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2019 Evaluation Plan

Ameren Illinois Company Energy Efficiency Programs

Final February 20, 2019



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1. Introduction

Ameren Illinois Company (AIC) hired the team of Opinion Dynamics, Navigant Consulting, The Cadmus Group, and Michaels Energy to perform impact and process evaluations for AIC's portfolio of energy efficiency programs implemented between January and December 2019. As part of the 2019 evaluation effort, the team will assess AIC's Residential, Business, and Voltage Optimization Programs, which are further split into a number of initiatives detailed below:

- Residential Program
 - Retail Products/Third Party Program
 - Income Qualified
 - Public Housing
 - Residential Behavioral Modification
 - Heating and Cooling (HVAC)
 - Appliance Recycling
 - Multifamily
 - Direct Distribution of Efficient Products
- Business Program
 - Standard
 - Custom
 - Retro-Commissioning (RCx)
 - Streetlighting
 - Business Behavior Modification
- Voltage Optimization Program

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

2. **Program-Specific Evaluation Plans**

2.1 Residential Program

In this section, we outline the anticipated evaluation activities for each of the Residential Program initiatives. AIC's planned Residential Program provides services to residential customers, and is made up of eight initiatives:

- Retail Products/Third-Party Program
- Income Qualified
- Public Housing
- Residential Behavioral Modification

- Heating and Cooling (HVAC)
- Appliance Recycling
- Multifamily
- Direct Distribution of Efficient Products

These initiatives are largely consistent with AIC's 2018 Residential Program. The only significant change expected to the Residential Program in 2019 relates to the Retail Products Initiative, which is expected to be delivered by a third party beginning in 2019. We expect this change to be made in fulfillment of the statutory requirement in the Future Energy Jobs Act (FEJA), which requires that program administrators to fund an electric third-party energy efficiency program annually beginning in 2019. As of the delivery of this plan, no final determination of the form of this program has been made, but we expect that this program will take a form similar to the previously existing Retail Products Initiative.

In accordance with Illinois evaluation requirements, we will deliver a draft annual Residential Program impact evaluation report on March 15, 2020, covering the 2019 program year. This report will include information on 2019 program participation, 2019 ex post gross and net impacts for all Residential Program initiatives, as well as initiative and program-level weighted average measure life (WAML) and cumulative persisting annual savings (CPAS) for the Program.

In addition, we will deliver stand-alone memos summarizing results of process and NTGR research, where applicable. At the close of the 2019 evaluation, we will deliver an integrated process/forward looking evaluation report that rolls up all the stand-alone memos relevant to the 2019 Residential Program.

| Deliverable | Date |
|---|----------------|
| Draft Annual Residential Program Impact Evaluation Report | March 15, 2020 |
| Final Annual Residential Program Impact Evaluation Report | April 30, 2020 |
| Annual Integrated Impact Report | April 30, 2020 |
| Annual Integrated Residential Program Process/Forward Looking Evaluation Report | May 31, 2020 |

Table 1. Schedule of 2019 Residential Program Evaluation Deliverables

2.1.1 Retail Products

The objective of the Retail Products Initiative is to increase awareness and sales of high efficiency products through retail and online stores. The Initiative provides discounts for the following products:

Omnidirectional LEDs

- Specialty LEDs
- Advanced Thermostats
- Tier 1 Advanced Power Strips
- Variable-Speed Pool Pumps

Customers can receive a rebate for their purchase of qualifying products through the following channels:

- By receiving a point-of-sale discount on purchases of qualified LEDs at participating retailers;
- By submitting an online or mailed-in rebate application for the purchase of qualified advanced thermostats or variable-speed pool pumps purchased at a retail location or online retailer;
- By registering online and downloading a coupon for qualified advanced thermostats that can be used at the check-out at select in-store and online retailers; and
- By purchasing discounted LEDs, advanced thermostats, or advanced power strips through the Ameren Illinois Online Marketplace.

The implementation contractor will work with participating retailers to promote qualifying products through instore marketing, special product placement, and product demonstrations. Implementation staff will also visit participating retailers to provide sales associates with training on how to best promote the Initiative with customers.

Evaluation Approach

The assessment of the 2019 Retail Products Initiative includes both process and impact analyses and also looks to answer several forward-looking questions, as outlined in the following sections.

Research Objectives

Impact Questions

- 1. What were the estimated gross energy and demand savings from this initiative?
- 2. What were estimated net energy and demand savings from this initiative?
- 3. What are the installation rates of new products introduced to the Initiative in 2019, if any?
- 4. What are NTGRs of new products introduced to the Initiative in 2019, if any?

Process Questions

- 5. Was initiative implementation effective and streamlined?
- 6. In what areas could the Initiative improve to increase its overall effectiveness, or ease of implementation?
- 7. How did the various rebate channels perform relative to one another? Did rebated measures align well with the channels through which they were offered?

8. Were customers satisfied with the Initiative, products, and participation channels?

Evaluation Tasks

Table 2 summarizes the 2019 evaluation activities planned for the Retail Products Initiative.

| Activity | Impact | Process | Forward Looking | Details |
|---|--------------|--------------|--------------------|---|
| Initiative Staff Interviews | | \checkmark | | Conduct interviews with AIC and implementation contractor staff to understand initiative design and implementation. |
| Initiative Materials and Database Review | \checkmark | \checkmark | | Review all initiative tracking data, relevant administrative reports, and marketing and outreach materials to document and provide feedback on initiative design with a focus on any changes introduced in 2019. |
| Process Models | | ~ | | For any additional products or channels introduced in 2019, we will develop process models based on staff interviews and material review. If executed, the process models will document key decision-points and potential barriers and identify critical initiative processes that require evaluation. |
| Participant Survey | ¥ | V | ~ | For any additional non-lighting products introduced in 2019, we will conduct quarterly participant interviews with participating customers. If executed, participant survey results will be used to estimate NTGRs, installation rates, and participant satisfaction and use of the newly introduced products. |
| Impact Analysis | ~ | | ~ | Assess the initiative tracking data for accuracy and completeness. Calculate gross and net impacts using the IL-TRM V7.0 and SAG-approved NTGR values for 2019. |

Table 2. Summary of Retail Products Initiative Evaluation Activities for 2019

We describe each of these activities in detail below.

Task 1. Initiative Staff Interviews

The evaluation team will conduct up to four in-depth phone interviews with AIC and implementation staff involved in the design and administration of the Retail Products Initiative. We will conduct two rounds of interviews. We will schedule the first round at the beginning of the program year to understand initiative design elements that could impact evaluation methods. We will conduct another round of interviews towards the end of the program year to gather feedback on the initiative performance and implementation challenges that occurred during the year. These interviews will allow us to fully explore the details of the initiative design and implementation and to examine the perspective of the people who are in direct contact with participating retailers and processing initiative payments and data. We will conduct the interviews over the telephone using experienced Opinion Dynamics staff. We will record and transcribe all interviews to facilitate analysis.

Deliverable: Completed interviews

Deliverable Date: April and December 2019

Task 2: Initiative Materials and Database Review

The evaluation team will conduct a comprehensive review of all initiative materials. This includes initiative implementation plans, marketing plans, QA/QC documents, all materials provided to retailers, as well as mass marketing and in-store materials. We expect to submit a request at the beginning of the program year to obtain

materials related to initiative design. We will request additional materials at the end of the program year to ensure we have a complete set of materials used throughout the year. These activities will inform our process evaluation.

Deliverable: Data requests

Deliverable Date: April and November 2019

Task 3: Process Models

For any additional products or delivery channels introduced in 2019, we will develop process models using information that we gain from initiative staff interviews and materials review. The models will document key decision-points and identify critical initiative processes that require evaluation. The models will also document initiative goals, the barriers to achieving them, and the activities that the initiative implementer is using to overcome them. We will construct separate models for each measure introduced in 2019 and for each additional or altered channel.

Deliverable: Draft and final process models

Deliverable Date: June 2019

Task 4: Participant Survey

For any additional products introduced in 2019, the evaluation team will conduct a rolling survey with participating customers. If executed, we will use these surveys to estimate NTGRs and installation rates for each measure. We will also measure participant satisfaction with the initiative measures and processes, as well as how customers are using the discounted products. We will work with initiative staff to determine the best approach to fielding based on the availability of customer contact information. Ideally, we would conduct surveys every few months with recent participants to minimize the time between initiative participation and survey date. The number of target survey completes by measure type will depend on the number of participants, which is unknown at this point. We will target enough completes to achieve 10% precision at 90% confidence for NTGRs and installation rates by measure type.

Deliverable: Draft and final data collection instruments

Deliverable Date: May 2019

Task 5: Impact Analysis

The evaluation team will review all records in the initiative database. We will check to ensure that the correct savings assumptions have 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.

We will use the savings parameters outlined in the IL-TRM V7.0 to estimate gross energy and demand savings for each measure. The evaluation team will use these values and data from the initiative tracking database to calculate gross initiative savings. The evaluation team will apply verified installation rates from the IL-TRM V7.0, as listed in Table 3.

| Measure Description | Installation Rate |
|------------------------------|-------------------|
| Omnidirectional LEDs | 78.4% |
| Specialty LEDs | 84.0% |
| Advanced Thermostats | 100.0% |
| Tier 1 Advanced Power Strips | 69.0% |

Table 3. Retail Products Initiative Installation Rates

| Measure Description | Installation Rate |
|---------------------------|-------------------|
| Variable Speed Pool Pumps | 100.0% |

For all measures rebated by the Retail Products Initiative, we will calculate 2019 ex post net savings by applying SAG-approved NTGRs to ex post gross electric and gas savings (see Table 4). For any products introduced in 2019 for which a SAG-approved NTGR is not available, we will conduct secondary research into the NTGRs used for these measures in other jurisdictions and provide recommended NTGRs for each measure for use in 2019. We will also use the participant survey to estimate NTGR for these new measures to support a recommendation for future years of the Initiative.

Table 4. Retail Products Initiative 2019 NTGRs

| Measure Description | NTGR |
|--|------|
| LED Lighting | 0.69 |
| Tier 1 Advanced Power Strips | 0.86 |
| Tier 1 Advanced Power Strips (Income Eligible) | 1.00 |
| Variable Speed Pool Pumps | 0.80 |
| Advanced Thermostats | N/Aª |

^a No NTGR because savings are deemed net savings.

Deliverable: Draft annual impact evaluation report

Deliverable Date: March 15, 2020

Task 6: Reporting

The evaluation team will include 2019 initiative impacts in the draft Residential Program annual impact evaluation report. We will incorporate our responses to stakeholder feedback in a final report. We will submit separate deliverables containing results from process and forward-looking research tasks.

| Deliverable: Chapter in draft annual Residential Program impact report | Deliverable Date: March 15, 2020 |
|--|----------------------------------|
| Deliverable: Chapter in final annual Residential Program impact report | Deliverable Date: April 30, 2020 |

Evaluation Budget and Timeline

Table 5 summarizes the timing and budget associated with each evaluation activity.

| Table 5. Retail Products Ini | itiative 2019 Evaluation | Schedule and Budget |
|------------------------------|--------------------------|---------------------|
|------------------------------|--------------------------|---------------------|

| Task | Evaluation Activity | Deliverable Date | Budget |
|------|--|------------------------------|---------------|
| 1 | Initiative Staff Interviews | January and December 2019 | \$8,100 |
| 2 | Initiative Materials and Database Review | February and November 2019 | \$6,700 |
| 3 | Process Models | June 2019 | \$5,200 |
| 4 | Participant Survey | June 2019 | \$43,900 |
| 5 | Impact Analysis | February 2020 and March 2020 | \$38,200 |
| | Draft Annual Impact Report | March 15, 2020 | |
| 6 | Comments from AIC and ICC Staff | Within 15 Business Days | ¢16 900 |
| 0 | Final Annual Report | April 30, 2020 | 40,000 |
| | Process Deliverables | TBD | |
| | | Total Budget | \$148,900 |

2.1.2 Income Qualified

The Income Qualified (IQ) Initiative is a home energy diagnostic and whole-house retrofit offering. The target market for the initiative is low- to moderate-income AIC customers with a household income up to 300% of federal poverty guidelines for household size. Typical measures installed through the IQ Initiative include energy efficient light bulbs, low-flow faucet aerators and showerheads, HVAC equipment (e.g., furnaces and central air conditioners), programmable thermostats, and building envelop measures. AIC has offered the IQ Initiative since PY3 (June 2010 to May 2011), but several important initiative design and implementation changes occurred beginning in 2018:

- Community action agencies (CAAs) provided recruitment and implementation services for the Initiative (in addition to AIC implementation contractor staff and trade allies);
- Multifamily properties with at least 50% low-income units were newly eligible to participate; and
- The Initiative provided no-cost energy savings kits through community events and other direct distribution efforts.

Evaluation Approach

Research Objectives

The 2018 evaluation of the Initiative includes both process and impact analyses as outlined in the following sections.

Impact Questions

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

Process Questions

- 3. Initiative Design and Implementation Effectiveness
 - a. What were the Initiative's marketing and outreach efforts?
 - b. Is the Initiative being implemented according to design?
 - c. Have there been any modifications to design or implementation since the Initiative was launched in 2018?
 - d. Did implementation and design changes/enhancements in 2018 or 2019 achieve their intended outcomes? What areas for improvement exist?
 - e. What implementation challenges occurred in 2019, if any, and how were they overcome?
 - f. What successes and challenges, if any, has the inclusion of CAAs created? What are the opportunities for improvement?

- 4. Initiative Participation
 - a. How many single family homes received audits? How many received shell measures? Has participation met expectations? If not, why?
 - b. What was the distribution of CAA and non-CAA single family projects?
 - c. How many multifamily properties and units received audits? How many received shell measures? Has participation met expectations? If not, why?
 - d. How many energy savings kits were distributed?

Evaluation Tasks

This section outlines the planned tasks for the 2019 evaluation of the Income Qualified Initiative.

| Activity | Impact | Process | Forward Looking | Details |
|--|--------|--------------|--------------------|--|
| Initiative Staff Interviews | | ~ | | Explore changes made since 2018 and gather information about initiative marketing, implementation, and 2019 performance to ensure the evaluation plan covers current initiative design and operations. |
| CAA Interviews | | \checkmark | | Collect feedback from CAAs on their experiences, successes, and challenges implementing projects through the Initiative. |
| Interim Process Memo | | ~ | | Develop interim memo of high priority findings related to initiative design and implementation, coordination among implementers, and the incorporation of CAAs into the Initiative. |
| Initiative Tracking Data Review | ~ | | | Gather initiative data to develop the site visit sample, perform engineering desk reviews, and ensure that the tracking data includes all necessary information for the impact analysis. |
| On-Site Verification Visits and Desk Reviews | ~ | ~ | | Conduct site visits to verify measure installation, assess the quality of installation in participating homes, and identify any missed opportunities for additional savings. |
| Impact Analysis | ✓ | | \checkmark | Estimate gross impacts for 2019 through review of the initiative tracking database and application of the IL-TRM V7.0 and net impacts using the SAG-approved NTGR of 1.0. |

Table 6. Summary of Income Qualified Initiative Evaluation Activities for 2019

We describe each of these activities in detail below.

Task 1. Initiative Staff Interviews

We will conduct two rounds of interviews with the AIC initiative manager and AIC implementation contractor staff. We will schedule the first round in Q2 2019 and use the process model developed in the 2018 evaluation as a foundation to discuss planned or executed changes to initiative design and implementation. We will also discuss planned marketing and outreach efforts and any challenges initiative staff have faced or anticipate they will face in 2019. Next, we will conduct another round of interviews in Q4 2019 to get feedback on initiative performance and implementation challenges that occurred during the year. We anticipate conducting five interviews per round (ten total).

Deliverable: First round of completed interviews

Deliverable: Second round of completed interviews

Task 2. CAA Interviews

The Initiative experienced delays in onboarding CAAs into the Initiative in 2018 as compared to plans, resulting in a limited set of evaluation tasks related to CAAs that included in-depth interviews with three participating CAAs and an exploration of the challenges and opportunities around braided funding. In 2019, we expect that more CAAs will begin participating in the Initiative, and therefore the evaluation team will conduct another phase of in-depth interviews with CAAs. These interviews will capture feedback from CAAs on their experiences, successes, and challenges implementing projects through the initiative. We will avoid duplicative efforts and questioning by building on findings from the 2018 CAA interviews and braided funding research.¹

The evaluation team will conduct up to ten in-depth interviews (the final target depends on the number of agencies involved) and aim for a mix of agencies with different levels of initiative participation (i.e., projects completed). We will request updated lists of CAAs, contact information, and number of projects completed todate in April 2019.

Deliverable: Data request

Deliverable: Draft and final interview guides

Task 3. Interim Process Memo

The evaluation team will synthesize results of interviews with AIC staff, implementers, and CAAs to deliver an interim memo of high priority findings related to initiative design and implementation, coordination among implementers, and the incorporation of CAAs into the Initiative. This memo will also include an updated process model for the Initiative.

Deliverable: Draft and final interim memo

Deliverable Date: August 2019

Task 4. Initiative Tracking Data Review

The evaluation team will review the tracking database to assess initiative participation as an input to the impact evaluation. There will be two data requests associated with this task. The first, in July 2019, will be for all initiative participant tracking data through June 2019 and detailed project documentation (e.g., applications, invoices) for a sample of 100 projects (see next task). The evaluation team will use this data to develop the site visit sample, perform engineering desk reviews, and ensure that the tracking data includes all necessary information for the impact analysis. The second data request, in January 2020, will be for final 2019 initiative tracking data.

Deliverable: Data requests

Deliverable Date: July 2019 and January 2020

Deliverable Date: April 2019 Deliverable Date: December 2019

Deliverable Date: April 2019

Deliverable Date: May 2019

Task 5. On-Site Verification Visits and Desk Reviews

Single family on-site visits will also be prioritized for 2019 given the new involvement of the CAAs in implementing the Initiative. The sample frame will include all single-family projects completed in 2018 and the first half of 2019. The visits will verify measure installation, assess the quality of installation in participating homes, and identify any missed opportunities for additional savings. We expect to complete approximately 40 site visits, but the specific targets will depend on the measure mix in the tracking data.

Prior to conducting site visits, we will perform engineering desk reviews of project documentation (e.g., applications, invoices) to familiarize ourselves with the properties and projects and ensure the accuracy of initiative tracking data. To allow for enough time to review documentation before conducting site visits, the evaluation team will request documentation for a sample of approximately 100 projects, but we will only review documentation for recruited sites.

We will develop an interim memo that summarizes desk review and site visit findings and provides comparisons of CAA and non-CAA projects where possible.

Deliverable: Draft and final interim memo

Deliverable Date: August 2019

Task 6. Impact Analysis

The 2019 evaluation will include gross and net impact estimates. The impact evaluation team will use savings algorithms from the IL-TRM V7.0, and data inputs from the initiative tracking database to estimate ex post gross savings. In addition to the site visits, we will conduct desk reviews of all projects selected for on-site verification. Finally, we will calculate 2019 net savings by applying the SAG-approved NTGR of 1.0 to ex post gross electric and gas savings.

Deliverable: Results provided in annual impact evaluation report Deliverable Date: March 15, 2020

Task 7. Reporting

The evaluation team will provide all impact findings in the Residential Program annual impact evaluation report in March 2020. The evaluation team will provide a draft report for AIC and ICC staff review and then deliver a final report that incorporates any comments from the review.

Deliverable: Chapter in draft annual Residential Program impact report Deliverable Date: March 15, 2020

Deliverable: Chapter in final annual Residential Program impact report Deliverable Date: April 30, 2020

Evaluation Budget and Timeline

Table 7 summarizes the timing and budget associated with each evaluation activity.

| Table 7 | Income Qualified | Initiative 2019 | Evaluation | Schedule and | Budget |
|---------|------------------|-----------------|------------|--------------|--------|
|---------|------------------|-----------------|------------|--------------|--------|

| Task | Evaluation Activity | Deliverable Date | Budget |
|------|--|----------------------------|----------|
| 1 | Initiative Staff Interviews | April and December 2019 | \$15,400 |
| 2 | CAA Interviews | April and May 2019 | \$16,400 |
| 3 | Interim Process Memo | June 2019 | \$7,600 |
| 4 | Initiative Tracking Data Review | July 2019 and January 2020 | \$9,700 |
| 5 | On-Site Verification Visits and Desk Reviews | August 2019 | \$76,000 |

| Task | Evaluation Activity | Deliverable Date | Budget |
|------|---------------------------------|-------------------------|-----------|
| 6 | Impact Analysis | March 2020 | \$48,100 |
| | Draft Annual Impact Report | March 15, 2020 | |
| 7 | Comments from AIC and ICC Staff | Within 15 Business Days | \$19,200 |
| | Final Annual Impact Report | April 30, 2020 | |
| | | Total Budget | \$192,400 |

2.1.3 Public Housing

The Public Housing Initiative offers home energy diagnostic services and whole-house retrofits for single and multifamily properties owned by government entities (i.e., federal, state, and municipal housing authorities). The Initiative serves communities where the average household income is at or below 300% of Federal Poverty Guidelines. Notably, all single or multifamily properties within AIC territory that are owned or managed by PHAs are eligible to participate in the Initiative.

