4.0). The evaluation team will apply the installation rates listed in Table 13 in PY8.

Table 13. Rural Efficiency Kits Program PY8 Installation Rates

Measure Description	Installation Rate
14-watt CFLs	66%
23-watt CFLs	66%
1.0 GPM Bath Faucet Aerator	17%
2.0 GPM Dual Kitchen Faucet Aerator	20%
1.75 GPM Chrome High-Efficiency Showerhead	39%
Hot Water Temperature Card Thermometer	10%

Process Analysis

For the process evaluation, the team will draw on additional data sources, using information gathered from interviews with program management and implementation staff regarding program design and delivery changes since PY7, QC processes, satisfaction with the implementation processes, and PY8 goal achievement.

Sampling Plan

Impact Analysis

The evaluation team will analyze the census of records provided in the program tracking database.

Analysis Plan

The evaluation team will conduct impact and process evaluations of the Rural Efficiency Kits Program. Our analysis plan is outlined below.

Gross Savings

The team will use the program tracking database to verify participation and results from the PY7 participant survey to determine electric water heater saturation and installation rates. The team will calculate gross impacts by multiplying the number of verified measures by the deemed unit savings, electric water heater saturation, and installation rate for each measure, as indicated in the IL-TRM V4.0.

Net Savings

To calculate net savings for PY8, the evaluation team will apply deemed, SAG-approved NTGRs (listed in Table 14) to ex post gross savings for each measure.

Table 14. Rural Efficiency Kits Program PY8 NTGR

Measure Description	NTGR
CFLs	0.851
Showerheads	0.941
Faucet Aerators	1.004
Water Heater Setback	1.00

Process Findings

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

2.5.4 Tasks

This section describes the evaluation team's planned tasks in assessing the PY8 Rural Kits Program.

Task 1: Request and Review Data from Utility

The evaluation team will review all program documents, including records of marketing and outreach efforts, instructional materials, and all other paperwork. The data request will include critical program documentation, such as:

- Program tracking database (all available data)
- Specification sheets for each item included in the energy efficiency kits
- Program instructional materials
- All program marketing materials
- Any documentation of implementation processes

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

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

Task 2: Program and Implementation Staff Interviews

The evaluation team will perform up to three qualitative interviews with AIC program staff, implementation contractors, and other relevant program stakeholders, focusing on assessing program goals and progress toward meeting these goals. Additionally, the evaluation team will explore:

- Program changes since PY7, including progress in mapping a follow-up procedure for past participants
- Program design and implementation

- Program strengths and weaknesses
- Outreach, marketing, and customer education

Deliverable: Conducted interviews *Deliverable Date:* June 2016

Task 3: Impact Analysis

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

- Analyze the tracking database at the end of PY8 to verify participation
- Apply installation rates and electric water heater saturation ratios, determined through the PY7 participant survey
- Apply IL-TRM V4.0 unit savings to installed products to determine gross savings
- Apply SAG-approved NTGRs by measure to calculate net savings

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

Task 4: Reporting

The evaluation team will summarize and report on data from the PY8 evaluation activities, providing a draft report for stakeholders' review, and then incorporating resulting comments into the final report.

Deliverable: Draft report *Deliverable Date:* November 2016

Deliverable: Final report *Deliverable Date:* December 2016

2.5.5 Budget and Schedule

Figure 5 and Table 15 summarize the timing of each evaluation activity. Table 15 also lists the budget associated with each task. The total budget for the PY8 Rural Kits Program evaluation is $16,000.

Figure 5. Rural Efficiency Kits Program PY8 Evaluation Timeline

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

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

Table 15. Rural Efficiency Kits Program PY8 Evaluation Budget

Task	Evaluation Activity	Deliverable Date	Cost by Task
1	Request and Review Data from Utility	June 2016 and August 2016	$2,000
2	Program and Implementation Staff Interviews	June 2016	$1,500
3	Impact Analysis	September–October 2016	$5,500
4	Reporting	November 2016 and December 2016	$7,000
		Total Cost	$16,000

2.6 Small Business Direct Install

2.6.1 Program Description

The Small Business Direct Install (SBDI) Program began as a pilot in PY5 as part of the AIC Business Program and was fully launched in PY6 as an IPA program. The program offers AIC business customers in the DS-2 rate code energy-efficient measures, including CFLs, LED exit signs, occupancy sensors, and T12 to T8 retrofits.