Leidos is the overall implementer of the initiative, while CMC Energy leads the day-to-day implementation of the initiative and coordinates with participating customers, namely PHA staff, with regard to participation, as well as scheduling and conducting energy audits. Based on the results of the audit, CMC Energy will develop a statement of work and once approved, will install direct install measures such as LEDs, low-flow faucet aerators and showerheads, pipe wrap, programmable or advanced thermostats, and Tier 1 advanced power strips. Should participating customers decide to install envelope measures (i.e., air sealing and insulation), Leidos will work with program allies to schedule and complete their installation.²

Evaluation Approach

The 2019 evaluation of the Public Housing Initiative includes both process and impact analyses as outlined in the following sections.

Research Objectives

Impact Questions

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

Process Questions

- 3. Initiative Design and Implementation Effectiveness
 - a. How and why do PHAs decide to invest in EE upgrades?
 - b. Was the Initiative implemented according to design?
 - c. What were the Initiative's marketing and outreach efforts?

² In 2018, the PHA Initiative only offered air sealing and insulation. According to program staff, participants interested in larger energy efficient upgrades such as HVAC are referred to one of the Business Programs (i.e., the Standard or Custom Initiatives).

- d. What implementation challenges occurred in 2019 and how were they overcome?
- 4. Initiative Participation
 - a. How many properties and units received audits? How many received shell measures? Has participation met expectations? If not, why?
 - b. How will new participants be recruited as the Initiative grows?
 - c. Are building residents receiving education on how to save energy?
 - d. How many energy savings kits were distributed? Has participation met expectations? If not, why?
 - e. What were the barriers to installation of incentivized shell measures after receiving an audit? What specific needs and barriers to multifamily public housing properties have?

Evaluation Tasks

Table 8 summarizes the 2019 evaluation activities conducted for the Public Housing Initiative.

| Activity | Impact | Process | Details |
|---|--------------|--------------|---|
| Initiative Staff Interviews | | \checkmark | Explore initiative implementation, changes to design, and future plans for the Public Housing Initiative. |
| Initiative Design, Materials, and Database Review | \checkmark | \checkmark | Review of implementation plans, marketing plans and collateral, and the initiative tracking database. |
| Impact Analysis | \checkmark | | Calculate gross and net impacts using the IL-TRM V7.0 and SAG- approved NTGR value of 1.0. |

Table 8. Summary of Public Housing Initiative Evaluation Activities for 2019

We describe each of these activities in detail below.

Task 1. Initiative Staff Interviews

We will conduct two sets of interviews with AIC staff, Leidos, and CMC Energy implementation staff. The first set, in June 2019, will be used to understand changes to initiative design and implementation, successes and challenges encountered in the first half of the year, and identify evaluation priorities. The second set, in January 2020, will address final initiative performance. We anticipate conducting three interviews per set, for a total of six.

Deliverable: Mid-year completed interviewsDeliverable Date: June 2019Deliverable: End-of-year completed interviewsDeliverable Date: December 2019

Task 2. Initiative Design, Materials, and Database Review

The evaluation team will review initiative materials, including implementation plans, marketing plans and collateral, and initiative tracking databases to understand and describe initiative implementation and provide recommendations for improvement, where applicable. This task will include two data requests. The first, in July 2019, will request the following:

Documentation or materials discussed during the initiative staff interviews, as needed;

- Single family and multifamily participant tracking data through June 2019; and
- A list of housing authority and community agency partners, count of projects completed by agency, and key contacts

The evaluation team will use this information to support the impact analyses and confirm accurate and sound tracking of initiative performance. The second data request in January 2020 will be for the final initiative tracking data and will inform the impact analysis.

Deliverable: Initial data request

Deliverable: Final tracking data request

Task 3. Impact Analysis

The 2019 evaluation will include gross and net impact estimates conducted over two waves—one midway through the 2019 program year and one after the initiative closes at year end. The impact evaluation team will use savings algorithms from the IL-TRM V6.0, and data inputs from the initiative tracking database to estimate ex post gross savings. We will calculate 2019 net savings by applying the SAG-approved NTGR of 1.0 to ex post gross electric and gas savings.

Deliverable: Results provided in annual impact evaluation report

Deliverable Date: March 2020

Task 4. Reporting

The evaluation team will provide all impact and process findings in the annual impact report in March 2020. The evaluation team will provide a draft report for AIC and ICC staff review and then deliver a final report that incorporates any comments from the review.

| Deliverable: Chapter in draft annual Residential Program impact report | Deliverable Date: March 15, 2020 |
|--|----------------------------------|
| Deliverable: Chapter in final annual Residential Program impact report | Deliverable Date: April 30, 2020 |

Evaluation Budget and Timeline

Table 9 summarizes the timing and budget associated with each evaluation activity.

| Task | Evaluation Activity | Deliverable Date | Budget |
|------|---|-------------------------|----------|
| 1 | Initiative Staff Interviews | June 2019, January 2020 | \$9,000 |
| 2 | Initiative Design, Materials, and Database Review | July 2019, January 2020 | \$12,000 |
| 3 | Impact Analysis | March 2020 | \$33,500 |
| | Draft Annual Impact Report | March 15, 2020 | |
| 4 | Comments from AIC and ICC Staff | Within 15 business days | \$30,700 |
| | Final Annual Impact Report | April 30, 2020 | |
| | | Total Budget | \$85,200 |

Deliverable Date: July 2019

Deliverable Date: January 2020

2.1.4 Residential Behavioral Modification

AIC administers the Residential Behavioral Modification Initiative as a part of the Residential Program to reduce its residential customers' energy consumption. Initially launched in August 2010, the Initiative seeks to:

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

Traditionally, the Initiative has included three forms of treatment³: a hard-copy printed home energy report (HER) mailed six times a year to a treatment customer's billing address; an electronic HER (eHER) which is also sent six times a year to a treatment customer so long as AIC has the customer's email address and the customer has not opted out of receiving emails from AIC; and an online Home Energy Portal, which provides all AIC customers (both treatment and control) with information about their energy usage and tips to adopt energy efficient behaviors. The portal displays many of the same energy use statistics as provided to treatment customers in their HERs and eHERs.

Since 2018, AIC contracted with Tendril, whose initiative delivery also that offers two additional forms of customer engagement: High Usage Alerts (HUAs) and energy challenges. HUAs are sent to treatment customers who, according to the individual customer's home characteristics and upcoming weather forecasts, are at risk of experiencing a spike in energy usage in a given month. The energy challenges are offered to all AIC treatment and control customers with an email address on file that have not opted out of receiving emails from AIC. Information about energy challenges is sent by email and is included on the online portal.

Evaluation Approach

The 2019 evaluation of the Residential Behavioral Modification Initiative includes an impact analysis, a persistence study, and a limited process analysis as outlined below. To support these efforts, the evaluation team plans to interview the AIC initiative manager and implementation team, review relevant background materials and documentation, conduct an equivalency assessment to ensure similar energy consumption and other key characteristics across treatment and control customers in the new cohort, and conduct a consumption analysis, joint savings analysis, and make savings adjustments to provide net adjusted energy and demand savings attributable to the initiative.

Research Objectives

Impact Questions

The 2019 Residential Behavioral Modification Initiative evaluation is focused on the assessment of initiative impacts and is structured to answer the following research questions:

1. Are the new treatment and control groups for 2019 equivalent?

³ The Residential Behavioral Modification Initiative uses a randomized control trial (RCT) design which randomly selects customers for treatment through the initiative with the remaining customers serving as a group of control customers.

- 2. What are the estimated electric energy, electric demand, and therm savings from the Initiative in 2019?
- 3. Do estimated savings need to be adjusted due to the treated population's participation in other AIC initiatives? If yes, by how much do savings need to be adjusted?
- 4. What are initiative savings for customers experiencing a stoppage in treatment?⁴
- 5. What is the difference in initiative savings for customers experiencing a *stoppage* in treatment that received HERs for a longer duration compared to customers who received the report for a shorter duration? Is there a difference in savings persistence across cohorts?
- 6. What is the difference in electric and gas initiative savings for customers experiencing a *stoppage* in treatment? In other words, what is the difference in the potential persistence factors for application by fuel type?

Process Questions

- 7. How has the Initiative changed since 2018 when AIC switched implementers after the Transition Period?
- 8. What process did the implementer use to select the 2019 cohort?
- 9. Are there any lessons learned from 2018 that led the implementer to make changes to the Initiative's design and implementation in 2019?

Evaluation Tasks

To achieve our research objectives, the team will complete a series of evaluation tasks as outlined in Table 10. Additional detail regarding each task can be found following the table.

| Activity | Impact | Process | Forward Looking | Details |
|---|--------------|---------|--------------------|---|
| Initiative Material and Database Review | \checkmark | ~ | | Review materials to assess initiative design, implementation, and operations. |
| Initiative Staff Interviews | \checkmark | ~ | | Explore how the initiative has changed since 2018. |
| Treatment/Control Randomization | \checkmark | | | Randomize the selection of customers into treatment and control groups. |
| Equivalency Analysis | \checkmark | | | Confirm that the random assignment led to relatively comparable treatment and control groups. |
| Consumption Analysis | ~ | | | Conduct consumption analysis to quantify the changes in energy use between the treatment and control groups and apply a coincidence factor to energy savings to estimate demand savings. |

Table 10. Summary of Residential Behavioral Modification Initiative Evaluation Activities for 2019

⁴ As a result of changes in AIC's portfolio of energy efficiency programs beginning in 2018, a significant number of AIC customers who received home energy reports prior to 2018 will no longer be receiving home energy reports in 2018 and beyond. This creates the opportunity for a natural experiment that can be used to assess persistence of behavioral savings.

| Activity | Impact | Process | Forward Looking | Details |
|------------------------|--------------|---------|--------------------|---|
| Joint Savings Analysis | ~ | | | Determine the savings due to participation in other AIC residential initiatives and make adjustments to account for them. |
| Savings Adjustments | \checkmark | | | Calculate adjusted lifetime savings per the IL-TRM V7.0. |
| Persistence Study | ~ | ~ | \checkmark | Estimate the difference in savings between customers experiencing a <i>stoppage</i> in treatment compared to those who continue to receive HER treatment. |

Task 1. Initiative Material and Database Review

The evaluation team will review the initiative tracking database, monthly progress reports showing achievements towards savings goals, and other initiative materials, including a sample of the 2019 HERs. Through this review the team will determine if there were any gaps present in the data, particularly around information required for the impact analysis.

Deliverable: Data request

Deliverable Date: November 2019

Task 2. Initiative Staff Interviews

The team will conduct telephone interviews with key staff from AIC and the implementation contractor. The interviews will provide the evaluation team with a comprehensive understanding of the Initiative and its implementation, including insights into the daily workings of the Initiative, changes made in 2019 based on lessons learned from the implementation of the Initiative in 2018, and key successes and challenges.

Deliverable: Completed interviews

Deliverable Date: June 2019

Task 3a. Treatment/Control Randomization

Prior to the start of the 2019 program year, AIC and Tendril coordinated with the Opinion Dynamics evaluation team to support the selection of a cohort for 2019. Once the cohort was selected, the implementer provided the set of customers and asked the evaluation team to randomly assign customers into treatment and control groups.

Deliverable: Randomization of cohort into treatment/control groups

Deliverable Date: December 2018

Task 3b. Equivalency Analysis

One of the first steps prior to estimating the Initiative's impacts is to conduct an equivalency analysis to ensure that, prior to HER treatment, the treatment and control groups are comparable in terms of energy usage and other key characteristics. This review strengthens the internal validity and defensibility of the research design by ensuring that the random assignment of customers to treatment and control groups resulted in relatively comparable groups. To assess equivalency, we will utilize Experian data appended to the treatment and control groups' pre-treatment period (pre-period) monthly usage data to compare pre-period energy usage across key demographic characteristics. If the groups differ in terms of pre-period energy usage, we will conduct a review and comparison of the new implementer's data cleaning and modeling methods to our data cleaning and modeling methods to understand why potential differences in results exist.

Deliverable: Data request

Deliverable: Equivalency results provided in annual report

Deliverable Date: December 2019

Deliverable Date: March 2020

Task 4a. Consumption Analysis

The evaluation team will use a consumption analysis as the primary method to determine energy savings and demand impacts from the initiative. Further, given the randomized control design (and assuming our review confirmed their equivalency), the estimated savings from the consumption analysis are considered net savings. The evaluation team will conduct an intent to treat (ITT) approach and estimate savings using a difference-in-differences (DID) model. The DID refers to the model's implicit comparison of consumption before and after treatment of both treatment and control group customers. The model includes customer-specific intercepts (i.e., fixed effects) to capture unobserved differences between customers that do not change over time and which affect customers' energy use.

The evaluation team will calculate measured electric and gas savings from a consumption analysis that controls for non-treatment differences in energy use between treatment and control customers using lagged energy use as an explanatory variable (Equation 1). This model includes terms to account for systematic differences between control and treatment customers in their past energy use, which is highly correlated with their current energy use.

Equation 1. Post-Only Model Estimating Equation

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

Where:

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

 α = Overall intercept

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

 β_2 = Coefficient for the average daily usage across pre-treatment meter reads

 β_3 = Coefficient for the average daily usage over the months of December, January, February, and March pretreatment meter reads

 β_4 = Coefficient for the average daily usage over the months of June, July, August, and September pretreatment meter reads

 β_5 = Vector of coefficients for month-year dummies

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

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

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

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

 $MonthYear_t$ = Vector of month-year dummies

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

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

 ε_{it} = Error

It is important to note that the consumption analysis will include all customers in the treatment group with sufficient data. The evaluation team will compare pre-period energy consumption and other key characteristics across the treatment and control populations to ensure that the treatment and control groups are relatively comparable. If the populations are equivalent, no sampling will occur for the consumption analysis and the team will include all available data in our analysis. However, if the treatment and control groups are found to be dissimilar, the team will select two matched samples from the population of treatment and control group members for this analysis.

Task 4b. Joint Savings Analysis

Estimated savings from the Residential Behavioral Modification Initiative 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 light-emitting diode (LED) lamps, or other purchase behaviors. Therefore, savings from equipment that was rebated through AIC's Residential Program appear in both the savings results for the Residential Behavioral Modification Initiative and for rebate initiatives, which would result in a double-counting of savings if an adjustment were not made. The evaluation team will calculate a savings adjustment to account for the portion of net savings estimated from the consumption analysis that has already been claimed by other AIC initiatives.

The evaluation team will base the savings associated with participation in other AIC initiatives on the results of their respective 2019 impact evaluations, as well as on legacy savings from past participation in AIC initiatives for equipment that has not yet reached the end of its lifetime. As such, the team will conduct a participation lift and joint savings analysis to assess trends in initiative participation over time and calculate adjusted net savings estimates. Participation lift analysis assesses whether initiative treatment has an incremental effect on participation in other AIC initiatives, while the joint savings analysis identifies the portion of savings from behavioral treatment that is double-counted by the Residential Behavior Modification Initiative and other AIC energy efficiency initiatives.

Task 4c. Savings Adjustments

In accordance with the IL-TRM V7.0, the evaluation team will also calculate adjusted lifetime savings for the Initiative.⁵ This will take into account persisting savings from the 2018 cohort and will account for both persistence and retention rates.

Deliverable: Results provided in annual report

Deliverable Date: March 2020

Task 5. Persistence Study

The 2019 evaluation includes a study of the persistence of behavioral savings among customers who have previously received HERs through AIC's programs and now are experiencing a *stoppage* in treatment. To

⁵ This adjustment will take place after the consumption and joint savings analyses have been conducted as outlined in the IL-TRM V7.0, Section 6.1.1 Adjustments to Behavior Savings to Account for Persistence.

ensure that the evaluation team has a sufficient number of customers to perform the persistence study, we requested that the implementer remove customers included in some of the previously established cohorts (prior to 2018) from the pool of potential customers for the 2019 cohort. Setting aside a set of customers ensures that the evaluation team can continue to measure the effects of past treatment on these customers over time. These customers, along with those who were treated in 2018, are the set of customers that will be used in the persistence study to estimate persisting rates of savings.

Since cohorts of customers were selected based in part on their potential for energy savings through HER treatment, it is possible that the persistence of savings is higher for cohorts that were established earlier in the initiative compared to those formed later. We will examine the differences in persistence across cohorts and may consider including a term in the model to control for pre-participation usage.

The evaluation team will conduct consumption analyses to calculate energy savings after the *stoppage* in treatment for the participants that are reserved from the pool of customers selected for treatment, the 2018 cohort (which was the previously established Expansion Cohort 1), as well as any decay in savings. We will conduct the consumption analysis at the initiative level to understand the total impacts of the stoppage in initiative treatment. Findings from the persistence study will be used to inform future updates to the IL-TRM.

For the persistence study, the evaluation team will use the results from the consumption analysis and estimate an annual decay rate as follows:

Equation 2. Decay Rate Calculation

$$Decay Rate = 1 - \frac{\% Savings for Treatment in First Year After Stoppage}{\% Savings for Control in First Year After Stoppage}$$

In addition, the team will estimate lifetime persistence savings:

Equation 3. Lifetime Persistence Savings

$$Lifetime \ Persistence \ Savings = \frac{Total \ Savings \ for \ Treatment \ in \ First \ Year \ After \ Stoppage}{Decay \ Rate + \ Annual \ Attrition \ Rate - (Decay \ Rate * \ Annual \ Attrition \ Rate)}$$

As well as measure life:

Equation 4. Measure Life

Measure Life =

$$\frac{Total Savings for Control in First Year After Stoppage + Lifetime Persistence Savings}{Total Savings for Control in First Year After Stoppage}$$

This approach is consistent with other Illinois persistence studies.

| Deliverable: Results provided in a persistence study memorandum | Deliverable Date: May 2020 |
|---|----------------------------|
|---|----------------------------|

Task 6. Reporting

The evaluation team will provide all impact findings in the Residential Program annual impact evaluation report in March 2020. The evaluation team will provide a draft report for AIC, ICC staff, and SAG review and then deliver a final report that incorporates any comments from the review.

| Deliverable: Chapter in draft annual Residential Program impact report | Deliverable Date: March 15, 2020 |
|--|----------------------------------|
| Deliverable: Chapter in final annual Residential Program impact report | Deliverable Date: April 30, 2020 |

Evaluation Budget and Timeline

Table 11 summarizes the timing of each evaluation activity, as well as the budget associated with each task.

| Task | Evaluation Activity | Deliverable Date | Budget |
|------|---|-------------------------|-----------|
| 1 | Initiative Material and Database Review | November 2019 | \$6,400 |
| 2 | Initiative Staff Interviews | June 2019 | \$7,000 |
| 3 | Treatment/Control Randomization | December 2018 | ¢4,000 |
| 3b | Equivalency Analysis | March 2020 | \$4,900 |
| 4a | Consumption Analysis | | |
| 4b | Joint Savings Analysis | March 2020 | \$49,100 |
| 4c | Savings Adjustments | | |
| 5 | Persistence Study | May 2020 | \$27,200 |
| | Draft Annual Impact Report | March 15, 2020 | |
| 6 | Comments from AIC and ICC Staff | Within 15 Business Days | \$29,700 |
| | Final Annual Impact Report | April 30, 2020 | |
| | | Total Budget | \$124,300 |

| Table 11 Residential | Rehavioral Modification | 2019 Evaluation | Schedule and Budget |
|-----------------------|--------------------------------|-----------------|---------------------|
| Table TT' Vesinelling | Denavioral infoundation | ZUIS LValuation | Scheudie and Duuget |

2.1.5 HVAC

Through the HVAC Initiative, AIC offers incentives for the purchase of high-efficiency heating and cooling equipment to both single and multifamily homes. The overall goal of the Initiative is to persuade customers to purchase higher-efficiency equipment than they might otherwise purchase. AIC implementation staff work directly with contractors and distributors to educate them about the incentives available, as well as to train them on promoting the initiative. Measures offered through this initiative include: programmable and advanced thermostats, air source heat pumps (ASHPs), central air conditioners (CACs), high efficiency blower motors (ECM fans), and air source heat pump water heaters (HPWHs). Further, the Initiative includes incentives for both early retirement (ER) and replacement on burnout (RB) measures.

Approved contractors will become HVAC Initiative Allies, and will receive training from AIC around Initiative requirements, promotion and customer communications. AIC will also assign an Account Manager to each ally to support their involvement in the Initiative.

Evaluation Approach

The 2019 assessment of the HVAC Initiative focuses on a quantification of energy and demand impacts, estimation of NTGRs for measures incentivized through the Initiative for prospective application, as well as process and forward-looking research.

Research Objectives

Impact Questions

The 2019 impact evaluation will answer the following questions:

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

Process Questions

The 2019 evaluation of the HVAC Initiative will also include process research. Information sources include the initiative tracking database, information from in-depth interviews with AIC and implementation staff, and primary data collection efforts, including a participant survey and a trade ally survey. We will seek to answer the following process-related questions:

- 3. Initiative Participation
 - a. Did customer participation in the Initiative meet planning expectations? If not, how and why did it differ from expectations?
 - b. How many measures were installed through the Initiative in 2019? What is the mix of measures?
- 4. Initiative Design and Implementation
 - a. Did the Initiative's design and implementation change from 2018? If so, how and why was this change made?
 - b. Did the Initiative experience any implementation challenges in 2019? If so, what were they, and how were they overcome?
 - c. What changes could the Initiative make to improve participating customer and trade ally experience and generate greater energy savings?
- 5. Participating Customer Experience and Satisfaction
 - a. How did customers hear about the Initiative? What motivated customers to participate?
 - b. How satisfied are customers with the Initiative overall and initiative components (e.g. application process, incentive levels, interactions with the participating trade ally)?
 - c. What barriers, if any, do customers face related to participating in the Initiative? How can these barriers be overcome?
- 6. Trade Ally Experience and Satisfaction
 - a. How satisfied are trade allies with their experience in the initiative? How satisfied are they with the level of training provided?
 - b. What barriers, if any, do trade allies face related to participating in the initiative? How can these barriers be overcome?

c. What effects, if any, has the HVAC Initiative had on trade ally practices?

Forward Looking

The evaluation will also answer the following forward-looking research questions:

- 7. What is the level of participating customer and trade ally free-ridership and spillover for measures delivered through the Initiative, for prospective application?
- 8. What is the level of non-participating trade ally spillover, for prospective application?

Evaluation Tasks

Table 12 summarizes the 2019 evaluation activities conducted for the HVAC Initiative.

| Activity | Impact | Process | Forward Looking | Details |
|--|--------------|--------------|--------------------|--|
| Initiative Material and Database Review | \checkmark | \checkmark | | Comprehensive review of initiative data to assess any changes in initiative processes or impacts and to support sampling and reporting. |
| Initiative Staff Interviews | | \checkmark | | Interview AIC and implementation managers to understand goals, progress to date, initiative changes from 2018 and over the 2019 period, successes and challenges, and future goals. |
| Participant Survey | \checkmark | ~ | \checkmark | Collect information to develop NTGRs for prospective application and gather information to assess participant experience and satisfaction with the Initiative's processes. |
| Trade Ally Survey | ~ | ~ | ~ | Survey active trade allies to assess free-ridership and spillover for prospective application. Survey inactive trade allies to assess spillover for prospective application. Identify the Initiative's effect on trade ally installation practices. |
| Impact Analysis | ~ | | | Review initiative tracking data to ensure that correct deemed input values and IL-TRM V7.0 specified algorithms are used in calculating savings. Determine 2019 net impacts using SAG-approved NTGR values. |

Table 12. Summary of HVAC Initiative Evaluation Activities for 2019

Task 1. Initiative Material and Database Review

The evaluation team will conduct a comprehensive review of all initiative materials and tracking data. This includes Residential Program marketing and implementation plans, customer and trade ally communications, and extracts from the Residential Program tracking database. At a minimum, we will request a mid-year extract of the database in June 2019 and make a subsequent request at the close of January 2020, when we expect the database to be finalized.

Deliverable: Data requests

Deliverable Date: Ongoing

Task 2. Initiative Staff Interviews

The evaluation team will conduct two rounds of interviews with AIC and implementation staff. These interviews will focus on assessing goal achievement, initiative design/delivery modifications and reasons for change,

implementation challenges and successes, and plans for the Initiative's future. We will plan to conduct the first round of interviews in Q2 2019 and the second round in Q4 2019. Overall, we anticipate conducting six interviews total (three per round).

Deliverable: Completed interviews

Deliverable Date: April and November 2019

Task 3. Participant Survey

The evaluation team will conduct a quantitative online survey with participating customers in Q3 2019. The survey will focus on assessing free-ridership and participant spillover for measures sold through this offering. The survey will also explore key aspects of the participation process, as well the key drivers of purchase decisions and the role of the Initiative in that decision. For AIC customers installing electronically commutated motors (ECMs), the evaluation team will also use the survey to understand customers' current fan operating practices and how those fan operating practices compare to their pre-ECM behaviors.

Our sample frame will include all customers installing at least one measure through the HVAC Initiative from July 2018 through June 2019.⁶ We will attempt a census – the total number of survey completes will depend on the final number of participating customers in our sample frame. We plan to use the data gathered from the survey to develop initiative-level free-ridership and spillover estimates for participating customers. We might provide measure-level NTGR estimates if we receive a sufficient number of responses for each measure.

We will report results in a memorandum, which will provide our process findings and NTGRs from participating customers, while including a full description of the methodology used to assess free-ridership and spillover. We will provide a draft memorandum to AIC and ICC staff for review and comment before we finalize results.

| Deliverable: Draft and final participant survey instruments | Deliverable Date: June 2019 |
|---|----------------------------------|
| Deliverable: Draft memorandum | Deliverable Date: August 2019 |
| Deliverable: Final memorandum | Deliverable Date: September 2019 |

Task 4. Trade Ally Survey

Trade allies play a prominent role in delivering and promoting the HVAC Initiative. The evaluation team will conduct a quantitative survey with active registered (AR) and non-active registered (NAR) trade allies to assess free-ridership for AR trade allies and spillover for both AR and NAR trade allies.⁷ Additionally, we will gather feedback about initiative requirements, processes, and design. To maximize trade ally response rates, we will administer the survey in Q1 2020, which is typically considered as the off-season for HVAC contractors. The evaluation team will attempt a census – the total number of survey completes will depend on the final number of AR and NAR contractors in our sample frame. For budgeting purposes, we assume a total of 140 completes: 70 for AR contractors and 70 for NAR contractors.

Active Registered (AR) Trade Ally Survey

We plan to estimate initiative-level free-ridership and spillover and might provide measure-level NTGR estimates if we receive a sufficient number of responses. Per the IL-TRM V7.0, we will combine the free-

⁶ If the 2019 HVAC Initiative's design and implementation changed from 2018, the evaluation team will assess whether those changes could bias our participant survey results. If needed, we may exclude 2018 participants from our sample.

⁷ Based on past program tracking data, we expect to have email contact information for the majority of AR trade allies who have submitted projects in 2019. As such, we will administer an online survey to AR contractors. We will assess the availability of emails for NAR contractors to determine if an online survey or a phone survey will be more feasible.

ridership estimate from AR trade allies with the free-ridership estimate from participants to form a combined free-ridership value for the HVAC Initiative. The evaluation team will apply the methodology outlined in the IL-TRM V7.0 to triangulate the two free-ridership estimates.

This survey will also include questions about AR trade allies' installation practices (including the percentage of installed equipment that is eligible for initiative incentives and the percentage of eligible equipment that receives incentives) and the effect, if any, the HVAC Initiative had on these installation practices. We will use this information, together with data on trade ally projects from the initiative tracking database, to estimate spillover associated with AR trade allies, i.e., high efficiency installations that did not receive an incentive through the HVAC Initiative but that were influenced by the initiative.

When estimating spillover from multiple sources, it is important to avoid double-counting. In the case of this evaluation, double-counting could occur if participants and AR trade allies report spillover installations from the same projects. We will avoid such double-counting by determining if the participant's spillover project was completed by a trade ally who is in the sample frame for the AR trade ally survey (i.e., they completed at least one project through the HVAC Initiative in 2019). If so, the spillover reported by the participant will be excluded from the participant spillover estimate, as it will be captured through the AR trade ally spillover analysis.

Non-Active Registered (NAR) Trade Ally Survey

Per the IL-TRM V7.0, NAR trade allies might create spillover if they promote and stock higher-efficiency equipment due to the influence of the HVAC Initiative on the market. The evaluation team will conduct a survey with NAR contractors who are a part of the AIC Trade Ally Network but did not complete any projects through the HVAC Initiative in 2019. This survey will ask NAR contractors if the initiative influenced their sales of high-efficiency HVAC equipment to participating or nonparticipating customers and to quantify the initiative's impact on their high-efficiency sales. The survey will also collect data to inform barriers to participation.

| Deliverable: Draft and final participant survey instruments | Deliverable Date: February 2020 |
|---|---------------------------------|
| Deliverable: Draft memorandum | Deliverable Date: April 2020 |
| Deliverable: Final memorandum | Deliverable Date: June 2020 |

Task 5. Impact Analysis

To estimate 2019 ex post gross savings for the HVAC Initiative, the evaluation team will use appropriate IL-TRM V7.0 savings algorithms to estimate gross savings for each measure. The team will derive inputs for the algorithm primarily from the initiative tracking database (SEER level, climate zone, etc.). When input data are unavailable from the database, the team will use deemed inputs from the IL-TRM V7.0. The team will multiply gross savings by each measure installed, as tracked through the participant database.

The evaluation team will review all of the data in the 2019 tracking database to support estimation of gross impacts for the HVAC Initiative. The evaluation team will apply the SAG-approved NTGRs to gross savings (presented in Table 13) to determine 2019 net impacts.

| Maggura Description | NTGR | | |
|--------------------------|------------------|------------------|--|
| | Electric | Gas | |
| Programmable Thermostats | 0.870ª | 0.870ª | |
| Advanced Thermostats | N/A ^b | N/A ^b | |

| Table 1 | .3. H\ | /AC Ir | nitiative | 2019 | NTGRs |
|---------|--------|--------|-----------|------|-------|
|---------|--------|--------|-----------|------|-------|

| Maaaura Deseriation | NTGR | | |
|-----------------------------|----------|-------|--|
| | Electric | Gas | |
| SEER 16+ CAC or ASHP (ER) | 0.761 | — | |
| SEER 16+ CAC/ASHP (RB) | 0.641 | — | |
| Brushless Motors (ECM fans) | 0.761 | 0.761 | |
| Heat Pump Water Heaters | 0.760° | — | |

^a Previous SAG-approved value for Home Efficiency Standard. Opinion Dynamics will submit this value to the SAG for 2019 application.

^b No NTGR because TRM savings are deemed net savings.

° Value is approved for ComEd. No approved value exists for AIC. Opinion Dynamics will submit this value to the SAG for 2019 application.

Deliverable: Results provided in annual impact evaluation report

Deliverable Date: March 2020

Task 6. Reporting

The evaluation team will provide all impact findings in the Residential Program annual impact evaluation report in March 2020. The evaluation team will provide a draft report for AIC and ICC staff review and then deliver a final report that incorporates any comments from the review.

| Deliverable: Chapter in draft annual Residential Program impact report | Deliverable Date: March 15, 2020 |
|--|----------------------------------|
| Deliverable: Chapter in final annual Residential Program impact report | Deliverable Date: April 30, 2020 |

Evaluation Budget and Timeline

Table 14 summarizes the timing of each evaluation activity, as well as the budget associated with each task.

| Task | Evaluation Activity | Deliverable Date | Budget |
|------|---|-------------------------|-----------|
| 1 | Initiative Material and Database Review | Ongoing | \$12,300 |
| 2 | Initiative Staff Interviews | April and November 2019 | \$11,900 |
| 3 | Participant Survey | September 2019 | \$32,900 |
| 4 | Trade Ally Survey | June 2020 | \$69,900 |
| 5 | Impact Analysis | March 2020 | \$42,200 |
| | Draft Annual Impact Report | March 15, 2020 | |
| 6 | Comments from AIC and ICC Staff | Within 15 business days | \$34,300 |
| | Final Annual Impact Report | April 30, 2020 | |
| | | Total Budget | \$203,500 |

Table 14. HVAC Initiative 2019 Evaluation Schedule and Budget

2.1.6 Appliance Recycling

The Appliance Recycling Initiative promotes the retirement and recycling of working, but inefficient refrigerators and freezers from the homes of AIC's electric customers by offering a turn-in incentive and free pickup, as well as information and education on the cost of keeping an inefficient unit in operation. This initiative is cross-promoted with the Retail Products Initiative so that customers purchasing new energy efficiency refrigerators and freezers know how to dispose of their older equipment, as well as through the

Income Qualified Initiative, where in-home assessments are done to help identify potential energy efficient upgrades.

Evaluation Approach

The 2019 assessment of the Appliance Recycling Initiative includes both impact and process analyses as outlined in the following sections.

Research Objectives

Impact Questions

The 2019 Appliance Recycling Initiative evaluation will answer the following questions:

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

Process Questions

The evaluation team will also explore limited process-related research questions for the 2019 evaluation, including the following:

- 3. Did the Initiative's implementation change since 2018? If so, how and why, and was this change advantageous?
- 4. What were any challenges faced by the implementer in 2019?

Evaluation Tasks

Table 15 summarizes the 2019 evaluation activities conducted for the Appliance Recycling Initiative.

| Activity | Impact | Process | Forward Looking | Details |
|--|--------|---------|--------------------|--|
| Initiative Material and Database Review | ~ | ~ | | Review all initiative materials and data in the tracking database to ensure collection of appropriate data to inform the evaluation. |
| Initiative Staff Interviews | | ~ | | Interview AIC and implementation staff to gather insights into initiative design and delivery. |
| Impact Analysis | ~ | | | Assess ex post gross energy savings through engineering review based on tracking data and participant surveys. Review initiative tracking data for accuracy, completeness, and to ensure that correct deemed input values and IL-TRM V7.0 specified algorithms are used in calculating savings. Determine 2019 net impacts using SAG-approved NTGR values. |

Table 15. Summary of Appliance Recycling Initiative Evaluation Activities for 2019

We describe each activity below in detail.

Task 1. Initiative Material and Database Review

The evaluation team will conduct a review of all initiative materials and tracking data. This will include initiative marketing and implementation plans, as well as the initiative tracking database. The team will rely on tracking database for relevant data required to estimate gross savings using the IL-TRM V7.0 algorithm. The tracking data also contain measure data, including ex ante savings and incentives.

The team will also request initiative materials, including marketing materials and information regarding the Initiative's processes. These materials will inform the team's design of interview instruments.

Deliverable: Data request

Deliverable Date: January 2020

Task 2. Initiative Staff Interviews

The evaluation team will conduct up to two interviews with initiative managers and implementers. The interviews will focus on changes in the Initiative's design or marketing strategy since 2018, specific marketing tactics and perceived results, and initiative performance. Interviews will also provide stakeholders with an opportunity to ensure that the team achieves an up-to-date understanding of initiative operations in 2019 and initiative plans for the near future.

Deliverable: Completed interviews

Deliverable Date: July 2019

Task 3. Impact Analysis

The evaluation team will use engineering and database reviews to estimate the Initiative's 2019 ex post gross savings. The database contains relevant physical characteristics of appliances recycled through the initiative, including capacity (in cubic feet), year of manufacture, and unit configuration (all inputs to the algorithm for calculating gross savings).

To calculate ex post net savings, the evaluation team will apply SAG-approved NTGRs (Table 16).

Table 16. Appliance Recycling Initiative 2019 NTGRs

| Measure Description | NTGR |
|---------------------|------|
| Refrigerator | 0.52 |
| Freezer | 0.62 |

Deliverable: Analysis provided in draft report

Deliverable: Analysis provided in final report

Deliverable Date: March 2020

Deliverable Date: April 2020

Task 4. Reporting

The evaluation team will provide all impact findings in the Residential Program annual impact evaluation report in March 2020. The evaluation team will provide a draft report for AIC, ICC staff, and SAG review and then deliver a final report that incorporates any comments from the review.

| Deliverable: Chapter in draft annual Residential Program impact report | Deliverable Date: March 15, 2020 |
|--|----------------------------------|
| Deliverable: Chapter in final annual Residential Program impact report | Deliverable Date: April 30, 2020 |

Evaluation Budget and Timeline

Table 17 summarizes the timing of each evaluation activity and provides budgets associated with each task. The total budget for the 2019 Appliance Recycling Initiative evaluation is \$65,500.

| Task | Evaluation Activity | Deliverable Date | Budget |
|------|---|-------------------------|----------|
| 1 | Initiative Material and Database Review | January 2020 | \$9,400 |
| 2 | Initiative Staff Interviews | July 2019 | \$10,500 |
| 3 | Impact Analysis | February 2020 | \$24,600 |
| 4 | Draft Annual Impact Report | March 15, 2020 | |
| | Comments from AIC and ICC Staff | Within 15 business days | \$21,000 |
| | Final Annual Impact Report | April 30, 2020 | 0, 2020 |
| | | Total Budget | \$65,500 |

Table 17. Appliance Recycling 2019 Evaluation Schedule and Budget

2.1.7 Direct Distribution of Efficient Products

The Direct Distribution of Efficient Products Initiative ("Direct Distribution Initiative") provides energy savings kits to students in participating 5th to 8th grade classrooms with a focus on low income communities that receive both electric and gas service from AIC. The kits contain LED light bulbs, and LED nightlight, low flow showerheads and faucet aerators, a Tier 1 advanced power strip and a furnace filter tone alarm. By providing the kits in conjunction with energy conservation education in the classroom, AIC hopes to reduce energy use in participating student homes. To achieve its goals related to the Initiative, AIC will partner with the Illinois Board of Education, parent and teacher organizations, and public and private school systems.

Evaluation Approach

The 2019 assessment of the Direct Distribution Initiative includes both process and impact analyses as outlined in the following sections.

Research Objectives

Impact Questions

For the 2019 Direct Distribution Initiative evaluation, the team will answer the following questions:

- 1. What were the estimated gross energy and demand impacts from the Initiative?
- 2. What were the estimated net energy and demand impacts from the Initiative?

Process Questions

The evaluation team will also conduct a process evaluation to explore how the Initiative is performing. The evaluation will seek to address the following process-related questions:

- 3. Initiative Participation
 - a. How many kits were distributed to participants?

- b. What were the installation rates for each measure?
- c. Were there any barriers to participation?
- d. How are participants using advanced power strips? For example, are advanced power strips being used correctly? What equipment is being controlled by advanced power strips?
- e. How well does the curriculum address the historical issue of advanced power strips not being used properly?
- 4. Initiative Design and Implementation
 - a. Did AIC make any changes to the Initiative since 2018? How did these changes affect initiative performance or delivery?
 - b. What implementation challenges occurred in 2019?
 - c. What changes could AIC make to improve future initiative effectiveness?
- 5. Participant Awareness and Satisfaction
 - a. How aware are parents of available energy efficiency products?
 - b. How satisfied are households with their initiative experience and the measures offered?

Evaluation Tasks

Table 18 summarizes the 2019 evaluation activities conducted for the Direct Distribution Initiative.

| Activity | Impact | Process | Forward Looking | Details |
|---|--------------|---------|--------------------|---|
| Initiative Material and Database Review | \checkmark | ~ | | Review implementation plan, initiative marketing materials, and instructional materials. |
| Initiative Staff Interviews | | ~ | | Interview AIC and implementation staff to gain insights into the Initiative's design and delivery. |
| School Administrator and Teacher Interviews | | ~ | | Interview school administrator staff to verify kit receipt and distribution, and to gain insights into school participation, kit coordination, satisfaction with the curriculum and initiative. |
| Parent Survey | ~ | ~ | | Assess initiative process, measure installation, and energy efficiency product awareness and satisfaction. Assess lighting measure NTG for application in future years. |
| Impact Analysis | \checkmark | | | Review initiative tracking data for accuracy, completeness, and to ensure that correct deemed input values and IL-TRM V7.0 specified algorithms are used in calculating savings. Determine 2019 net impacts using SAG-approved NTGR values. |

We describe each activity below in detail.

Task 1. Initiative Material and Database Review

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

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

The team will make an initial data request in August 2019, with subsequent requests in January 2020 to obtain the final initiative tracking database.

Deliverable: Data requests

Deliverable Dates: August 2019 and January 2020

Task 2. Initiative Staff Interviews

The evaluation team will perform up to three in-depth interviews with AIC staff and implementation contractors, focusing on initiative goals and progress toward meeting these goals. Additionally, the evaluation team will explore the following: Initiative changes since 2018, design and implementation, strengths and weaknesses, and outreach and marketing.