There are two key entities involved in program delivery: small business energy advisors (SBEAs), and small business program allies (SBPAs). The SBEAs are program staff members who conduct outreach to customers and perform energy assessments for participants. They also work with SBPAs—program-qualified electrical contractors who install eligible measures and in many cases provide turnkey services by performing energy assessments as well. In PY8, Franklin Energy proposed and implemented a program model with the following key changes:

- **A La Carte Measure Offerings:** In PY7, the program grouped certain measures together and offered them in "packages" for different tiers of service. In PY8, the program offers each measure at an individual, pre-negotiated measure price.

- **Greater reliance on Program Allies to drive adoption:** In PY8, the program employs two Energy Advisors who cover the entire AIC service area as opposed to the seven Energy Advisors employed in PY7 with specific geographic regions. The responsibilities of Energy Advisors are largely the same in PY8 as in PY7 and include customer outreach, performing energy assessments, and managing program allies.

- **Excel-based assessment tool:** In PY8, assessments are completed using an electronic application workbook. The workbook allows for customization of estimated savings based on fixture operating hours and the customer's per-kWh delivery costs. In prior program years, assessors used an iPad with specialized software to perform, record, and track assessments, with savings estimates based on TRM-deemed measure savings.

In PY8, the SBDI Program is expected to provide 9,933 MWh in electric savings.

2.6.2 Research Objectives

This evaluation addresses the program's performance in PY8, which began in June 2015 and ends in May 2016. The objective of the PY8 SBDI Program evaluation is to provide estimates of gross and net electric savings associated with the program. In particular, the PY8 impact evaluation will answer the following questions:

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

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

3. What is the level of participant free-ridership and spillover for the program (for prospective application in PY10)?

In addition, we will conduct a process assessment of the SBDI Program designed to answer the following research questions:

4. Program Design and Implementation

    a. What changes, if any, were made to the program's design and implementation between PY7 and PY8? What was the rationale for these changes?

    b. What effect did program changes made between PY7 and PY8 have on program performance?

        i. How did the shift from "packages" of measures offered during PY7 to the a la carte individual measure offerings during PY8 impact participation in the program?

        ii. How did the shift from utilizing seven Energy Advisors, each responsible for a different geographic territory in PY7, to utilizing two Energy Advisors responsible for the entire AIC service territory in PY8 impact participation rates in the program across the various regions within the AIC service territory?

    c. Was the program implemented according to plan? If not, what changes were made and why?

    d. What implementation challenges occurred in PY8, and what was done to address them?

    e. What program marketing and outreach strategies did the program implement in PY8? What is the format of the outreach? How often does outreach occur? Are the messages clear and actionable?

f. What is the role of SBPAs and are they fulfilling it? Has the role of SBPAs changed since PY7? If so, what effect did the change in the SBPA role since PY7 have on program implementation and participation?

5. Program Participation

   a. How many customers and SBPAs participated in the program in PY8? Did participation meet expectations? If not, why not?

   b. What percentage of customers who receive an assessment go on to install program measures? What are the characteristics of assessment-only customers and full participants?

   c. What barriers exist to installing measures recommended through the assessment process? What changes, if any, could the program make to overcome these barriers?

6. Program Processes

   a. Are customers and SBPAs satisfied with the program processes in which they were involved?

   b. What do SBPAs feel are the barriers and benefits to participation?

   c. What quality assurance and quality control processes does the program have in place? Are they sufficient to ensure high quality projects?

   d. What are the impacts to customers, trade allies, AIC, and energy efficiency measure implementation and savings of having multiple small business energy efficiency program vendors operating in the AIC service territory?

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 PY8 SBDI Program evaluation.

Data Sources

Impact Analysis

The team will estimate ex post gross impacts by reviewing program tracking data and confirming correct application of the IL-TRM V4.0. We will also utilize a quantitative telephone survey to verify measure installation and installed measure characteristics for a sample of participants. We will calculate PY8 net savings by applying SAG-approved NTGRs to gross savings. We provide further detail in the Analysis Plan section below.

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

Process Analysis

The process analysis will utilize data from three data collection methods: 1) in-depth interviews, 2) a review of program materials and tracking data, and 3) a participant survey. In-depth interviews with AIC and

implementation contractor staff will provide the evaluation team with a comprehensive understanding of the program. In addition, interviews with SBPAs will help to assess program implementation and satisfaction. We also plan to field a telephone survey with SBDI Program participants to gather information about their experiences with the program.

Sampling Plan

Full and Assessment-Only Participant Surveys

The evaluation team will conduct telephone surveys with participants in the PY8 SBDI Program. Overall, we expect to complete the survey with a random sample of 70 full program participants, and up to 70 audit only participants drawn from the program-tracking database. This sampling strategy is designed to achieve 90/10 precision for the NTGR.