Deliverable: Completed interviews

Deliverable Date: July 2019

Task 3. School Administrator and Teacher Interviews

The evaluation team will perform up to ten depth interviews with school administrators or teachers, focusing on reasons for participation, kit ordering and delivery process, satisfaction with the curriculum, instruction developed for advanced power strips, and initiative satisfaction. The evaluation team will also ask administrators to verify receipt and distribution of the kits.

| Deliverable: Conducted interviews | Deliverable Date: July 2019 |
|-----------------------------------|---------------------------------|
| Deliverable: Draft memorandum | Deliverable Date: February 2020 |
| Deliverable: Final memorandum | Deliverable Date: March 2020 |

Task 4. Parent Survey

The evaluation team will revisit questions around initiative process, measure installation, and lighting measure NTGRs last researched in 2017. The evaluation team will work closely with the implementation team to design and administer surveys to the parents of participating students on a rolling basis using a web-based survey. The parent survey will explore initiative barriers, satisfaction, types of equipment the kit measures replaced, knowledge of the energy efficient products provided through the kit and assess the NTGR for lighting

measures. The evaluation team will use this information to inform an analysis of program attribution and will deliver a memorandum summarizing these results in early 2020.

Deliverable: Conducted surveys

Deliverable: Draft memorandum

Deliverable: Final memorandum

Task 5. Impact Analysis

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

- Analyze the initiative tracking database at the end of 2019 to verify participation
- Apply installation rates for all measures and water heater saturation rate by fuel type, derived from the implementer's web-based surveys
- Apply the IL-TRM V7.0 per-unit savings for each measure to verified participation numbers to determine ex post gross savings
- Apply the SAG-approved NTGRs by measure to calculate net savings (Table 19).

| Macaura Description | NTGR | | |
|----------------------|----------|------|--|
| measure Description | Electric | Gas | |
| LEDs | 0.84 | — | |
| LED Nightlight | 1.00 | — | |
| Advanced Power Strip | 1.00 | — | |
| Showerheads | 1.00 | 1.00 | |
| Faucet Aerators | 1.00 | 1.00 | |
| Water Heater Setback | 1.00 | 1.00 | |

Table 19. Direct Distribution Initiative 2019 NTGRs

Deliverable: Analysis provided in draft report

Deliverable: Analysis provided in final report

Deliverable Date: March 2020

Deliverable Date: April 30, 2020

Deliverable Date: December 2019

Deliverable Date: February 2020

Deliverable Date: March 2020

Deliverable Date: April 2020

Task 6. Reporting

The evaluation team will provide all impact findings in the Residential Program annual impact evaluation report in March 2020. The evaluation team will provide a draft report for AIC, ICC staff, and SAG review and then deliver a final report that incorporates any comments from the review.

Deliverable: Chapter in draft annual Residential Program impact report Deliverable Date: March 15, 2020

Deliverable: Chapter in final annual Residential Program impact report

Evaluation Budget and Timeline

Table 20 summarizes the timing of each evaluation activity. Table 20 also shows the budget associated with each evaluation task. The total budget for the 2019 Direct Distribution Initiative evaluation is \$99,000.

| Task | Evaluation Activity | Deliverable Date | Budget | |
|------|---|------------------------------|----------|--|
| 1 | Initiative Material and Database Review | August 2018 and January 2019 | \$11,400 | |
| 2 | Initiative Staff Interviews | July 2019 | \$12,500 | |
| 3 | School Administrator and Teacher Interviews | December 2019 | \$6,900 | |
| 4 | Parent Survey | December 2019 | \$10,200 | |
| 5 | Impact Analysis | March 2020 | \$29,600 | |
| 6 | Draft Annual Impact Report | March 15, 2020 | | |
| | Comments from AIC and ICC Staff | Within 15 business days | \$28,400 | |
| | Final Annual Impact Report | April 30, 2020 | 20 | |
| | | Total Budget | \$99,000 | |

| Table 20. Direct Distribution | n Initiative 2019 | Evaluation | Schedule and | Budget |
|-------------------------------|-------------------|-------------------|--------------|--------|
|-------------------------------|-------------------|-------------------|--------------|--------|

2.1.8 Multifamily

The Multifamily Initiative offers incentives and services that enable energy savings and lower operating costs in market-rate multifamily housing (buildings with four or more units managed by a private entity). The initiative implementer, CMC Energy, conducts all outreach and recruitment, performs audits to identify installation opportunities, and provides direct installation of energy-saving measures for building common areas and tenant units. Measures are provided free-of-charge. The provided measures are as follows:

- In-unit: Initiative offerings for tenant units include LEDs, low-flow showerheads, faucet aerators, programmable thermostats, advanced thermostats, pipe wrap, and Tier 1 advanced power strips. The implementer is responsible for installing LEDs, low-flow showerheads, faucet aerators, and pipe wrap in tenant units. CMC leaves advanced and programmable thermostats behind for property management staff to install and provides tenants with a tutorial about how to use their advanced power strips.
- Common Areas: Common area offerings include light bulb replacements. The implementer offers properties medium screw-based standard and specialty LED upgrades for incandescent or halogen lamps in interior and exterior settings. The implementation contractor conducts all lighting upgrades.

Leidos provides several services to support the Multifamily Initiative including initiative oversight, QA/QC inspections, and initiative tracking data management.

Evaluation Approach

The 2019 evaluation of the Multifamily Initiative includes an impact analysis and a limited process analysis as outlined below. To support these efforts, the evaluation team plans to interview the AIC initiative manager and implementation team, review relevant background materials and documentation and conduct an engineering analysis to determine gross and apply SAG-approved NTGR values to obtain net impacts.
Research Objectives

Impact Questions

The objective of the 2019 Multifamily Initiative evaluation is to provide estimates of gross and net electric (kWh, kW) and gas (therm) savings associated with the initiative. The 2019 impact evaluation will answer the following questions:

- 1. What are the estimated gross energy and demand impacts from the Initiative?
- 2. What are the estimated net energy and demand impacts from the Initiative?

Process Questions

The evaluation team will also explore several process-related research questions as part of the 2019 evaluation:

- 3. How many projects were completed? By how many different customers? What types of projects?
- 4. Did participation meet initiative planning expectations? If not, how different was it, and why?
- 5. How has the Initiative changed compared to past years? If so, how, why, and were these advantageous changes?
- 6. What implementation challenges have occurred in 2019, and how has the initiative overcome them?
- 7. What changes could the Initiative make to improve the customer experience?

Evaluation Tasks

Table 21 summarizes the 2019 evaluation activities planned for the Multifamily Initiative.

| Activity | Impact | Process | Forward Looking | Details |
|--|--------|---------|--------------------|---|
| Initiative Material and Database Review | | ~ | | Review the 2019 database, relevant administrative reports, and marketing and outreach materials to document initiative design and changes. |
| Initiative Staff Interviews | | ~ | | Conduct interviews with AIC and implementation staff to understand changes in initiative design and implementation. |
| Impact Analysis | V | | | Review initiative tracking data for accuracy, completeness, and to ensure that correct deemed input values and IL-TRM V7.0 specified algorithms are used in calculating savings. Determine 2019 net impacts using SAG-approved NTGR values. |

Table 21. Summary of Multifamily Initiative Evaluation Activities for 2019

We describe each activity below in detail.

Task 1. Initiative Material and Database Review

The evaluation team will conduct a comprehensive review of all initiative materials and tracking data including marketing and implementation plans, customer communications, and extracts from the tracking database. The purpose of this review is to document the design and implementation of the 2019 initiative. We anticipate requesting tracking data at mid-year and the end of the year to support the impact evaluation.

Deliverable: Data requests

Deliverable Date: Ongoing

Task 2. Initiative Staff Interviews

We will conduct brief early evaluation interviews with AIC and implementation contractor staff to confirm our understanding of the Multifamily Initiative design and implementation in 2019. These interviews will provide AIC and implementation staff with an opportunity to discuss their evaluation priorities for 2019. As in past years, we also plan to complete more detailed interviews with initiative staff closer to the end of the year to get staff perspective on initiative performance and detailed information on initiative marketing. In total, we expect to complete five interviews: one interview each with Leidos, CMC, and AIC initiative staff early in the program year and follow-up interviews with CMC and Leidos staff at the end of the year.

Deliverable: Completed interviews

Deliverable Date: May and December 2019

Task 3. Impact Analysis

To determine gross impacts associated with the Multifamily Initiative, we plan to review contents of the 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 V7.0. We will resolve any discrepancies found in the database, report on findings, and provide details related to any gross savings adjustments. The team will use algorithms and assumptions from the IL-TRM V7.0 to calculate ex post gross savings associated with the measures recorded in the database. For net impacts, we will generally apply the SAG-approved NTGRs for 2019, listed in Table 22. We anticipate beginning the impact analysis in August 2019 based on the expected availability of the final initiative tracking data.

| Massura Decorintian | NTGR | | |
|--|------------------|------|--|
| | Electric | Gas | |
| In-Unit – LEDs | 0.77 | _ | |
| In-Unit – Programmable Thermostat | 0.79 | 1.00 | |
| In-Unit – Advanced Thermostats | N/A ^a | N/Aª | |
| In-Unit – Faucet Aerators | 1.00 | 1.00 | |
| In-Unit – Showerheads | 1.00 | 1.00 | |
| In-Unit – Pipe Wrap | 0.79 | 1.00 | |
| In-Unit – Tier 1 Advanced Power Strips | 0.79 | 1.00 | |
| Common Area – LEDs | 0.77 | _ | |
| In-Unit – LEDs | 0.77 | _ | |

Table 22. Multifamily Initiative 2019 NTGRs

^a No NTGR because TRM savings are deemed net savings.

Deliverable: Results provided in annual report

Deliverable Date: March 15, 2019

Task 4. Reporting

The evaluation team will provide all impact findings in the Residential Program annual impact evaluation report in March 2019. The evaluation team will provide a draft report for AIC, ICC Staff, and SAG review and then deliver a final report that incorporates any comments from the review.

| Deliverable: Chapter in draft annual Residential Program impact report | Deliverable Date: March 15, 2020 |
|--|----------------------------------|
| Deliverable: Chapter in final annual Residential Program impact report | Deliverable Date: April 30, 2020 |

Evaluation Budget and Timeline

Table 23 summarizes the timing and budget associated with each evaluation activity.

| Task | Evaluation Activity | Deliverable Date | Budget |
|------|---|-------------------------|----------|
| 1 | Initiative Material and Database Review | Ongoing | \$7,600 |
| 2 | Initiative Staff Interviews | May and December 2019 | \$6,800 |
| 3 | Impact Analysis | March 15, 2020 | \$32,300 |
| | Draft Annual Impact Report | March 15, 2020 | |
| 4 | Comments from AIC and ICC Staff | Within 15 business days | \$21,300 |
| | Final Annual Impact Report | April 30, 2020 | |
| | | Total Budget | \$68,000 |

Table 23. Multifamily Initiative 2019 Evaluation Schedule and Budget

2.2 Business Program

AIC's planned Business Program provides services to non-residential customers (including the public sector) and is made up of four main initiatives: the Standard Initiative, the Custom Initiative, the Retro-Commissioning Initiative, and the Streetlighting Initiative. Within each of these initiatives, AIC includes various targeted offerings (for example, the Building Operator Certification offering contained within the Custom Initiative). Additionally, AIC is launching a new Business Behavioral Modification pilot in 2019.

In this section, we outline the anticipated evaluation activities for each of the Business Program initiatives. In accordance with Illinois evaluation requirements, we will deliver a draft annual Business Program impact evaluation report on March 15, 2020, covering the 2019 program year. This report will include information in 2019 program participation, 2019 ex post gross and net impacts for all Business Program initiatives, as well as initiative and program-level WAML and CPAS for the Program.

In addition, we will deliver a number of stand-alone memos summarizing results of process and NTGR research, where applicable. At the close of the 2019 evaluation, we will deliver an integrated process/forward looking evaluation report that rolls up all the stand-alone memos relevant to the 2019 Business Program.

| Deliverable | Date |
|--|----------------|
| Draft Annual Business Program Impact Evaluation Report | March 15, 2020 |
| Final Annual Business Program Impact Evaluation Report | April 30, 2020 |
| Annual Integrated Impact Report | May 15, 2020 |
| Annual Integrated Business Program Process/Forward Looking Evaluation Report | May 31, 2020 |

Table 24. Schedule of 2019 Business Program Evaluation Deliverables

2.2.1 Standard

The Standard Initiative offers AIC business customers fixed incentives for the installation of prescriptive energy efficiency measures. Since 2018, both private and public sector customers are eligible to participate in the Initiative, which consists of the following offerings:

- The Core offering of the Initiative provides incentives for lighting, variable frequency drives (VFDs), HVAC equipment, steam traps, compressed air leak repair, and other measures. The Core offering is application-based.
- The Instant Incentives offering provides mid-stream incentives to AIC business customers purchasing lighting products at distributor retail locations to help increase the market share of efficient lighting products. Some the products include standard and specialty LED lamps, LED linear lamps, LED retrofit kits, and LED fixtures.
- The Ameren Illinois Business Customer Online Store (Online Store) provides all AIC business customers with an e-commerce option to order and receive a variety of energy-saving lighting products, including LEDs, occupancy sensors, advanced thermostats, and advanced power strips.
- The Green Nozzle offering provides free efficient water nozzles to gas customers and to customers in the food service sector who use electric or natural gas water heating. Since its introduction, this offering has accounted for a very small proportion of therm savings for the Standard Initiative.
- The Small Business offering provides direct install energy efficiency measures to AIC's small (primarily DS-2 and/or GDS-2) customers. While the Standard Initiative is designed to serve business customers of all sizes, this offering is a critical participation channel for AIC's small customers, who prior to 2018 were targeted by a series of stand-alone Illinois Power Agency approved energy efficiency programs. This will be the second year the Standard Initiative will include a Small Business offering.

Evaluation Approach

The 2019 assessment of the Standard Initiative focuses on a quantification of energy and demand impacts, estimation of NTGRs for measures sold through the Online Store (for prospective application), as well as process and forward-looking topics related to the Online Store and Small Business offerings.

Research Objectives

Impact Questions

The 2019 impact evaluation will answer the following impact-related questions:

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

Process Questions

The 2019 evaluation of the Standard Initiative will also include process research. Information sources include the initiative tracking database, information from the in-depth interviews with AIC and implementer staff, and responses to the surveys with participants of the Online Store and Small Business offerings. We will seek to answer the following questions:

- 3. Initiative Participation
 - a. What are the characteristics of participating customers? How many projects were completed through the different offerings? By how many different customers? What type of projects? What was the level of cross-participation in the various offerings?
 - b. Did customer participation in the Initiative meet expectations (i.e., did the number of participants and diversity across business segments exceed goals)? If not, how and why is it different from expectations? Were any changes in the mix of customers and projects desirable?
- 4. Initiative Design and Implementation
 - a. Did the Initiative's design and implementation change from 2018? If so, how and why and was this an advantageous change?
 - b. Did the Initiative experience any implementation challenges in 2019? If so, what were they, and how were they overcome?
 - c. What changes could the Initiative make to improve the customer experience and generate greater energy savings?
- 5. Online Store Offering
 - a. How did customers hear about the Online Store?
 - b. How satisfied are customers with their experience making purchases through the Online Store and the quality of the products they purchased?
 - c. How satisfied are customers with the measures available through the Online Store? What other types of products would they like to see offered?
 - d. What barriers, if any, do customers face in using the Online Store?
 - e. What is the cross-initiative participation rate for customers who have made a purchase through the Online Store and what can AIC do to improve this?
 - f. How aware are Online Store participants of the other Initiative offerings? How applicable are those offerings to them?
- 6. Small Business Offering
 - a. How did customers hear about the Small Business offering?
 - b. How satisfied are customers with their experience purchasing energy efficiency equipment through the Small Business offering?
 - c. How satisfied are customers with the measures available through the Small Business offering? What other types of products would they like to see offered?
 - d. What barriers do customers face related to participating in the Small Business offering? What barriers do they face related to the purchase and installation of non-lighting measures?

e. How aware are participants in the Small Business offering of the other Initiative offerings? How applicable are those offerings to them?

Forward Looking

The evaluation will also answer the following forward-looking research questions:

7. What is the level of participant free-ridership and spillover for measures delivered through the Initiative's Online Store offering, for prospective application?

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

Evaluation Tasks

This section outlines the planned tasks for the 2019 evaluation of the Standard Initiative (Table 25).

| Activity | Impact | Process | Forward Looking | Details |
|---|--------|--------------|--------------------|--|
| Initiative Material and Database Review | ~ | ~ | | Comprehensive review of initiative data to assess any changes in initiative processes or impacts and to support sampling and reporting. |
| Initiative Staff Interviews | | ~ | | Explore changes made since 2018 and gather information about initiative marketing, implementation, and 2019 performance to ensure the evaluation plan covers current initiative design and operations. |
| Online Store Participant Survey | | \checkmark | \checkmark | Collect information to develop NTGRs for prospective application, verify purchase and installation of equipment through self-reported actions, and gather information to assess the offering's processes. |
| Small Business Participant Survey | | ~ | ~ | Collect information to inform a process assessment examining potential design changes that would enhance AIC's ability to capture additional energy savings, particularly from non-lighting measures in addition to directly installed lighting. |
| Impact Analysis | ~ | | | Review initiative tracking data to ensure that correct deemed input values and IL-TRM V7.0 specified algorithms are used in calculating savings. Estimate gross impacts through review of the initiative tracking database and application of the IL- TRM V7.0. Estimate net impacts using SAG-approved NTGR values for 2019. |

Table 25. Summary of Standard Initiative Evaluation Activities for 2019

We describe each of these activities in detail below.

Task 1. Initiative Material and Database Review

The team will conduct a comprehensive review of all initiative materials and tracking data. This includes Business Program marketing and implementation plans, customer and ally communications, and extracts from the Business Program tracking database (i.e., AMPlify). We request extracts from AMPlify on a regular basis and will continue to communicate with AIC and Leidos about data requirements as needed. At a minimum, we will request a mid-year extract of the database in June 2019 and make subsequent requests at the close of 2019 (December 31, 2019) and then again in January 2020, when we expect the database to be finalized.

Deliverable: Data requests

Deliverable Date: Ongoing

Task 2. Initiative Staff Interviews

To support our evaluation, we will develop an in-depth interview guide for 2019 to explore initiative performance, changes since 2018, and other topics relevant to our research objectives. We will conduct two interviews with Business Program staff: (1) a brief interview mid-cycle to understand changes made to the initiative in 2019 and to provide time for the evaluation team to modify any research tasks as necessary and (2) a comprehensive interview toward the end of 2019 allowing implementation staff the opportunity to comment on the initiative's performance throughout 2019. In total, we plan to complete between three and five interviews, including interviews with the Business Program managers and marketing staff. We will likely conduct interviews focusing on all Business Program initiatives together, but we will conduct interviews with staff specific to offerings (e.g., implementation staff for the Small Business offering), as needed.

Deliverable: Completed interviews

Deliverable Dates: June and November 2019

Task 3. Online Store Participant Survey

The evaluation team will conduct a quantitative online survey with AIC business customers who have purchased energy efficient equipment through the Online Store offering in 2019. The survey will focus on assessing free-ridership and participant spillover for measures sold through this offering and will also include limited questions to verify measure purchase and installation. The survey will also address questions related to satisfaction with the Online Store experience, customer awareness of and interest in AIC's other Business Program initiatives, and interest in current and additional Online Store offerings that go beyond lighting (i.e., low flow showerheads, pre-rinse spray valves, and faucet aerators).

Our sample frame will include all customers completing at least one purchase through the Online Store during 2019. The sample frame will thus be all unique Online Store participants, i.e., we will attempt a census. As such, the concept of sampling error and precision does not apply.

We plan to use the data gathered from the survey to develop NTGRs for Online Store measures for prospective application. We will provide an offering-level NTGR and might provide separate NTGRs for public and private sector participants, if we receive a sufficient number of responses from each group.

We will report results in a memorandum, which will provide our process findings and updated NTGRs, while including a full description of the methodology used to assess free-ridership and spillover. We will provide a draft memorandum to AIC and ICC staff for review and comment before we finalize results.

| Deliverable: Draft and final participant survey instruments | Deliverable Date: August 2019 |
|---|---------------------------------|
| Deliverable: Draft memorandum | Deliverable Date: November 2019 |
| Deliverable: Final memorandum | Deliverable Date: December 2019 |

Task 4. Small Business Participant Survey

The evaluation team will conduct a quantitative online survey with customers who have participated in the Standard Initiative's Small Business (direct install) offering in 2019.

Our sample frame will include all customers who participated at the time of survey administration,⁸ and we anticipate attempting a census of these customers; as such the concept of sampling error and precision does not apply. As needed to ensure representativeness, we will complete up to 25 follow-up outreach attempts with participants who did not complete the survey online.

Since the 2018 projects carried out under the Small Business offering were almost exclusively lighting, we plan to use the data gathered from this survey to understand why customers have not used the initiative to upgrade their non-lighting equipment (assuming the same trend is seen in 2019). We will also use the survey to gather information about customer satisfaction with and awareness of the full breadth of the offering and whether they would consider using the Small Business offering in the future for upcoming energy efficiency purchases.