SBPA Interviews

We will make a final determination regarding the sampling strategy following in-depth interviews with program and implementation staff. SBPAs were required to re-apply to participate in the program in PY8 and the evaluation team does not yet know how many of the current SBPAs also participated in PY7. The team will also seek to understand the extent to which SBPAs perform the majority of assessments, a function that they largely took over from the Energy Advisors under the PY7 program. Once these questions are resolved, the team will outline its sampling strategy for this task.

Application Review and Onsite Visits

Based on findings from past evaluations of this program, the team will select two independent random samples of 10 SBDI projects each for documentation review and verification site visits. We plan to request and review project documentation, including any post-inspection records, for all of the projects selected to ensure that the tracking database is accurately capturing information gathered through the application process. For the projects selected for site verification, we will request and review project documentation in advance of visiting the customer facility to verify measure installation.

The application review and site visit process will each provide realization rates for each project included in the sample. From these results, we will determine an overall realization rate for the two samples, which will then be combined and extrapolated to the population of SBDI projects. The team chose this sampling strategy to achieve 90/10 precision for the impact values.

Analysis Plan

We outline our analysis plan for key impact- and process-related evaluation activities below.

Gross Impacts

To determine gross impacts associated with the SBDI Program, we plan to conduct a review of the program-tracking database to ensure the accurate application of the IL-TRM V4.0. In addition, engineers will conduct a limited number of site visits and application reviews to verify measure installation.

Net Impacts

We will estimate PY8 net savings by applying the SAG-approved NTGR to gross electric savings. The team will also conduct new NTGR research for prospective application in PY10.

Table 16. SBDI PY8 NTGRs

Measure Description	NTGR
All Measures	0.89

Process Findings

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

2.6.4 Tasks

This section outlines the planned tasks for our PY8 evaluation of the SBDI Program.

Task 1: Review Program Tracking Data and Materials

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

Deliverable: Data requests *Deliverable Date:* June 2016

Task 2: Program and Implementation Staff Interviews

We will conduct interviews with AIC and Franklin Energy staff to understand the SBDI Program's design and implementation in PY8. In total, we expect to complete interviews with two to three program staff members.

Deliverable: Conducted interviews *Deliverable Date:* June 2016

Task 3: SBPA Interviews

Interviews with SBPAs will focus on the SBPA application process, their role in providing turnkey services, feedback regarding how jobs are delegated to SBPAs, feedback on the new program processes and satisfaction with the program, and any ongoing barriers to AIC customer participation in the program. We plan to conduct up to 20 in-depth interviews with SBPAs who were active in the program during PY8. The total number of interviews will be determined by in-depth interviews with program implementer staff, as well as any SBPA tracking data we receive.

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

Task 4a: SBDI Full-Participant Survey

The evaluation team will conduct quantitative telephone interviews with customers who have participated in the SBDI Program in PY8. Full participant interviews will focus on free ridership and spillover, as well as program processes and satisfaction. As previously noted, our final sampling strategy will depend on the full population of projects, but we expect to complete approximately 70 interviews with full participants in the program to ensure sufficient responses to achieve 90/10 level of confidence and precision for the NTGR.

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

Task 4b: SBDI Assessment-Only Participant Survey

The evaluation team will conduct quantitative telephone interviews with customers who have received assessments through the SBDI Program in PY8, but have not installed recommended measures. Our final sampling strategy will depend on the final population of projects, but we expect to complete interviews with approximately 40 assessment-only customers. Interviews with assessment-only participants will focus on the assessment process and barriers to measure installation.

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

Task 5: Participation Analysis

The team will analyze the final PY8 database with a focus on overall participation, uptake, and conversion rates. In particular, we will analyze program uptake and conversion by business segment and geographic location.

Deliverable: Analysis in draft report *Deliverable Date:* September 2016

Task 6: Application Review and Onsite Visits

The team will select two random samples of 10 SBDI Program projects for application review and site visits. We plan to request and review project documentation, including any post-inspection records, for the 10 projects selected for application review to ensure that the tracking database is accurately capturing information gathered through the application process.

For the additional 10 randomly selected projects, the team will conduct onsite visits to assess measure installation. The application review and site visit process will provide realization rates for each project included in each samples. From these results, we will determine an overall realization rate for each sample, combine them and extrapolate the results to the population of SBDI projects.