We will provide a draft memorandum of the survey findings to AIC and ICC staff for review and comment before we finalize results.

| Deliverable: Draft and final participant survey instruments | Deliverable Date: September 2019 |
|---|----------------------------------|
| Deliverable: Draft memorandum | Deliverable Date: December 2019 |
| Deliverable: Final memorandum | Deliverable Date: January 2020 |

Task 5. Impact Analysis

We plan to conduct key activities to estimate ex post gross impacts associated with measures installed through the Standard Initiative.

We will conduct an IL-TRM application review for all Standard Initiative projects. We will review initiative tracking data to ensure that correct deemed input values and IL-TRM V7.0 specified algorithms are used in calculating savings, and replicate savings calculations to ensure accuracy. This step will produce gross savings estimates for 2019.

We will calculate 2019 net savings by applying the SAG-approved NTGRs for 2019 to electric and gas gross savings as presented in Table 26.9

| Macauta Deservition | NTGR | | |
|---------------------|----------|-------|--|
| | Electric | Gas | |
| Core Lighting | 77.8% | — | |
| Core HVAC | 55.7% | 49.4% | |
| Core Leak Survey | 70.2% | — | |
| Core Specialty | 84.9% | 67.5% | |
| Core Steam Trap | _ | 60.8% | |

Table 26. Standard Initiative 2019 NTGRs

⁸ Based on past participation patterns, we believe that using a partial year of program data is unlikely to bias our survey results, and therefore, we expect to complete this survey with only a partial program population to ensure that we can deliver results in Q4 2019.
⁹ For Standard projects associated with a Staffing Grant (described in the Custom Initiative section), the evaluation team will use the same NTGR approach as in past years: We will compare the NTGR developed through the 2019 interviews with the SAG-approved 2019 NTGR. The SAG-approved 2019 NTGR will be used as a floor and, if the NTGR developed through the Staffing Grant interviews exceeds the SAG-approved 2019 value, then we will apply the new NTGR to all of the projects associated with that Staffing Grant. However, if the newly developed NTGR falls below the SAG-approved 2019 value, we will apply the SAG-approved 2019 value to each of the participant's projects.

| Macaura Description | NTGR | | |
|--|----------|-------|--|
| Measure Description | Electric | Gas | |
| Core VFD | 83.3% | — | |
| Green Nozzles | 92.0% | 89.0% | |
| Instant Incentives - Linear LED | 91.6% | — | |
| Instant Incentives - Specialty LED | 91.6% | — | |
| Instant Incentives - Standard LED | 91.6% | — | |
| Instant Incentives - Occupancy Sensors | 91.6%ª | — | |
| Online Store Measures | 83.1% | — | |
| Small Business Direct Install | 96.2% | 96.2% | |
| Core Lighting | 77.8% | — | |
| Core HVAC | 55.7% | 49.4% | |

^a Previous SAG-approved value for Instant Incentives lighting measures. Opinion Dynamics will submit this value to the SAG for 2019 application.

Deliverable: Results provided in annual report

Deliverable Date: March 15, 2020

Task 6. Reporting

The evaluation team will provide all impact findings in the Business Program Annual Impact Evaluation Report in March 2019. The evaluation team will provide a draft report for AIC, ICC staff, and SAG review and then deliver a final report that incorporates any comments from the review.

| Deliverable: Chapter in draft annual Business Program impact report | Deliverable Date: March 15, 2020 |
|---|----------------------------------|
| Deliverable: Chapter in final annual Business Program impact report | Deliverable Date: April 30, 2020 |

Evaluation Budget and Timeline

Table 27 summarizes the timing and budget associated with each evaluation activity. In total, the 2019 budget for the Standard Initiative evaluation is \$193,400.

| Table 27. Standard Initiative 20 | 9 Evaluation Schedule and Budget |
|----------------------------------|----------------------------------|
|----------------------------------|----------------------------------|

| Task | Evaluation Activity | Deliverable Date | Budget |
|------|---|-------------------------|-----------|
| 1 | Initiative Material and Database Review | Ongoing | \$7,300 |
| 2 | Initiative Staff Interviews | June and November 2019 | \$5,600 |
| 3 | Online Store Participant Survey | August 2019 | \$31,500 |
| 4 | Small Business Participant Survey | October 2019 | \$34,400 |
| 5 | Impact Analysis | March 2020 | \$67,600 |
| | Draft Annual Impact Report | March 15, 2020 | |
| 6 | Comments from AIC and ICC Staff | Within 15 business days | \$47,000 |
| | Final Annual Impact Report | April 30, 2020 | |
| | | Total Budget | \$193,400 |

2.2.2 Custom

The Custom Initiative allows AIC business customers to complete energy efficiency projects that involve the installation of equipment not covered through the Standard or Streetlighting Initiatives. The availability of this initiative allows customers to propose additional measures and tailor projects to their facility and equipment needs. Complex and large-scale new construction and building renovation projects also qualify under the Custom Initiative. Custom incentives are available for both electric and gas equipment, including (but not limited to): lighting, compressed air, HVAC, refrigeration, motors, and industrial process upgrades. These projects normally are complex and unique, requiring separate incentive applications and calculations of estimated energy savings. Incentives are calculated based on energy savings estimates for each project and may vary between different technologies and fuel types as necessary.

Beginning in June 2017, the Custom Initiative has been made available to public sector customers. The Initiative also targets public sector facilities such as water treatment facilities. Enhanced incentives for public sector or other financially-strained customers will be provided where necessary.

The Custom Initiative also includes a number of smaller "incubator" offerings, including:

- The Metering and Monitoring offering, which promotes customers' ability to review and curtail their energy use using sub-meters and software;
- The SEM offering, which is designed to help customers achieve ongoing energy and cost savings by motivating changes in participants' organizational culture and business practices to achieve energy reduction and cost savings goals;
- The Staffing Grant offering, which provides customers with funding to help address energy efficiency project staffing needs. The offering distributes funds based on the predicted savings that will be achieved by the grant recipients; and
- The Feasibility Study offering, which helps participants define project costs and energy savings opportunities, primarily targeting manufacturing/industrial facilities with compressed air systems.

These incubator initiatives are targeted primarily at helping customers to overcome barriers to participation in AIC's Business Program, and typically do not directly yield energy savings.

The Custom Initiative also offers a number of additional services to AIC customers, including education, Building Operator Certification (BOC) training, and other training opportunities. The evaluation plan for the BOC offering is presented separately in Section 2.2.3.

Evaluation Approach

The evaluation of the Custom Initiative has impact, process, and forward-looking objectives as outlined below.

Research Objectives

The primary objective of the 2019 Custom Initiative evaluation is to provide estimates of gross and net electric and gas savings associated with the Initiative. In addition, the evaluation includes a targeted process analysis and development of NTGRs (for prospective application).

Impact Questions

The 2019 impact evaluation will answer the following questions:

- 1. What were the estimated gross energy and demand impacts from the Initiative in 2019?
- 2. What were the estimated net energy and demand impacts from the Initiative in 2019?
- 3. Did the Staffing Grant offering affect participant free-ridership in 2019?

Process Questions

The targeted process evaluation will focus primarily on the Initiative's Staffing Grant offering. The process research will utilize data from multiple data collection methods and sources: in-depth interviews with AIC and implementation staff, interviews with participants in the Staffing Grant offerings, and a review of initiative implementation and marketing materials. We will explore a number of process-related research questions outlined below.

- 4. Initiative Participation
 - a. What were the characteristics of participating customers? How many projects were completed through the different offerings? By how many different customers? What type of projects?
 - b. Did customer participation meet expectations? If not, how and why is it different from expectations? Would any changes in the mix of customers and projects have been desirable?
- 5. Initiative Design and Implementation
 - a. Did the Initiative's design and implementation change from 2019? If so, how and why and was this an advantageous change?
 - b. Did the Initiative experience any implementation challenges in 2019? If so, what were they, and how were they overcome?
 - c. What changes could the Initiative make to improve the customer experience and generate greater energy savings?
- 6. Participant Experience and Satisfaction
 - a. What effect, if any, has the Staffing Grant offering had on participating businesses' performance and practices?
 - b. Were participants in the Initiative's Staffing Grant offering satisfied with their experiences? What aspects of initiative design or implementation could AIC change to improve effectiveness and participant satisfaction?
 - c. What barriers, if any, prevented recipients from implementing energy saving projects before participating in the Initiative? How can these barriers be overcome?

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

Evaluation Tasks

Table 28 summarizes the 2019 evaluation activities proposed for the Custom Initiative.

| Activity | Impact | Process | Forward Looking | Details |
|--|--------------|---------|--------------------|---|
| Initiative Material and Database Review | ~ | ~ | | Gather information about initiative implementation and performance. |
| Initiative Staff Interviews | | ~ | | Explore changes made since 2018 and gather information about initiative marketing, implementation, and 2019 performance. |
| Staffing Grant Participant Interviews | \checkmark | ~ | | Gather attribution information to potentially adjust project NTGRs and gather process information. |
| Impact Analysis | V | | | Review project documentation and calculations to account for analytical errors, incorrect assumptions, etc. Collect data to inform measure verification and ex post gross impacts. Determine 2019 net impacts using SAG-approved NTGR values. |

Table 28. Summary of Custom Initiative Evaluation Activities for 2019

We describe each of these activities in detail below.

Task 1. Initiative Material and Database Review

The team will conduct a comprehensive review of all initiative materials and tracking data. This includes Business Program marketing and implementation plans, customer and ally communications, and extracts from the Business Program tracking database (i.e., AMPlify). We request extracts from AMPlify on a regular basis and will continue to communicate with AIC and Leidos about data needs as needed. At a minimum, we will request a mid-year extract of the database in June 2019, and make subsequent requests at the close of 2019 (December 31, 2019) and then again in January 2020, when we expect the database to be finalized.

Deliverable: Data requests

Deliverable Date: Ongoing

Task 2. Initiative Staff Interviews

To support our evaluation, we will develop an in-depth interview guide for 2019 to explore initiative performance, changes since 2018, and other topics relevant to our research objectives. We will conduct two interviews with Business Program staff: (1) an interview in the beginning of 2019 to understand changes made to the initiative from 2018 and to provide time for the evaluation team to modify any research tasks as necessary and (2) a comprehensive interview toward the end of 2019 allowing implementation staff the opportunity to comment on the Initiative's performance throughout 2019. We will likely conduct interviews focusing on all Business Program initiatives together, but we will also conduct interviews with staff specific to this initiative, as needed.

Deliverable: Completed interviews

Deliverable Dates: April and November 2019

Task 3. Staffing Grant Participant Interviews

The team will conduct interviews with AIC customers who received Staffing Grants. Consultant staff will conduct the interviews, which will focus on gathering information on how the Staffing Grant affects initiative attribution. We will also ask process-related questions about the initiative, including participants' level of satisfaction, challenges encountered, and recommendations for improvement. Given the small number of Staffing Grant participants, we will attempt to interview all Staffing Grant recipients. The total number of

interviews will depend on the final number of participants. For budgeting purposes, we assume we will conduct up to eight interviews.

Deliverable: Draft and final interview guides

Deliverable Date: June 2019

Task 4. Impact Analysis

Conducting gross impact analysis for custom projects requires custom engineering calculations. Since custom projects can have large variability in measures and savings, the gross impact analysis for the Custom Initiative will employ a sample-based, bottom-up approach to estimating gross savings. Consistent with prior years, the impact analysis will be based on site-specific engineering desk reviews and on-site measurement and verification.

We will conduct engineering desk reviews and on-site data measurement and verification for a sample of projects to review and verify savings assumptions. This may include an examination of existing equipment and/or the implementer's measurement and verification results. We will tailor the scope of each audit to the specific measures installed at the site, but at a minimum, the review engineer will perform the following actions during the on-site visits:

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

As part of this process, the team will submit formal M&V plans and reports for up to 15 of the largest Custom Initiative projects. No other M&V sites will have a written site-specific plan or report.

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

Equation 5. Ratio Estimate of Population Total¹⁰

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

Where:

- *y* = The total ex post savings for the sample of projects
- *x* = The total ex ante savings for the sample of projects
- *X* = The ex ante savings for the population of projects

Given the timing of this evaluation plan, it is too early to predict the level of activity expected for the Custom Initiative in 2019 and desirable sample sizes for the impact evaluation. We will determine the optimal sampling approach based on the number, type, and size of projects completed in 2019, and target 10%

¹⁰ Cochran, William. 1977. Sampling Techniques. New York: John Wiley & Sons.

relative precision at 90% confidence (90/10) by fuel type. For budgeting purposes, we assume 60 project reviews. We believe this is a conservative sample size that will be sufficient to provide 90/10 precision at the initiative level, at a minimum, but likely also for two or more sub-groups. As the 2018 evaluation concludes and we update our understanding of Initiative project characteristics, we will revise our planned sample size as necessary.

In an attempt to conduct impact research in a more "real time" fashion, we will develop our sample for engineering desk reviews and on-site verification in multiple waves, using the initiative tracking database as a sample frame. We expect to conduct four waves of impact research for the Custom Initiative in 2019. For each wave, we will stratify the Custom Initiative projects included in the Initiative tracking database by ex ante savings, and select a number of projects proportionate to the share of final initiative savings we believe the wave represents.

We anticipate drawing separate samples for gas and electric projects and, within each sample, stratifying projects by size. Stratification by size allows us to over-sample large savers, thus ensuring that our analysis covers a sufficient share of initiative savings. From within each stratum, we will randomly sample participants to achieve the precision and confidence targets. To ensure diversity of measures and offerings, we may consider stratifying the impact sample by offering if the final population of projects appears to require it. We will also adjust the sample size depending on participation in order to achieve the statistical targets if necessary.

The team will share the results of our gross impact analysis with AIC and ICC staff after the completion of each wave. The Excel file provided for review and discussion will feature the ex ante and ex post savings for each project selected for engineering review and/or on-site measurement and verification, the resulting realization rate, and the reasons for the realization rate. To the degree time allows, we will also hold a meeting with AIC and its implementation team, as well as with ICC staff, to discuss the findings and answer any questions.

We will calculate 2019 net savings by applying the SAG-approved NTGRs for the Custom Initiative of 82.2% (electric) and 93.9% (gas) to electric and gas gross savings. For Custom projects associated with a Staffing Grant, the evaluation team will compare the participant-specific NTGR developed through the 2019 interviews with the SAG-approved 2019 NTGR of 82.2% (electric) and 93.9% (gas). We will apply the larger of the two values to each of the participant's projects.

| Deliverable: Site visit formal M&V plans and results – Wave 1 | Deliverable Date: April 2019 |
|---|--------------------------------|
| Deliverable: Site visit formal M&V plans and results – Wave 2 | Deliverable Date: July 2019 |
| Deliverable: Site visit formal M&V plans and results – Wave 3 | Deliverable Date: October 2019 |
| Deliverable: Site visit formal M&V plans and results – Wave 4 | Deliverable Date: January 2020 |
| Deliverable: Final analysis in annual report | Deliverable Date: March 2020 |

Task 5. Reporting

The evaluation team will provide all impact findings in the Business Program annual impact evaluation report in March 2019. The evaluation team will provide a draft report for AIC, ICC Staff, and SAG review and then deliver a final report that incorporates any comments from the review.

| Deliverable: Chapter in draft annual Business Program impact report | Deliverable Date: March 15, 2020 |
|---|----------------------------------|
| Deliverable: Chapter in final annual Business Program impact report | Deliverable Date: April 30, 2020 |

Evaluation Budget and Timeline

Table 29 summarizes the timing and budget associated with each evaluation activity.

| Task | Evaluation Activity | Deliverable Date | Budget |
|------|---|------------------------------|-----------|
| 1 | Initiative Material and Database Review | Ongoing | \$10,500 |
| 2 | Initiative Staff Interviews | April and November 2019 | \$7,600 |
| 3 | Staffing Grant Participant Interviews | June 2019 | \$9,100 |
| 4 | Impact Analysis | April, August, December 2019 | \$194,900 |
| | Draft Annual Impact Report | March 15, 2020 | |
| 6 | Comments from AIC and ICC Staff | Within 15 business days | \$32,500 |
| | Final Annual Impact Report | April 30, 2020 | |
| | | Total Budget | \$254.600 |

| Table 29. | Custom | Initiative | 2019 | Evaluation | Schedule and | l Budget |
|-----------|--------|------------|------|-------------------|--------------|----------|
| | | | | | | |

2.2.3 Building Operator Certification

AIC, in partnership with the Midwest Energy Efficiency Alliance (MEEA), offers the Building Operator Certification (BOC) training program to building operators in Illinois. BOC is a nationally recognized training and certification program which was developed by the Northwest Energy Efficiency Council (NEEC) and focuses on energy-efficient building operations and preventative maintenance procedures.

The BOC offering consists of two levels of training. The Level I course consists of 8 one-day classes focused on building systems maintenance. The Level II course consists of 7 one-day classes focused on equipment troubleshooting and maintenance. Both courses consist of classroom training, project assignments to be completed at the participant's facility, and in-class tests at the end of each day. Course graduates must renew their credential annually by accumulating points for maintaining employment; attending approved continuing education webinars; and, implementing projects at their facility. While participants do not need to be AIC customers to enroll in the course, AIC customers receive a discounted rate for early enrollment and receive a partial tuition reimbursement upon completion.

MEEA conducted a Level I training course in AIC territory in fall 2018, which ran from early October through end of November and a Level II training course, which ran from late October through December. They have similar plans for 2019. Participation is relatively limited; 2018 participation was approximately 13 individual participants, and MEEA expects less than 20 participants in 2019.

Evaluation Approach

The evaluation of the BOC offering has both impact and process objectives as outlined below.

Research Objectives

Impact Questions

The 2019 impact evaluation will answer the following impact-related questions:

- 1. What are the baseline O&M practices that BOC training participants employ in their facilities?
- 2. What energy-efficient equipment was in place prior to participation in BOC training?
- 3. What baseline knowledge and skills did participants possess prior to the BOC training?
- 4. What are the energy savings per BOC participant?
 - a. What actions were taken due to the training?
 - b. What actions were not taken and why?
- 5. What amount of channeling occurs from the BOC offering to AIC's other energy efficiency rebate initiatives? Do other AIC initiatives already capture BOC savings?
- 6. What is the persistence of energy savings actions over time?

Process Questions

In addition, we will seek to answer the following process-related questions:

- 7. Are BOC participants satisfied with the training experience?
- 8. What improvements could be made to the training experience to increase effectiveness and participant satisfaction?

Conceptual Framework

A useful framework for assessing training programs is the Kirkpatrick Model—the gold standard for evaluating adult training interventions in the training industry. We will utilize this model to guide this study. As illustrated in Figure 1, Kirkpatrick's Framework consists of four levels. The first level is Reaction. Reaction measures how participants feel about the learning experience. The value of Level 1 is that a good training experience improves knowledge transfer. Level 2 is Learning. Learning measures the degree participants change attitudes, increase knowledge, or enhance skills as a result of the learning experience. The value of Level 2 is to demonstrate that learning occurs as a result of the training. The third level is Behavior. Behavior measures the degree to which participants apply what they have learned outside of the learning environment. This level seeks to demonstrate whether trainees take the information they learn and apply it. Finally, Level 4 is Results. Results refer to the degree targeted outcomes are achieved system wide. For results, we seek to measure the program's overall impacts and tangible results, such as energy savings, improved quality, and increased productivity. The value of measuring Level 4 is to inform the return on training investment that a program, entity, or organization realizes from the training endeavor.



Figure 1. Kirkpatrick Model

Sampling

Savings from BOC programs are as custom as you can get, and thus a wide variation in per-participant savings values are to be expected. Previous BOC evaluations have sampled a group of participants and then extrapolated the savings to the population of all participants. However, this proves to be challenging as the population is so heterogeneous. Given our expectations for participation, Opinion Dynamics will take a census approach to the study; thus, removing the challenges associated with sampling.

Evaluation Tasks

The table below summarizes the 2019 evaluation activities proposed for the BOC offering. These tasks fall into two categories: (1) evaluating savings from the 2018 course participants and conducting pre-assessment activities and in-depth interviews for 2019 course participants.

| Activity | Impact | Process | Details |
|--|--------|---------|---|
| 2019 Program Staff Interviews | | ~ | Explore changes made since 2018 and gather information about 2019 program design and implementation. |
| 2019 BOC Participant Pre-Assessment | ~ | ~ | Assess 2019 participants' knowledge and the facilities they manage prior to training intervention. |
| 2019 BOC Participant Level 1 Reaction and Level 2 Knowledge Assessments | ~ | | Use knowledge test results and homework assignments to assess the level of learning that has occurred. |
| 2019 Participant Interviews | | ~ | Gather feedback from participants on their experiences and satisfaction with training. |
| 2018 Pre-Assessment Data Analysis | ~ | | Analyze data collected on 2018 participants' knowledge and the facilities they manage prior to training intervention. |

| [ahle | 30 Su | mmary of | Ruilding | Operator | Offering | Evaluation | Activities | for 2019 |
|-------|--------|----------|----------|----------|----------|------------|------------|----------|
| | 00. Ou | | Pananis | Obolator | VIIVIIIE | LIGUAGO | | |

| Activity | Impact | Process | Details |
|-------------------------|--------|---------|---|
| 2018 BOC Savings Survey | ~ | | Collect data on specific energy savings actions taken by 2018 participants as a result of the BOC training. |
| 2018 On-Site Audits | ~ | | Verify measures and collect data to assess savings of 2018 program. |

We describe each of these activities in detail below.

Task 1: 2019 Program Staff Interviews

Opinion Dynamics will conduct semi-structured interviews with program and implementation staff at AIC and MEEA to determine any changes to the 2019 BOC offering. The interviews will explore program design and implementation elements and discuss a strategy for collecting data for use in evaluation. When acceptable to the interviewee, we will record and transcribe all interviews to facilitate analysis.

Deliverable: Completed interviews

Deliverable Date: January 2019

Task 2: 2019 BOC Participant Pre-Assessment

To fully understand the impacts of the training intervention, we need to develop an understanding of the "base case" of both the training participant's knowledge and the facilities the participant manages where energy savings will likely occur for 2019 participants. We will utilize three mechanisms to assess this: (1) a self-assessment, (2) a baseline 0&M and energy efficient equipment Survey, and (3) BOC homework assignments.

Self-Assessment

BOC students complete a self-assessment during the first day of class. While we understand that this assessment has not been collected from students in the past, we will work with MEEA to collect a copy of this completed document for use in our evaluation. This pre-assessment will enable us to understand the baseline each student comes to the class with which will allow us to better understand the learning that can be attributed to the training intervention.

Baseline O&M Practices and Energy Efficient Equipment Survey

In addition, we will ask MEEA staff to include a survey as homework to bring to the first class that identifies the baseline O&M practices that BOC participants employ in their facilities and what energy efficient equipment is in place prior to the training intervention. We will also ask building operators if they have an energy management system and if so, what data is tracked. In addition, we will ask if they have made any attempt to measure the impact of changes through submetering or other means. We will also ask them about past participation with AIC energy efficiency programs. If the participant manages more than one facility, we will focus the surveys on the three largest facilities they manage. This survey will focus on the following measure categories that the BOC curriculum addresses:

- Boiler/Hot Water/Steam
- Chiller/Chilled Water Systems
- Cooling Tower Optimization
- Domestic Hot Water
- Economizer/Ventilation Controls

- Fan Optimization/Air Distribution
- HVAC Scheduling/Space Temperature
- Lighting
- Packaged/Split System HVAC
- Water Pump Optimization
- Other

We will also ask key questions regarding data points that past BOC evaluations have identified as key to obtain, including hours of operation; if the facility(ies) owns, leases or is managed by the participant's company; if other employees at the organization have taken the BOC training; and, if the participant has direct influence over energy management decisions at the facility(ies).

Finally, we will use this opportunity to understand any plans for energy efficient upgrades or changes in O&M that will inform our understanding of BOC attribution.

BOC Homework Assignments

We will also collect BOC homework assignments to gain further understanding of one of the participant's facilities.

| Deliverable: Draft and final participant survey instruments | Deliverable Date: TBD |
|--|----------------------------------|
| Deliverable: Results provided in annual impact evaluation report | Deliverable Date: March 15, 2020 |
| Deliverable: Results provided in process memo | Deliverable Date: March 15, 2020 |

Task 3: 2019 BOC Participant Level 1 Reaction and Level 2 Knowledge Assessments

At the end of each class day, a course evaluation and knowledge test are given to each participant. Opinion Dynamics will work with MEEA to obtain copies of these assessments from the 2019 courses as indicators of Kirkpatrick's Level 1 and Level 2. In addition, we will use the homework assignments mentioned above as evidence to assess the level of learning that has occurred.

Deliverable: Data request

Deliverable Date: TBD

Task 4: 2019 Participant Interviews

Directly following the conclusion of the 2019 Level I and Level II courses, we will reach out to all participants and schedule a telephone in-depth interview. The objective of these interviews will be to: (1) confirm completion of the course series; (2) solicit more detailed feedback regarding their satisfaction with the experience; (3) understand how they characterize the learning that occurred in the course they participated in; (4) characterize any changes (if any) they have made to their facilities during the course of the training; (5) understand any future plans for energy efficiency equipment additions, upgrades, or replacements and their estimated timelines; (6) codify any future plans for 0&M changes and their estimated timelines; (7) understand the role the training intervention played in these future plans and (8) characterize any plans to participate in other AIC energy efficiency offerings. The timing of these interviews will minimize recall issues and increase the validity of the attribution assessment. We estimate these interviews to last approximately 45 minutes and will provide participants a \$50 gift card for their time. During this interview, we will let them know about the upcoming survey and on-site audit, their estimated timing, and the incentive for them to participate.

Deliverable: Completed interviews

Task 5: 2018 Pre-Assessment Data Analysis

After collecting the BOC self-assessment and BOC homework assignments upon completion of the Level I (November 29, 2018) and Level II courses (December 13, 2018) and fielding the baseline 0&M and energy efficient equipment survey with all participants, we will analyze the 2018 data to develop the "base case" of both the training participant's knowledge and the facilities the participant manages where energy savings will likely occur for these participants.

Deliverable: Results provided in annual impact evaluation report

Deliverable Date: March 15, 2020

Task 6: 2018 BOC Savings Survey

The timing of these interventions is challenging from an evaluation perspective as enough time must elapse to see most of the impacts of the intervention. Participants need to identify most potential energy efficiency improvements, have these improvements approved by their organization, implement these measures, and then enough time must pass in order to assess the resulting savings. Given the situation, Opinion Dynamics will field a survey of 2018 participants to elicit specific actions (if any) that participants took as a result of the training.¹¹ We will seek to understand: (1) What they have changed? (2) What equipment or process did the change apply to? (3) How they have changed it? and (4) When and how often they implement that change? We will also assess channeling into other AIC programs. We will conduct the BOC savings survey as an internet survey and attempt a census of all participants. We will provide each participant who completes the survey a \$100 incentive as a thank you for their time, as we anticipate this survey to be approximately 20-30 minutes.

Deliverable: Draft and final survey instruments

Deliverable Date: November 2019

Task 7: 2018 On-Site Audits

Using the survey as a foundation, we will conduct on-site audits with a census of 2018 participants in November of 2019.¹² For each site visit, engineers will perform three main tasks:

- 1. Verify that the measures indicated on the surveys are installed and operating;
- 2. Determine the timing of the measures to be sure that they were completed after any BOC program training; and,
- 3. Gather detailed information to allow for calculation of savings based on standard engineering algorithms and Excel models such as the bin method.

From this data, we will calculate any additional energy saving attributable to BOC. We will attempt to conduct audits for a census of participants. We will offer a \$250 incentive to participants for allowing us to conduct the audit.

Deliverable: Results provided in annual impact evaluation report

Deliverable Date: March 15, 2020

Task 8: 2018 Reporting

The evaluation team will provide impact findings in the Business Program annual impact evaluation report in March 2020. The evaluation team will provide a draft report for AIC, ICC Staff, and SAG review and then deliver

Deliverable Date: TBD

¹¹ We will conduct a similar survey of 2019 participants in late 2020 as part of our 2020 evaluation activities.

 $^{^{\}rm 12}$ We will conduct on-site audits of 2019 participants in late 2020.

a final report that incorporates any comments from the review. In addition, the evaluation team will provide a process memo addressing the process research objectives listed above.

| Deliverable: Chapter in draft annual Business Program impact report | Deliverable Date: March 15, 2020 |
|---|----------------------------------|
| Deliverable: Draft process memo | Deliverable Date: March 15, 2020 |
| Deliverable: Chapter in final annual Business Program impact report | Deliverable Date: April 30, 2020 |
| Deliverable: Final process memo | Deliverable Date: April 30, 2020 |

Evaluation Budget and Timeline

Table 31 summarizes the timing and budget associated with each evaluation activity.

| Task | Evaluation Activity | Deliverable Date | Budget |
|------|---|--|-----------|
| 1 | 2019 Program Staff Interviews | January 2019 | \$2,700 |
| 2 | 2019 BOC Participant Pre-Assessment | Survey conducted as homework assignment for first class | \$16,900 |
| 3 | 2019 BOC Participant Level 1 Reaction and Level 2 Knowledge Assessments | 2 months post-first day of class | \$3,800 |
| 4 | 2019 Participant Interviews | 2.5 months post-first day of class | \$13,300 |
| 5 | 2018 Pre-Assessment Data Analysis | January 21, 2019 – August 30, 2019 | \$42,400 |
| 6 | 2018 BOC Savings Survey | November 4 – November 11, 2019 | \$46,600 |
| 7 | 2018 On-Site Audits | December 2 – December 13, 2019 | \$26,300 |
| | Draft Annual Impact Report | March 15, 2020 | |
| 6 | Comments from AIC, ICC, and SAG staff | Within 15 business days | \$30,200 |
| | Final Annual Impact Report | April 30, 2020 | |
| | | Total Budget | \$182,200 |

 Table 31. Building Operator Certification Offering 2019 Evaluation Schedule and Budget

2.2.4 Retro-Commissioning

Over time, deferred maintenance and changing operating directives and practices can lead to inefficient operation of building systems. Retro-commissioning is a process that examines current operations relative to the needs of equipment owners and those served by the equipment and determines opportunities for increasing equipment efficiency through maintenance, system tune-ups, scheduling, and optimization of operations.

The Retro-Commissioning (RCx) Initiative helps AIC business and public sector customers identify no-cost and low-cost efficiency optimizations and implement these improvements to achieve energy savings in existing energy-using systems. The initiative includes several offerings:

- Compressed Air
- Large Facilities
- Industrial Refrigeration

- Grocery Store
- Retro-Commissioning Lite

Secondary objectives of the initiative include:

- Channeling participation into other AIC Business Program initiatives to implement cost-effective equipment replacements and retrofits (e.g., healthcare retro-commissioning studies might recommend that laminar flow restrictors be installed through the Standard Initiative)
- Developing a network of retro-commissioning service providers (RSPs) that will continue to operate in the AIC service territory

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

Evaluation Approach

The evaluation of the RCx Initiative includes a quantification of energy and demand impacts, estimation of NTGRs (for prospective application), and a limited process analysis.

Research Objectives

Impact Evaluation

The 2019 research objectives for the evaluation of the Retro-Commissioning Initiative focus on rigorous impact evaluation. The primary objective of the evaluation is to provide estimates of gross and net electric and gas savings associated with the initiative. More specifically, the 2019 impact evaluation will answer the following questions:

- 1. What are the estimated gross energy and demand impacts from the Initiative in 2019?
- 2. What are the estimated net energy and demand impacts from the Initiative in 2019?

Process Evaluation

We plan to conduct a limited assessment of initiative processes in 2019. Our process analysis will primarily focus on changes made by the Initiative moving into 2019 and will be based on our review of initiative materials, initiative staff interviews, and process questions included in the participant survey.

- 3. Initiative Participation
 - a. What were the characteristics of participating customers? How many projects were completed? By how many different customers? What type of projects?
 - b. Did customer participation meet expectations? If not, how and why is it different from expectations? Would any changes in the mix of customers or projects have been desirable?

- c. How many RSPs actively participated in the various sectors and offerings targeted by the initiative? How many projects did each RSP complete?
- 4. Initiative Design and Implementation
 - a. Did the initiative's design and implementation change from 2018? If so, how and why and was this an advantageous change?
 - b. Did the initiative experience any implementation challenges in 2019? If so, what were they, and how were they overcome?
 - c. How satisfied are customers with their experience participating in the initiative?
 - d. What changes could the initiative make to improve the customer experience and generate greater energy savings?

Forward Looking

The evaluation will also answer the following forward-looking research questions:

5. What is the level of participant free-ridership and spillover for the initiative, for prospective application?

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

Evaluation Tasks

The table below summarizes the 2019 evaluation activities proposed for the RCx Initiative.

| Activity | Impact | Process | Forward Looking | Details |
|---|--------|---------|--------------------|--|
| Initiative Material and Database Review | ~ | ~ | | Gather information about initiative implementation and performance. |
| Initiative Staff Interviews | | ~ | | Explore changes made since 2018 and gather information about initiative marketing, implementation, and 2019 performance. |
| Impact Analysis | V | | | Review project documentation and calculations to account for analytical errors, incorrect assumptions, etc. Collect on- site data to inform measure verification and ex post gross impacts. Determine 2019 net impacts using SAG-approved NTGR values. |
| Participant Interviews | ~ | ~ | ~ | Gather attribution information for each project to support estimation of NTGRs for prospective application. Conduct limited exploration of initiative processes and areas for initiative improvement. |

Table 32. Summary of Retro-Commissioning Initiative Evaluation Activities for 2019

We describe each of these activities in detail below.

Task 1. Initiative Material and Database Review

The team will conduct a comprehensive review of all initiative materials and tracking data. This includes Business Program marketing and implementation plans, customer and ally communications, and extracts from the Business Program tracking database (i.e., AMPlify). We request extracts from AMPlify on a regular basis and will continue to communicate with AIC and Leidos about data needs as needed. At a minimum, we will request a mid-year extract of the database in June 2019, and make subsequent requests at the close of 2019 (December 31, 2019) and then again in January 2020, when we expect the database to be finalized.

Deliverable: Data requests

Deliverable Date: Ongoing

Task 2. Initiative Staff Interviews

To support our evaluation, we will develop an in-depth interview guide for 2019 to explore initiative performance, changes since 2018, and other topics relevant to our research objectives. We will conduct two interviews with Business Program staff involved in retro-commissioning: (1) a brief interview mid-cycle to understand changes made to the initiative in 2019 and to provide time for the evaluation team to modify any research tasks as necessary and (2) a comprehensive interview toward the end of 2019 allowing implementation staff the opportunity to comment on the initiative's performance throughout 2019. We will likely conduct interviews focusing on all Business Program initiatives together, but we will conduct interviews with staff specific to this initiative, as needed.

Deliverable: Completed interviews

Deliverable Dates: April and November 2019

Task 3. Impact Analysis

Conducting gross impact analysis for retro-commissioning projects requires custom engineering calculations. However, retro-commissioning projects can have large variability in savings among participants. Sources of variability include the physical size of the participant site, the systems installed, the condition of systems prior to retro-commissioning, the extent of control capabilities, the scope and quality of the retro-commissioning study itself, and the willingness of customers to implement recommendations. To appropriately represent this variability, the gross impact analysis for the Retro-Commissioning Initiative will employ a bottom-up approach to estimating gross savings. Consistent with prior years, the impact analysis will be based on site-specific engineering desk reviews¹³ and on-site M&V.

Given the timing of this evaluation plan, it is too early to predict the level of activity for the initiative in 2019 and desirable sample sizes for the impact evaluation. We will determine the optimal sampling approach based on the number and type of projects completed in 2019, and target 90/10 confidence and precision around our results, by fuel type.

We anticipate drawing separate samples for gas and electric projects and stratifying projects into small and large energy savers (or small, medium, and large savers, depending on the initiative results) within each sample. Stratification of projects by size allows us to over-sample large savers, thus ensuring that our analysis covers a sufficient share of initiative savings. From within each stratum, we will randomly sample projects to achieve the desired precision and confidence targets. To ensure diversity of measures and offerings, we may consider stratifying the impact sample by offering if the final population of projects appears to require it.

¹³ As needed, engineering desk reviews will include consumption analysis and modeling on a project-specific basis.

Depending on the overall level of participation and project characteristics (energy savings and retrocommissioning offering type), we may take one of two sampling approaches to our impact analysis:

Conduct engineering desk reviews and on-site M&V for a census of completed projects in 2019.

Conduct engineering desk reviews for a census of completed projects in 2019, coupled with on-site M&V at a stratified random sample of completed projects. In this case, we will use a stratified ratio estimation technique: we will draw a stratified random sample of projects for on-site verification, determine realization rates for each sampled site (for each impact metric, at the project level), and apply these realization rates to the preliminary ex post gross savings values determined for each project through engineering desk reviews to determine overall ex post gross savings for the Initiative.

For budgeting purposes, we have assumed that we will conduct 30 engineering reviews and 10 on-site visits. We will adjust the sample size depending on participation in order to achieve the statistical targets, if necessary. As needed, and as project completion timing allows, we will conduct our impact analysis in multiple waves to expedite our 2019 evaluation results.

The team will share the results of our gross impact analysis with AIC and ICC staff in advance of submitting the draft annual report. The Excel file provided for review and discussion will feature the ex ante and ex post savings for each project selected for engineering review and/or on-site measurement and verification, the resulting realization rate, and the reasons for the realization rate. To the degree time allows, we will also hold a meeting with AIC and its implementation team, as well as with ICC staff, to discuss the findings and answer any questions.

We will calculate 2019 net savings by applying the SAG-approved NTGR of 89.0% to electric and gas gross savings.¹⁴

Deliverable: Gross impact analysis summary spreadsheet

Deliverable Date: TBD¹⁵

Deliverable: Final analysis in annual report

Deliverable Date: March 2020

Task 4: Participant Interviews

The evaluation team will conduct telephone interviews with customers who have participated in the initiative in 2018 and 2019.¹⁶ These interviews will focus on attribution (i.e., NTGR) and will include targeted measure verification to help inform the engineering review and site visits. In addition, they may include limited questions on program processes, including satisfaction with the initiative, barriers to participation, and areas for improvement.

¹⁴ For Retro-Commissioning projects associated with a Staffing Grant (described in the Custom Initiative section), the evaluation team will use the same NTGR approach as in past years: We will compare the NTGR developed through the 2019 interviews with the SAG-approved 2019 NTGR. The SAG-approved 2019 NTGR will be used as a floor and, if the NTGR developed through the Staffing Grant interviews exceeds the SAG-approved 2019 value, then we will apply the new NTGR to all of the projects associated with that Staffing Grant. However, if the newly developed NTGR falls below the SAG-approved 2019 value, we will apply the SAG-approved 2019 value to each of the participant's projects.

¹⁵ This is dependent upon the sampling approach chosen for 2019.

¹⁶ We plan to interview both 2018 and 2019 participants in order to ensure a large enough sample to achieve the target number of completes. Based on current information, we believe the programs will be implemented in 2019 as they were in 2018 and therefore participants in 2019 will have a similar experience as 2018 participants.

The number of interviews will depend on the final level of participation in 2018 and 2019, but it is likely that we will attempt a census of all participants. For budgeting purposes, we assume that we will conduct approximately 15 interviews.

We will report results in a memorandum, which will provide our process findings and updated NTGRs, while including a full description of the methodology used to assess free-ridership and spillover. We will provide a draft memorandum to AIC and ICC staff for review and comment before we finalize results.

| Deliverable: Draft and final participant survey instrument | Deliverable Date: April 2019 |
|--|-------------------------------|
| Deliverable: Draft memorandum | Deliverable Date: June 2019 |
| Deliverable: Final memorandum | Deliverable Date: August 2019 |

Task 5: Reporting

The evaluation team will provide all impact findings in the Business Program annual impact evaluation report in March 2019. The evaluation team will provide a draft report for AIC, ICC staff, and SAG review and then deliver a final report that incorporates any comments from the review.

| Deliverable: Chapter in draft annual Business Program impact report | Deliverable Date: March 15, 2020 |
|---|----------------------------------|
| Deliverable: Chapter in final annual Business Program impact report | Deliverable Date: April 30, 2020 |

Evaluation Budget and Timeline

Table 33 summarizes the timing and budget associated with each evaluation activity. In total, the 2019 budget for the evaluation of the Retro-Commissioning Initiative is \$127,600.

| Task | Evaluation Activity | Deliverable Date | Budget |
|------|---|-------------------------|-----------|
| 1 | Initiative Material and Database Review | Ongoing | \$2,200 |
| 2 | Initiative Staff Interviews | April and November 2019 | \$4,000 |
| 3 | Impact Analysis | May 2019 | \$76,400 |
| 4 | Participant Interviews | August 2019 | \$22,500 |
| | Draft Annual Impact Report | March 15, 2020 | |
| 5 | Comments from AIC and ICC Staff | Within 15 business days | \$22,500 |
| | Final Annual Impact Report | April 30, 2020 | |
| | | Total Budget | \$127,600 |

Table 33. Retro-Commissioning Initiative 2019 Evaluation Schedule and Budget

2.2.5 Streetlighting

Made available to AIC customers for the first time in 2018, the Streetlighting Initiative incentivizes municipal customers to upgrade their streetlight fixtures. High-intensity discharge (HID) lighting is still the standard technology used for streetlighting in the United States. The Initiative targets existing streetlighting and other outdoor lighting for upgrades from HID to LED technology.