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

Task 7: Impact Analysis

The team will use the IL-TRM V4.0 to calculate ex post gross savings associated with the measures installed through the program. In addition, we will draw on the application review and onsite visit findings to verify the installed measure inventory for a sample of projects. For net impacts, we will apply the SAG-approved NTGR presented in Table 11 to gross savings.

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

Task 8: Reporting

The team will provide a draft annual evaluation report containing process and impact results for the SBDI Program. We will also issue a final report based on comments received from AIC, ICC staff and stakeholders.

Deliverable: Draft report *Deliverable Date:* September 2016

Deliverable: Final report *Deliverable Date:* October 2016

2.6.5 Budget and Schedule

Figure 6 and Table 17 summarize the timing of each evaluation activity, as well as the budget associated with each task. In total, the PY8 budget for the SBDI Program is $174,100.

Figure 6. SBDI Program PY8 Evaluation Timeline

Task	Evaluation Activity	2016									
		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	Review Program Tracking Data and Materials										
2	Program & Implementation Staff Interviews										
3	SBPA Interviews										
4a	SBDI Full-Participant Survey										
4b	SBDI Assessment-Only Survey										
5	Participation Analysis										
6	Application Review and Onsite Visits										
7	Impact Analysis										
8	Reporting										

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

Table 17. SBDI Program PY8 Budget

Task	Evaluation Activity	Deliverable Date	Cost by Task
1	Review Program Tracking Data and Materials	June 2016	$5,300
2	Program & Implementation Staff Interviews	June 2016	$4,700
3	SBPA Interviews	June 2016	$17,200
4a	SBDI Full-Participant Survey	July 2016	$43,700
4b	SBDI Assessment-Only Survey	July 2016	
5	Participation Analysis	September 2016	$12,300
6	Application Review and Onsite Visits	September 2016	$39,200
7	Impact Analysis	September 2016	$28,200
8	Reporting	September 2016	$23,500
		Total Cost	**$174,100**

2.7 Small Business Refrigeration

2.7.1 Program Description

The Small Business Refrigeration Program was offered for the first time in PY8. The program provides direct install refrigeration/freezer measures to small business customers in AIC's DS-2 rate class. The program targets independent grocers, bars and restaurants, convenience stores, and liquor stores that have refrigerators and freezers for food and beverages, as well as refrigerated cases for other food or beverage items.

The Small Business Refrigeration Program is implemented by Staples Energy and uses a network of program allies. The participation process begins with a free energy assessment conducted by a program ally. Allies use Energy Snapshot, an electronic tablet-based assessment tool, to gather information about the business and to identify potential opportunities for the installation of energy-efficient refrigeration equipment. After the assessment is complete, the customer receives a report that includes a list of recommended measures. If a customer chooses to complete a project, the program pays incentives that cover between some and all of the cost of the measure, including installation cost.

According to the program implementation plan, the savings target for the PY8 Small Business Refrigeration Program is 15,344 MWh. However, the evaluation team understands from early discussions with implementation staff that the program achieved a much lower level of savings than originally expected in PY8.

2.7.2 Research Objectives

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

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

Given the limited scope of PY8 activities, we will conduct a limited process assessment based on our review of program materials and in-depth interviews with program staff, addressing the following questions:

3. 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?
4. Program Design and Implementation
    a. Was the program implemented as planned? If not, what changes were made, and why?
    b. What, if any, implementation challenges occurred in PY8, and how were they overcome?
    c. What are the impacts to customers, trade allies, AIC, and energy efficiency measure implementation and savings of having multiple small business energy efficiency program vendors operating in the AIC service territory?

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

2.7.3 Methodology

Below we provide a summary of the methods planned for the PY8 Small Business Refrigeration evaluation.

Data Sources

Impact Analysis

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

Process Analysis

The process analysis will utilize data from a review of program data and materials, as well as in-depth interviews with program staff, to assess program operations in PY8 and identify opportunities for improvement.

Sampling Plan

Impact Analysis

The evaluation team will examine all project records provided in the program tracking database. As such there is no sampling associated with our impact analysis.

Analysis Plan

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

Gross Impacts

To determine gross impacts associated with the Small Business Refrigeration Program, we plan to conduct a review of the program tracking database to ensure the accurate application of the IL-TRM V4.0.

Net Impacts

We will estimate PY8 net savings by applying the SAG-approved NTGR for the program to gross electric savings. Table 18 presents the approved NTGR.

Table 18. Small Business Refrigeration Program PY8 NTGR

Measure Description	NTGR
All Measures	0.86

Process Findings

Where possible, we will present qualitative process-related findings based on our analysis of the program materials, databases, and program staff interviews.