The Initiative targets both municipal customers, who own their streetlighting fixtures, and municipal customers with AIC-owned streetlight fixtures. In both cases, the Initiative provides incentives for customers to upgrade their lighting. AIC is currently replacing streetlights it owns with LED technology upon burnout at no cost to

customers. Early replacement of these streetlights is available to customers for a per-fixture fee. The Initiative incentivizes customers to request early replacement of these fixtures and provides an incentive to decrease the per-fixture cost to customers.

The 2018 program year did not have significant initiative participation and only generated seven percent or 401 MWhs of the 5,811 MWh 2018 goal. Initiative staff attribute this lack of participation to the tariff that requires AIC to replace HID streetlights with LEDs on burnout. This tariff and knowledge that fixtures will eventually be replaced without municipal investment creates a high barrier to initiative participation.

Evaluation Approach

The evaluation of the Streetlighting Initiative has both impact and process objectives to provide immediate feedback on this new offering to AIC and to ground future evaluation work.

Research Objectives

Impact Questions

The 2019 impact evaluation will answer the following questions:

- 1. What were the estimated gross energy and demand impacts from the Initiative in 2019?
- 2. What were the estimated net energy and demand impacts from the Initiative in 2019?

Process Questions

The 2019 process evaluation will answer the following questions:

- 3. Implementation Improvements
 - a. What actions have taken place to increase initiative participation in 2019?
- 4. Initiative Participation
 - a. What are the main barriers to initiative participation?
 - b. What were the characteristics of participating and non-participating customers? How many projects were completed?
 - c. Are any changes in the mix of customers and projects desirable?
- 5. Participant Feedback
 - a. What experience did participants have with the Initiative? What was their level of satisfaction?
 - b. What was the level of free-ridership and participant spillover associated with the Initiative in 2019?

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

Evaluation Tasks

Table 34 summarizes the 2019 evaluation activities proposed for the Streetlighting Initiative.

| Activity | Impact | Process | Forward Looking | Details |
|---|--------|---------|--------------------|---|
| Initiative Material and Database Review | ~ | ~ | | Gather information about initiative implementation and performance. |
| Initiative Staff Interviews | | ~ | | Discuss theory behind the initiative, implementation challenges, our evaluation approach, and other relevant topics. |
| Process Model Development | | ~ | | Develop initiative process model to ground future evaluation efforts |
| Participating Municipality Survey | | ~ | \checkmark | Assess participant experience with initiative and develop NTGRs for future application. |
| Impact Analysis | ~ | | | Review project documentation and calculations to account for analytical errors, incorrect assumptions, etc. Determine 2019 net impacts based on AIC planning assumptions and/or evaluation team recommendations. |
| IL-TRM Algorithm Updates | ~ | | | Based on engineering desk reviews, develop recommendations for streetlighting measures changes into IL-TRM |

Table 34. Summary of Streetlighting Initiative Evaluation Activities for 2019

We describe each of these activities in detail below.

Task 1. Initiative Material and Database Review

The team will conduct a comprehensive review of all initiative materials and tracking data. This includes Business Program marketing and implementation plans, customer and ally communications, and (assuming that the Streetlighting Initiative tracks projects in the same manner as all other Business Program initiatives) extracts from the Business Program tracking database (i.e., AMPlify). We request extracts from AMPlify on a regular basis and will continue to communicate with AIC and Leidos about data needs as needed. At a minimum, we will request a mid-year extract of the database in June 2019 and make subsequent requests at the close of 2019 (December 31, 2019) and then again in January 2020, when we expect the database to be finalized.

Deliverable: Data requests

Deliverable Date: Ongoing

Task 2. Initiative Staff Interviews

To support our evaluation, we will develop an in-depth interview guide for 2019 to explore initiative performance, changes since 2018, and other topics relevant to our research objectives. We will conduct multiple interviews with Business Program staff: a brief interview mid-cycle to discuss the initiative and to provide time for the evaluation team to modify any research tasks as necessary, as well as a comprehensive interview toward the end of 2019 allowing implementation staff the opportunity to comment on the initiative's performance throughout 2019. In total, we plan to complete three to five interviews, including interviews with the Business Program managers and marketing staff. We will likely conduct interviews focusing on all Business Program initiatives together, but we will conduct interviews with specific staff as needed (e.g. Streetlighting specific staff).

Deliverable: Completed interviews

Deliverable Date: April and November 2019

Task 3. Process Model Development

Based on our review of initiative materials and interviews with Business Program staff, we will develop a process model for the Streetlighting Initiative to inform future evaluation efforts and determine if the theory behind the Initiative is sound.

Deliverable: Streetlighting Initiative process model

Task 4. Participating Municipality Survey

We will conduct direct research with Streetlighting Initiative participants to assess participant experience and explore initiative attribution. If possible, surveys will be web-based so that they can be administered on rolling basis. The evaluation team will use results from the survey, consistent with the IL-TRM, to develop a streetlighting-specific NTGR for future application. Given the lack of participation in 2018, this task will be taken on in 2019 as long as more participants engage in the initiative.

Deliverable: Draft and final survey instrument

Deliverable: Streetlighting participant findings memo

Task 5a. Impact Analysis

To assess gross savings in 2019, the evaluation team will conduct engineering desk reviews of the ex ante savings calculations made for streetlighting and apply the IL-TRM algorithm for streetlighting measures. Where necessary, we will assess the assumptions made by the implementation team and comment on their appropriateness. In addition, we will conduct engineering desk reviews of initiative application forms and other supporting documents to ensure that the initiative tracking database represents this information appropriately. To calculate net impacts, the evaluation team will apply the SAG-approved NTGR of 100% for streetlighting.

Deliverable: Final analysis in annual report

Deliverable Date: March 2020

Task 5b. IL-TRM Algorithm Updates

The evaluation team will use the engineering reviews completed as part of the gross impact analysis to update the streetlighting measure and submit the recommendations for updates to the IL-TRM Technical Advisory Committee for consideration as part of the development process. This task will only occur if necessary.

Deliverable: Recommendations for IL-TRM updates (if necessary) D

Deliverable Date: May 15, 2020

Task 6. Reporting

The evaluation team will provide all impact findings in the Business Program annual impact evaluation report in March 2020. The evaluation team will provide a draft report for AIC, ICC staff, and SAG review and then deliver a final report that incorporates any comments from the review.

| Deliverable: Chapter in draft annual Business Program impact report | Deliverable Date: March 15, 2020 |
|---|----------------------------------|
| Deliverable: Chapter in final annual Business Program impact report | Deliverable Date: April 30, 2020 |

Evaluation Budget and Timeline

Table 35 summarizes the timing and budget associated with each evaluation activity. In total, the 2019 budget for the evaluation of the Streetlighting Initiative is \$123,000.

Deliverable Date: June 2019

Deliverable Date: August 2019

Deliverable Date: February 2020

| Task | Evaluation Activity | Deliverable Date | Budget |
|------|---|-------------------------|-----------|
| 1 | Initiative Material and Database Review | Ongoing | \$3,800 |
| 2 | Initiative Staff Interviews | April and November 2019 | \$4,100 |
| 3 | Process Model Development | December 2019 | \$11,500 |
| 4 | Participating Municipality Survey | August 2019 | \$27,200 |
| 5a | Impact Analysis | March 2020 | \$30,500 |
| 5b | IL-TRM Algorithm Updates | May 2020 | \$11,900 |
| | Draft Annual Impact Report | March 15, 2020 | |
| 6 | Comments from AIC and ICC Staff | Within 15 business days | \$34,000 |
| | Final Annual Impact Report | April 30, 2020 | |
| | | Total Budget | \$123,000 |

Table 35. Streetlighting Initiative 2019 Evaluation Schedule and Budget

2.2.6 Business Behavioral Modification Pilot

Beginning in 2019, AIC will be newly offering a behavioral pilot treating non-residential customers as part of its Business Program. This behavioral pilot is part of AIC's Breakthrough Equipment and Devices (BED) activities as specified in its 2018-2021 Energy Efficiency Plan.

The pilot has multiple goals, including:

- Reducing non-residential energy consumption by encouraging energy-efficient behaviors
- To help AIC to further engage its non-residential electric customers
- To empower AIC staff to better target, segment, and serve customers

The pilot will include two distinct customer-facing forms of treatment: bi-monthly business energy reports (BERs) delivered by mail to a selected group of small and medium business electric customers; as well as an online engagement portal providing information on energy consumption to **all** non-residential electric customers.

The pilot will be implemented by Agentis, an implementation contractor that has offered a similar program to ComEd customers in past years. Based on initial conversations with AIC, AIC's prime implementation contractor Leidos, and Agentis, we expect that the pilot will launch in late Q1 of 2019.

Evaluation Approach

The 2019 evaluation of the Business Behavioral Modification pilot will include an impact analysis focused on the BERs delivered through the pilot and limited process analysis as outlined below. Notably, the 2019 evaluation **does not** expect to assess energy savings achieved via customer interaction with the online engagement portal.¹⁷

¹⁷ Past evaluations of these types of program offerings in Illinois have not been able to detect statistically significant savings from customer engagement with online portals (see the PY5 evaluation of the ComEd Commercial & Industrial Behavioral Program: http://ilsagfiles.org/SAG_files/Evaluation_Documents/ComEd/ComEd%20EPY5%20Evaluation%20Reports/ComEd_EPY5_C&I_Behavioral_Program_Eval_Report_2014-03-11_Final.pdf). Opinion Dynamics plans to monitor customer engagement with the online

To support these efforts, the evaluation team plans to interview the AIC pilot manager and implementation team, review relevant background materials and documentation, assist the implementation team in randomizing customers to receive BERs and ensure that the pilot is implemented as a randomized control trial (RCT), and conduct a consumption analysis, joint savings analysis, and make savings adjustments to provide net adjusted energy and demand savings attributable to BERs delivered through the pilot. In addition, the evaluation team also plans to conduct a limited process evaluation of the online portal, including an assessment of uptake rate and the level of customer engagement.

Research Objectives

Impact Questions

The 2019 Business Behavioral Modification pilot evaluation is focused on the assessment of impacts from the pilot's BERs and is structured to answer the following research questions:

- 1. Are the new treatment and control groups selected to receive BERs in 2019 equivalent in terms of pretreatment energy consumption (e.g., does the pilot represent a true RCT)?
- 2. What are the estimated electric energy and electric demand savings from the pilot in 2019?
- 3. Do estimated savings need to be adjusted due to the treated population's participation in other AIC initiatives? If yes, by how much do savings need to be adjusted?

Process Questions

- 4. How effectively was the pilot implemented in 2019? Can any changes be made to implementation of the pilot to increase its effectiveness in achieving its objectives?
- 5. What is the level of customer uptake and usage of the online portal?

Evaluation Tasks

To achieve our research objectives, the team will complete a series of evaluation tasks as outlined in Table 36. Additional detail regarding each task can be found following the table.

| Activity | Impact | Process | Forward Looking | Details |
|--|--------------|--------------|--------------------|--|
| Pilot Material and Database Review | \checkmark | \checkmark | | Review materials to assess pilot design, implementation, and operations. |
| Pilot Staff Interviews | \checkmark | \checkmark | | Explore topics around implementation of the pilot. |
| Treatment/Control Randomization and Equivalency Analysis | ~ | | | Randomize the selection of customers receiving BERs into treatment and control groups and confirm that the random assignment led to relatively comparable groups. |
| Consumption Analysis | ~ | | | Conduct consumption analysis to quantify the changes in energy use between the treatment and control groups attributable to BERs and apply a coincidence factor to energy savings to estimate demand savings. |

Table 36. Summary of Business Behavioral Modification Pilot Evaluation Activities for 2019

portal throughout the 2019 program year and will revisit whether impacts from the online portal should be evaluated in the 2020 evaluation planning process.

| Activity | Impact | Process | Forward Looking | Details |
|--|--------------|---------|--------------------|--|
| Joint Savings Analysis and Savings Adjustments | \checkmark | | | Determine the savings due to participation in other AIC business initiatives and make adjustments to account for them. |
| Assessment of Persisting Savings | \checkmark | | | Calculate persisting savings for the pilot per the IL-TRM V7.0. |
| Online Portal Uptake Analysis | | ~ | ~ | Examine and summarize customer use of the online portal, with a particular eye toward determining whether assessment of energy savings from this engagement would be appropriate in future years. |

Each of these activities is described in more detail below.

Task 1. Pilot Material and Database Review

The evaluation team will review the pilot tracking database, and other pilot materials, including a sample of the 2019 BERs. Through this review, the team will determine if there were any gaps present in the data, particularly around information required for the impact analysis.

Deliverable: Data requests

Deliverable Date: Throughout 2019

Task 2. Pilot Staff Interviews

The team will conduct telephone interviews with key staff from AIC and the implementation contractor. The interviews will provide the evaluation team with a comprehensive understanding of the pilot and its implementation, including insights into the daily workings of the pilot and key successes and challenges.

Deliverable: Completed interviews

Deliverable Date: June 2019

Task 3. Treatment/Control Randomization and Equivalency Analysis

AIC and the implementer will coordinate with the Opinion Dynamics evaluation team to support the selection of a cohort for 2019. The implementer will select a cohort and provide the set of customers to the evaluation team for random assignment customers into treatment and control groups. Using a randomized control trial design will eliminate self-selection bias and strengthen the internal validity of our research. Prior to estimating pilot impacts, we will also analyze the treatment and control groups' pre-treatment period (pre-period) monthly usage data to confirm that the groups are equivalent.

Deliverable: Randomized treatment and control groups

Deliverable Date: TBD

Task 4a. Consumption Analysis

The evaluation team will use a consumption analysis as the primary method to determine energy savings and demand impacts from the pilot. Further, given the randomized control design, the estimated savings from the consumption analysis are considered net savings. The evaluation team will conduct an intent to treat (ITT) approach and estimate savings using a difference-in-differences (DID) model. The DID refers to the model's implicit comparison of consumption before and after treatment of both treatment and control group customers. The model includes customer-specific intercepts (i.e., fixed effects) to capture unobserved differences between customers that do not change over time and which affect customers' energy use.

The evaluation team will calculate measured electric savings from a consumption analysis that controls for non-treatment differences in energy use between treatment and control customers using lagged energy use as an explanatory variable (Equation 1). This model includes terms to account for systematic differences between control and treatment customers in their past energy use, which is highly correlated with their current energy use.

Equation 6. Post-Only Model Estimating Equation

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

Where:

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

 α = Overall intercept

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

 β_2 = Coefficient for the average daily usage across pre-treatment meter reads

 β_3 = Coefficient for the average daily usage over the months of December, January, February, and March pretreatment meter reads

 β_4 = Coefficient for the average daily usage over the months of June, July, August, and September pretreatment meter reads

 β_5 = Vector of coefficients for month-year dummies

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

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

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

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

 $MonthYear_t$ = Vector of month-year dummies

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

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

ε_{it} = Error

It is important to note that the consumption analysis will include all customers in the treatment group with sufficient data. The evaluation team will compare pre-period energy consumption across the treatment and control populations to ensure that the treatment and control groups are relatively comparable.

Task 4b. Joint Savings Analysis and Savings Adjustments

Estimated savings from the Business Behavioral Modification pilot will reflect both non-purchase behavioral changes (e.g. turning off lights in unoccupied rooms and adjusting thermostat settings), as well as investments in energy-saving equipment (e.g. high efficiency HVAC equipment and LED lighting). If energy-saving equipment was installed in treated businesses through other AIC business initiatives, savings from this equipment could appear in both the savings results for the Business Behavioral Modification pilot and for business initiatives, which would result in a double-counting of savings if an adjustment were not made. The evaluation team will calculate a savings adjustment to account for the portion of net savings estimated from the consumption analysis that has already been claimed by other AIC initiatives.

The evaluation team will base the savings associated with participation in other AIC initiatives on the results of their respective 2019 impact evaluations. As such, the team will conduct a participation lift and joint savings analysis to assess trends in initiative participation during 2019 and calculate adjusted net savings estimates using the results of this analysis. Participation lift analysis assesses whether behavioral initiative treatment has an incremental effect on participation in other AIC initiatives, while the joint savings analysis identifies the portion of savings from behavioral treatment that is double-counted by the Business Behavioral Modification pilot and other AIC energy efficiency initiatives.

Task 4c. Assessment of Persisting Savings

In accordance with the IL-TRM V7.0, the evaluation team will also calculate persisting savings for the pilot. This adjustment will take place after the consumption and joint savings analyses have been conducted as outlined in IL-TRM V7.0, Section 6.1.1 Adjustments to Behavior Savings to Account for Persistence. As specified by the TRM, this pilot will use a one-year measure life in the absence of supportable evidence for persisting savings beyond one year.

Deliverable: Impact results provided in annual report

Deliverable Date: March 2020

Task 5. Online Portal Uptake Analysis

The 2019 evaluation will include an examination of the degree of customer engagement with the online portal. Specific areas for examination will be determined through conversations with implementation staff once the pilot is up and running, but will include at minimum:

- Assessment of the number of AIC customers engaging with the portal
- Assessment of the depth of engagement of customers who use the portal (e.g., do they log in once and never use the portal again; do they use the portal every week, what parts of the portal do they use, etc.)
- Assessment of the characteristics of AIC customers engaging with the portal (e.g., business type)

We will report the results of this analysis in a stand-alone memo to be provided to AIC. To the degree possible, we will also comment on whether statistically significant assessment of energy savings resulting from customer engagement with the portal will be possible in future years.

Deliverable: Online portal uptake analysis memo

Deliverable Date: December 2019

Task 6. Reporting

The evaluation team will provide all impact findings in the Business Program annual impact evaluation report in March 2020. The evaluation team will provide a draft report for AIC, ICC staff, and SAG review and then deliver a final report that incorporates any comments from the review.

| Deliverable: Chapter in draft annual Business Program impact report | Deliverable Date: March 15, 2020 |
|---|----------------------------------|
| Deliverable: Chapter in final annual Business Program impact report | Deliverable Date: April 30, 2020 |

Evaluation Budget and Timeline

Table 37 summarizes the timing of each evaluation activity, as well as the budget associated with each task.

Table 37. Business Behavioral Modification Pilot 2019 Evaluation Schedule and Budget

| Task | Evaluation Activity | Deliverable Date | Budget |
|------|--|-------------------------|-----------|
| 1 | Pilot Material and Database Review | Ongoing | \$4,700 |
| 2 | Pilot Staff Interviews | June 2019 | \$5,300 |
| 3 | Treatment/Control Randomization and Equivalency Analysis | TBD | \$4,800 |
| 4a | Consumption Analysis | | |
| 4b | Joint Savings Analysis and Savings Adjustments | March 2020 | \$54,400 |
| 4c | Assessment of Persisting Savings | | |
| 5 | Online Portal Uptake Analysis | December 2019 | \$21,200 |
| | Draft Annual Impact Report | March 15, 2020 | |
| 6 | Comments from AIC and ICC Staff | Within 15 business days | \$29,500 |
| | Final Annual Impact Report | April 30, 2020 | |
| | | Total Budget | \$119,900 |

2.3 Voltage Optimization Program

In 2019, AIC will be operating and claiming savings from Voltage Optimization as part of its energy efficiency portfolio. In this section, we outline the anticipated evaluation activities for this program. In accordance with Illinois evaluation requirements, we will deliver a draft annual Voltage Optimization impact evaluation report on March 15, 2020, covering the 2019 program year. This report will include information on 2019 ex post impacts.

Voltage optimization (VO) is a form of energy efficiency technology implemented by electric utilities at the distribution substation or circuit level that optimizes voltage levels along distribution circuits to reduce electricity usage. There are two main VO technologies: Conservation Voltage Reduction (CVR) and Volt-Var Optimization (VVO). CVR reduces customer energy consumption by reducing line voltage and VVO improves the power factor to reduce line losses. Once implemented, VO technologies are intended to operate 24 hours a day, 365 days a year. AIC will implement hardware and software solutions using VO technologies.

AlC launched its VO program in 2018, leveraging experience gained from a 2012 VO Pilot Project. As part of 2018 implementation activities, AlC installed hardware, software, and communications components¹⁸ on a subset of 1,047 eligible feeders¹⁹ on a phased basis, with 19 circuits deployed in 2018 and culminating in 1047²⁰ circuits deployed by 2024. In 2019, evaluation activities will evaluate the impacts of the circuits deployed in 2018, in addition to calculating impacts from "on/off testing," which will commence in 2019.

Evaluation Approach

The 2019 evaluation of the VO Program focuses exclusively on estimating impacts associated with VO implementation.

Research Objectives

Impact Questions

The VO evaluation team seeks to address the following research questions:

- 1. What are the estimated energy savings from VO calculated with the algorithmic approach? What are the savings when calculated using the on/off testing approach?
- 2. What, if any, modifications are needed to the algorithm approach or its underlying parameter assumptions?