2.7.4 Tasks

This section outlines the planned tasks for our PY8 evaluation of the Small Business Refrigeration Program.

Task 1: Review Utility Data and Program Materials

The team will conduct a comprehensive review of all tracking data and program materials. This includes program marketing and implementation plans, program marketing materials, and extracts from the program tracking database. Based on initial conversations with AIC, we understand that final tracking data for this program will be available early in the summer of 2016. That assumption is reflected in the timeline outlined in the following sections.

Deliverable: Data requests *Deliverable Date:* Ongoing

Task 2: Program and Implementation Staff Interviews

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

Deliverable: Conducted interviews *Deliverable Date:* June 2016

Task 3: Impact Analysis

As noted throughout the plan, the team will use the IL-TRM V4.0 to calculate ex post gross savings associated with the measures installed through the program. For net impacts, we will apply the SAG-approved NTGR presented in Table 18 to gross savings.

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

Task 4: Reporting

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

Deliverable: Draft report *Deliverable Date:* July 2016

Deliverable: Final report *Deliverable Date:* August 2016

2.7.5 Budget and Schedule

Figure 7 and Table 19 summarize the timing of each evaluation activity. Table 19 also lists the budget associated with each task. In total, the PY8 budget for the Small Business Refrigeration Program evaluation is $40,000.

Figure 7. Small Business Refrigeration Program PY8 Evaluation Timeline

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

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

Table 19. Small Business Refrigeration Program PY8 Evaluation Budget

Task	Evaluation Activity	Deliverable Date	Cost by Task
1	Review Utility Data and Program Materials	Ongoing	$3,500
2	Program and Implementation Staff Interviews	May 2016	$4,000
3	Impact Analysis	July 2016	$10,900
4	Reporting	August 2016	$21,600
		Total Cost	**$40,000**

3. Non-Program Evaluation Tasks

As part of the PY8 evaluation of the stand-alone IPA programs, the evaluation team will perform a number of cross-cutting, non-program activities. The team will conduct these activities, which we describe in detail below, in conjunction with the 8-103/8-104 portfolio of energy efficiency programs administered by AIC.

3.1 Statewide Technical Reference Manual

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

3.2 Cost-Effectiveness Analysis

As in prior program years, the evaluation team will work with AIC and the IPA implementers, as needed, to audit their cost-effectiveness analysis based on PY8 program results. As part of this process, we will first prepare the model inputs, which consist of evaluated program savings as determined through the PY8 evaluation effort. Next, we will review AIC's assumptions for avoided costs, discount rates, measure cost information, administrative costs, and other relevant data. For a detailed discussion of the Total Resource Cost (TRC) test used by AIC, please see the PY8 AIC Evaluation Plan for the 8-103/8-104 programs.

3.3 Residential Cross-Cutting Research Activities

3.3.1 General Population Surveys

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

As nonparticipant spillover is likely to be a rare event, determining spillover requires a large sample (n=350) to ensure acceptable precision at a desired confidence level.[11] The team will draw a general population sample from AIC's residential customer database, using customer identification numbers to remove those participating in any AIC energy efficiency programs (including the Behavioral Modification Program).

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

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

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

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

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

3.4 Quality Assurance/Quality Control Collaboration

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

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

- Discuss portfolio evaluation plans with the evaluation team, providing advice as needed
- Participate in ongoing sampling and evaluation design efforts as requested; the team will meet with Dr. Ridge at least once a quarter to discuss ongoing activities
- Review draft evaluation reports to ensure quality and accuracy
- Provide the ICC with a report on the efforts in which he was involved; Dr. Ridge will provide this report as soon as the team has finalized all PY8 reports

4. Evaluation Budget

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

Table 20. PY8 IPA Evaluation Budget

Program/Task	Estimated Budget
Program-Specific Activities	
Residential Lighting	$290,000
Residential Behavioral Modification	$50,600
Residential Multifamily Major Measures	$47,300
Residential Moderate Income Kits	$16,000
Residential Rural Efficiency Kits	$16,000
Small Business Direct Install	$174,100
Small Business Refrigeration	$40,000
Total Program-Specific Efforts	*$634,900*
Statewide Technical Reference Manual	$25,200
TRM NTG Working Group	$29,400
Cost-Effectiveness Analysis	$14,700
Residential Cross-Cutting Research Activities	$26,460
QA/QC Coordination	$12,600
Other Non-Program Activities (i.e., Planning, SAG, Collaboration, etc.)	$89,502
Total Non-Program Efforts	*$196,560*
Total	$831,862

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