The process evaluation for this program will be limited to annual interviews with program staff, which will aid the evaluation team's understanding of the status of the program at the start of the evaluation year and inform the team of key developments made as the program matures.

Evaluation Tasks

Table 38 summarizes the 2019 evaluation activities conducted for the Voltage Optimization Program.

| Activity | Impact | Process | Forward Looking | Details |
|--|--------------|--------------|--------------------|--|
| Program Staff Interviews | \checkmark | | | Explore program status, progress deploying VO technology, and potential ramifications for the 2019 evaluation. |
| Data Request and Materials Review | | \checkmark | | Request data needed for impact calculations, review and assess data for quality and completeness. |
| Verification of VO Deployment to Date | | \checkmark | | Verify installations made through the program. |
| Impact Analyses | | \checkmark | \checkmark | Calculate 2019 impacts using both algorithmic and on/off testing approaches. |

Table 38. Summary of Voltage Optimization Evaluation Activities for 2019

¹⁸ AIC identified multiple technology upgrades required to successfully deploy a VO program. These technology upgrades have hardware, software and communication components.

¹⁹ AIC staff used voltage level as the primary criteria for establishing the initial pool of potential candidate circuits and excluded circuits served by voltage levels > 20 kV or that serve only exempt customers (a customer whose highest 15-minute demand is at or greater than 10 MW).

²⁰ The number of circuits planned for VO deployment was determined based on calculated assumptions, industry results, and past AIC VO pilot results. The actual number of feeders with VO could increase based on deployment results.
Task 1: Program Staff Interviews

We will conduct an interview with the AIC engineering staff in early 2019 to learn of any changes to program design and implementation, successes and challenges encountered in deploying VO as planned, and any potential impacts changes could have on the evaluation timeline.

Deliverable: Completed interview

Task 2: Data Request and Materials Review

The evaluation team will request data needed to calculate impacts using both the algorithmic and on/off testing approach. We will conduct a comprehensive review of all data submitted in response to the data request. The data review will include a VO program data inventory, QA/QC of submitted data, and an assessment of data coverage.

Deliverable: Data Requests

Deliverable Dates: June 2019 and January 2020

Task 3: Verification of VO Deployment to Date

Per the request of the AIC engineering team, the evaluation team will perform an interim analysis to calculate the change in voltage resulting from VO deployment. This interim analysis will take place in early 2019 following a data request by February 1, 2019. The analysis will include data from the January 2018 through January 2019 timeframe. Though VO will have only been operational for a short period in 2019, the early review of results will aid AIC engineers in determining the efficacy of the installed equipment to date and flag any malfunctioning equipment early in the first year of operation.

Deliverable: VO Verification and Data Review Memo

Deliverable Date: July 2019

Deliverable Date: March 2019

Task 4a: Impact Analysis: Application of Energy Savings Algorithm

The primary method for calculating energy savings due to VO from January to December, 2019 is the following algorithm, which uses AIC's calculated CVR_f as a key input:

Equation 7. VO Savings Algorithm

Annual Energy Savings = Annual Energy Use₂₀₁₄₋₂₀₁₆ $\cdot CVR_f \cdot \%\Delta V$

Where:

- Annual Energy Use = The average annual customer energy use over the 2014-2016 timeframe excluding the exempt customers
- CVR_f = The estimate of the conservation voltage reduction factor (assumed to be 0.80)
- %∆V = The percent change in voltage resulting from VO implementation relative to the preinstallation baseline, calculated with one full year of actual pre- and post-voltage using a regression model to control for exogenous factors that may contribute to changes in voltage (e.g., weather) for each circuit.²¹

²¹ For circuits that do not have pre-period data, we will use the "off" period during the on/off testing as a baseline.

Through AIC's pilot study and a survey of the literature, AIC estimated that VO will lead to a 3% voltage reduction and a corresponding 2.4% usage reduction on circuits in AIC's territory. Based on these results, a CVR_f of 0.80 is applied to AIC circuits. The evaluation team will utilize the assumed CVR_f factor to calculate impacts from VO in 2019, and the results of this analysis will determine the savings that AIC may claim from the VO program for the program year.

Deliverable: Results provided in annual impact evaluation report Deliverable Date: March 2020

Task 4b: Impact Analysis: Regression Analysis using On/Off Testing Approach

The primary method for calculating and claiming energy savings due to VO in 2019 and 2020 is the algorithmic approach discussed above. However, to test the assumptions within the existing algorithm, the evaluation team and AIC engineers will implement an "on/off" experimental testing approach on a sample of circuits and compare the results to the findings of the algorithmic approach. If the energy savings results from the algorithmic approach and the on/off methodology diverge substantially, the evaluation team may suggest that savings be calculated using an alternative method or suggest changes to the parameter assumptions within the algorithm.²² In 2019, we will use the results of the on/off testing experiment to develop estimates of the distribution of VO impacts across all AIC VO implemented circuits, validate the algorithmic approach, and assess the accuracy of the deemed CVR_f of 0.8.

| Delive | erable | : Inte | erim | results | provi | ded i | n an interir | n me | mo | | Delive | erab | le Da | te: | No | vem | ber | 2020 |
|--------|--------|--------|------|---------|-------|-------|--------------|------|----|--|--------|------|-------|-----|----|-----|-----|------|
| | | | | | | | | | | | _ | | | _ | | | | |

Deliverable: Final results provided in annual impact evaluation report Deliverable Date: March 2020

Task 5. Reporting

The evaluation team will provide all impact findings in the annual impact report in March 2020. The evaluation team will provide a draft report for AIC and ICC staff review and then deliver a final report that incorporates any comments from the review.

Deliverable: Draft and final annual impact report

Deliverable Date: March 2020

Evaluation Budget and Timeline

Table 39 summarizes the timing and budget associated with each evaluation activity.

| Task | Evaluation Activity | Deliverable Date | Budget |
|------|---|------------------------------|-----------|
| 1 | Program Staff Interviews | March 2019 | \$5,100 |
| 2 | Data Request and Materials Review | June 2019, January 2020 | \$9,300 |
| 3 | Verification of VO Deployment to Date | July 2019 | \$20,600 |
| 4a | Impact Analysis: Application of Energy Savings Algorithm | March 2020 | \$20,400 |
| 4b | Impact Analysis: Regression Analysis using On/Off Testing Approach | November 2019, March 2020 | \$199,100 |
| | Draft Annual Impact Report | March 15, 2020 | |
| 5 | Comments from AIC and ICC Staff | Within 15 business days | \$26,100 |
| | Final Annual Impact Report | April 30, 2020 | |

Table 39. Voltage Optimization 2019 Evaluation Schedule and Budget

²² For additional information on energy savings calculation approaches, see Opinion Dynamics (2018) AIC Voltage Optimization Evaluation Plan for the 2018-2021 Plan Period.

| Task | Evaluation Activity | Deliverable Date | Budget |
|------|---------------------|------------------|-----------|
| | | Total Budget | \$280,600 |

3. Cross-Cutting Evaluation Activities

3.1 Illinois Statewide Technical Reference Manual Support

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

In addition, we will use the 2019 evaluation period to coordinate and collaborate with other Illinois evaluation teams on key IL-TRM related research. In particular, we expect to begin executing TRM research around cooling impacts of advanced thermostats in residential applications in 2019. We also expect to continue ongoing coordination with other Illinois evaluation teams on steam traps and measure persistence, though at this time no specific studies have been planned.

Residential Advanced Thermostat Study

Consistent with a stipulated agreement reached between the Illinois stakeholders in fall 2018, the evaluation team is currently working with the Illinois Advanced Thermostats Subcommittee and other Illinois evaluators to design and execute a study to assess cooling impacts associated with residential advanced thermostats in AIC territory. We expect that the process for such a study, including data acquisition and other study initiation activities, will begin in 2019. At this time, our research design for a residential advanced thermostat study has not yet been finalized, and as such we cannot provide a date at which such a study will be finalized. However, we are currently reserving 2019 evaluation budget to support initiation of such a study.

We expect to present our proposed research design to AIC and the Advanced Thermostat Subcommittee in late 2018/early 2019 and will adjust our design and evaluation plan in response to comments received on that design. If we have presented and received feedback on this study before final 2019 evaluation plans are due, we will update this document to reflect the specific design of such a study.

3.2 Non-Energy Impacts Research

Illinois stakeholders have expressed an interest in better understanding the non-energy impacts (NEI) of Ameren Illinois' 2018-2021 portfolio. NEIs are the impacts, both positive and negative, that energy efficiency programs produce in addition to energy savings and demand reduction. The energy efficiency industry recognizes three types of NEIs:

- Utility: Outcomes for the utility sponsoring the energy efficiency program. Positive impacts commonly focus on reduced (avoided) utility administrative costs due to customers' program participation (e.g., reduced arrearages, improved services).
- Participant: Ancillary outcomes that participants experience due to making program upgrades at their home or business. Positive impacts include increased occupant health, safety, and comfort, reduced operations and maintenance costs, and others. Negative impacts include increased operations and maintenance costs, negative perceptions about aesthetics, noise, or other features of the upgrade, and others.

Societal: Changes in the general population's welfare due to the economic, environmental, health and safety, and distribution system outcomes that spill over from program upgrades. These types of NEIs can be captured at a portfolio-wide level, given their societal scale. Net job creation (which captures both positive and negative changes in spending across an economy)²³ and changes in emissions are examples of societal impacts.

Evaluation Approach

Throughout the 2018-2021 evaluation cycle, the Opinion Dynamics team will conduct ongoing research around NEIs. The IL-TRM currently accounts for some NEIs (water savings and some operation and maintenance costs). In addition, the Future Energy Jobs Act (FEJA) instructs Illinois utilities to include greenhouse gas (GHG) emissions reductions in their cost-effectiveness calculations. In conjunction with other statewide evaluators, Opinion Dynamics will investigate other NEIs associated with AIC's initiatives.

As part of our 2018 initiatives evaluations, we conducted exploratory NEI research. This research included:

- Working with the SAG towards developing a statewide approach to NEI assessment;
- Developing a framework that lays the groundwork for NEI research in the 2019-2021 portfolio;
- Conducting an exploratory assessment of high-priority NEIs for the Income Qualified, Public Housing, and Multifamily Initiatives.

This work plan outlines the research objectives Opinion Dynamics will investigate in 2019 based on our initial exploratory NEI assessment, and our proposed evaluation tasks to address them. As our 2018 NEI research is still under way, we will plan to revise the below tasks as necessary to ensure we most efficiently achieve our research objectives throughout the 2018-2021 cycle.

Research Objectives

The following key research objectives shape our 2019 NEI evaluation plan:

- 1. What are the utility NEIs associated with AIC's Income Qualified Initiative (including, but not limited to, reductions in arrearages, terminations and reconnections, and collection notices)?
- 2. What are the pre-treatment conditions for participants in AIC's Income Qualified and Public Housing Initiatives with respect to a number of prioritized health, safety, and comfort NEIs?
- 3. What are the potential methods that could be used to assess negative NEIs associated with AIC's energy efficiency initiatives?

In addition, we will seek to assess economic and employment impacts from AIC's portfolio of energy efficiency initiatives. This assessment is discussed separately in Section 3.3.

Evaluation Tasks

In this section, we discuss the five tasks we will conduct in 2019.

²³ The AIC evaluation team outlined a general approach for estimating job impacts of the 2018 portfolio as part of its 2018 evaluation plan.

Task 1: Utility NEIs Assessment

Building on the exploratory NEI research conducted in 2018, Opinion Dynamics will assess utility NEIs including reductions in arrearages, terminations and reconnections, and collection notices (contingent on available data for each metric) for the Income Qualified Initiative. To complete the study, the evaluation team will develop a treatment group (initiative participants) and a control group (individuals with similar characteristics to the participants), which will allow for the detection of differences in arrearages and other metrics due to initiative participation. Since we can measure utility NEIs directly from utility administrative and payment data (e.g. occurrences of missed payments), utility NEIS can be quantified and directly monetized without the collection of additional data and without launching research efforts to collect such data. Because AIC does not track initiative participation or flag income qualification in its account database, the evaluation team will first work with AIC staff to develop an effective approach to identifying such individuals utilizing relevant databases and sampling methods. Once we confirm the approach to identifying the control group, we will request appropriate data (e.g. actual billed amounts by billing period, reconnections by billing period, and arrearage amount) from AIC for both groups. Using a difference-of-differences approach, we will analyze both customer payment and utility cost metrics.

Task 2: Income Qualified and Public Housing Participant NEIs Assessment

Opinion Dynamics will conduct primary research to quantify prioritized health, safety, and comfort NEIs for the Income Qualified and Public Housing Initiatives. In 2019, we will initiate this multi-year research effort by conducting a survey with initiative participants, which will establish pre-treatment conditions related to health and safety. We will field the pre-treatment survey to both initiative participants and a control group that has similar attributes to the participant pool. Given that the pre-treatment surveys may occur within two weeks of post initiative participation, the survey will address pre-period conditions retrospectively and will also cover topics such as initiative satisfaction, successes and challenges.²⁴ The evaluation team expects to field the survey in a mail push to web format, which has been successful in the past when collecting data from income qualified residents in the AIC territory.

Results from the pre-treatment survey will comprise the baseline conditions against which we measure NEIs of the initiative. As such, in 2019 we will develop a post-treatment survey that correlates to the pre-treatment data collection instrument, with the anticipation of fielding the post-treatment survey to the same respondents in 2020.

Task 3: Develop Whitepaper on Assessing Negative NEIs

From the literature review conducted in 2018, we have identified a gap in the literature regarding identifying and measuring negative NEIs. This whitepaper will focus on exploring potential research methods that could be employed in future years to assess negative NEIs.

Task 4: Reporting

The evaluation team will provide Utility NEI findings in a memo in early 2020. We will also prepare and give a presentation to the IL SAG NEI Working Group presenting the Utility NEI findings, an overview of whitepaper findings, as well as our progress on determining baseline conditions.

Task 5: SAG and Cross-Utility Coordination

²⁴ Pre-treatment surveys may occur after participation if the evaluation team cannot verify specific program participants until after the work has been completed.

This task covers participation in cross-coordination meetings with other Illinois evaluators, with the goal of aligning methodologies during the evaluation (e.g., methods, survey questions, and others). We will also use this task to prepare for and attend IL SAG NEI Working Group meetings, as well as the IL SAG Income Qualified Advisory Committee meetings, when the Committee plans to discuss NEI topics. The evaluation team will provide a draft report for AIC, ICC Staff, and SAG review and then deliver a final report that incorporates any comments from the review.

Evaluation Budget and Timeline

Tas

4

5

Reporting

Table 40 summarizes the budget associated with each 2019 NEI evaluation activity.

SAG and Cross-Utility Coordination

| ask | Evaluation Activity | Budget |
|-----|--|-----------|
| 1 | Assessing Utility NEIs | \$40,000 |
| 2 | Assessing Income Qualified and Public Housing Participant NEIs | \$140,000 |
| 3 | Develop Whitepaper on Assessing Negative NEIs | \$30,000 |

Table 40. 2019 NEI Evaluation Budget

3.3 **Economic and Employment Impacts of AIC Energy Efficiency Programs**

During the development of the 2018-2021 portfolios and evaluation plans, as part of NEI research discussions, several stakeholders in Illinois expressed interest in quantifying the impacts of AIC's energy efficiency portfolio have on employment in Illinois. We will be estimating these impacts on a yearly basis and expect to provide results in our yearly ex post cost-effectiveness analysis report for 2019.

A range of methods exist for estimating these impacts. During 2018, the evaluation team has been collaborating with the evaluation team for ComEd in development of a methodology for estimating these impacts. A draft methodology has been developed and will be presented to the SAG NEI Working Group at some point in early 2019. Once this methodology has been presented and approved, we will add it to this evaluation plan.

3.4 **Cost-Effectiveness Analysis**

On a yearly basis, we conduct a cost-effectiveness analysis of AIC's energy efficiency portfolio. As directed by SB2814, we conduct a total resource cost (TRC) test to determine if AIC's portfolio is cost-effective. A program is cost-effective if its net total resource benefits are positive:

\$20,000

\$20,000

\$250,000

Total Budget

Equation 8. Definition of Cost-Effectiveness

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

In addition, we conduct the program administrator cost test (PA/UCT) to support SAG requested reporting

To assess cost-effectiveness, the team begins with a valuation of each program's and the portfolio's net total resource benefits, as measured by the avoided costs, the total incremental costs of measures installed, and administrative costs associated with the program. We will work closely with AIC and its implementer to ensure we accurately capture costs and benefits associated with the portfolio.

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

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

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

SB2814 indicates that AIC's requirement is for its energy efficiency portfolio to be cost-effective at the portfolio level. Nevertheless, to the degree possible, our analysis will provide insight into the cost-effectiveness of various components of AIC's portfolio to provide further insight for program planning. In addition, our analysis will comply with all Illinois-specific guidance, including the Illinois TRC provisions included in the Illinois Energy Efficiency Policy Manual. We will report results of our analysis in an annual ex post cost-effectiveness report to be delivered after yearly program impacts have been finalized. The final 2019 ex post cost-effectiveness report will be delivered no later than September 30, 2020.

3.5 Quality Assurance and Control

Per our contract, the team must hire a separate entity for quality assurance/quality control (QA/QC) review, and work collaboratively with this entity to ensure the quality of our evaluation plans, analysis, and reporting. Since PY4, the team has worked with Dr. Richard Ridge, who has a long history in energy efficiency evaluation. In recent years, Dr. Ridge has used his expertise to help write evaluation protocols and oversee other firms in their evaluation efforts, as well as continuing to perform evaluations across the country. From 2005 through 2012, 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. From 2008 through 2016, he provided similar support to

the New York State Department of Public Service. From 2019 through 2021, he will be assisting in evaluating multiple programs implemented by the California IOUs and third parties and advising the CPUC.

As part of the 2019 evaluation effort, Dr. Ridge will continue to (1) discuss portfolio evaluation plans with the evaluation team, providing advice as needed; (2) participate in ongoing sampling and evaluation design efforts as requested (including the Illinois Net to Gross Working Group); (3) review draft evaluation reports to ensure quality and accuracy; and (4) provide the ICC with a report on the efforts in which he was involved.

3.6 Integrated Reporting

The evaluation team will provide an annual integrated report with impact findings for all AIC initiatives. This report will include detailed EM&V tables, an overall AIC portfolio WAML, overall AIC portfolio CPAS calculations, as well as a high impact measure summary table for the Residential Program and Business Program.

4. 2019 Evaluation Budget

The following table outlines the estimated budget to execute the evaluation plans presented above.²⁵ Note that some of the budgeted activities have already begun and been invoiced.

| Initiative/Task | Budget | | | | | | | |
|---------------------------------|---|-----------|--|--|--|--|--|--|
| Initiative-Specific Activities | | | | | | | | |
| | Retail Products | \$148,900 | | | | | | |
| | Income Qualified | \$192,400 | | | | | | |
| | Public Housing | \$85,200 | | | | | | |
| Posidential Program | Behavioral Modification | \$124,300 | | | | | | |
| Residential Program | HVAC | \$203,500 | | | | | | |
| | Appliance Recycling | \$65,500 | | | | | | |
| | Direct Distribution of Efficient Products | \$99,000 | | | | | | |
| | Multifamily | \$68,000 | | | | | | |
| | Standard | \$193,400 | | | | | | |
| | Custom | \$254,600 | | | | | | |
| Pusinoss Program | Building Operator Certification | \$182,200 | | | | | | |
| Business Program | Retro-Commissioning | \$127,600 | | | | | | |
| | Streetlighting | \$123,000 | | | | | | |
| | Business Behavioral Modification Pilot | \$119,900 | | | | | | |
| | \$1,987,500 | | | | | | | |
| Cross-Cutting Activities | | | | | | | | |
| Non-Energy Impacts Res | search | \$250,000 | | | | | | |
| Illinois Statewide Techni | cal Reference Manual Activities | \$186,000 | | | | | | |
| SAG Participation | | \$90,000 | | | | | | |
| QA/QC Coordination | | \$30,000 | | | | | | |
| Ex Post Cost-Effectivene | \$50,000 | | | | | | | |
| Assessment of Economi | \$50,000 | | | | | | | |
| Integrated Reporting | \$50,000 | | | | | | | |
| Other Non-Program Activ | \$485,800 | | | | | | | |
| Total Non-Program Effor | \$1,191,800 | | | | | | | |
| Contingency | \$71,048 | | | | | | | |
| Total | \$3,250,348 | | | | | | | |

| Table 41 | . 2019 | AIC | Evaluation | Budget |
|----------|--------|-----|-------------------|--------|
|----------|--------|-----|-------------------|--------|

²⁵ Please note that the evaluation of the Voltage Optimization Program is conducted under a stand-alone budget and is not included in Table 41. A budget for Voltage Optimization is provided in Section 2.3.

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