Opinion Dynamics

Boston | Headquarters

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

1000 Winter St
Waltham, MA 02451

# Memorandum

**To:** Fernando Morales, AIC; Jennifer Morris, ICC Staff
**From:** Opinion Dynamics Evaluation Team
**Date:** July 10, 2020
**Re:** Ameren Illinois Company Income Qualified Initiative – Single Family Site Visit Findings

## 1. Introduction

As part of the evaluation of the 2019 Ameren Illinois Company (AIC) Income Qualified (IQ) Initiative, the evaluation team conducted site visits of AIC IQ Initiative single family participant homes. In 2018, AIC made significant changes to the design of the Initiative and began working with a new type of implementation partner for single family projects, Community Action Agencies (CAAs). The purpose of this research was to assess the effectiveness of the new implementation design across several areas and identify any differences between CAA and non-CAA projects. Specifically, the objectives of these visits were to:

1. Assess in-service rate (ISR);
2. Assess the accuracy of other types of data tracking elements;
3. Review the quality of measure installation; and
4. Identify potential missed or remaining opportunities for energy efficiency measures.

This memorandum summarizes the key findings in these areas based on 40 site visits, including 19 CAA projects and 21 non-CAA projects. These visits provided detailed qualitative findings regarding the four topics above for these 40 projects, though we note that this sample represents a small portion of the approximately 2,700 total CAA and non-CAA projects completed through the Initiative in 2019.

### 1.1 Overview of the 2019 IQ Initiative

The AIC IQ Initiative is a home energy diagnostic and whole house retrofit offering. The target markets for the initiative are (1) single family customers with household incomes up to 300% of federal poverty guidelines for household size and (2) multifamily properties with the majority of tenants receiving state, federal, or other income-qualified assistance. The IQ Initiative provides Building Performance Institute (BPI) energy audits that identify building shell and HVAC retrofit opportunities and provide health and safety inspections. During the audit, implementation staff also install energy efficient "direct install" (DI) measures, such as LEDs, showerheads, faucet aerators, advanced power strips, and pipe insulation. Following the audit, customers may also receive building shell measures (e.g., air sealing and insulation) or high efficiency HVAC measures (e.g., advanced thermostats, central air conditioners, and furnaces).

Leidos oversees the implementation of the IQ Initiative in coordination with several implementation partners, and the single family portion of the Initiative has two implementation channels. Walker-Miller and AIC program allies implement the non-CAA or "Moderate Income" channel, which serves low to moderate-income single family customers who do not participate in the Illinois Home Weatherization Assistance Program (IHWAP). CAAs, with support from AIC partner Resource Innovations, implement the CAA channel, which serves low-

income single family AIC customers that also participate in IHWAP. With AIC funding, CAAs provide direct install measures such as standard LEDs, faucet aerators, and showerheads, as well as air sealing and insulation. CAAs can also leverage IHWAP funding to provide HVAC, weatherization, and DI measures that the Initiative does not fund for CAAs.

## 1.2 Summary of Approach

The evaluation team used interim initiative tracking data through July 2019 to randomly select 200 projects for the site visit recruitment list, including100 CAA projects and 100 non-CAA projects. We then recruited in random order until we filled the quota of 40 site visits, aiming for an even mix of CAA and non-CAA projects.

Table 1 summarizes the measure types we assessed across the sampled projects and the number of homes that included them. Notably, we were unable to review boilers, air source heat pumps, and duct sealing because these measures were relatively uncommon in the interim data (installed in less than 4% of projects in the interim tracking data) and no homes we recruited completed projects that included them. Further, we excluded wall insulation, floor insulation, and brushless permanent magnet motors from the ISR and quality install review because these measures are typically not readily visible, though we did note any potential missed or remaining opportunities that we observed for these measures. Finally, as shown in the table, there are some measures that AIC does not fund for CAA projects, but that CAAs may still provide to customers using IHWAP funding. AIC does not capture these measures in Initiative tracking data, but we did catalogue any additional energy efficiency upgrades we observed on site when assessing potential missed or remaining opportunities.

Table 1. Summary of Measures Reviewed On-Site, by Project Type

| Measure Installed | Project Type | | |
|---|---|---|---|
| | Non-CAA Projects (n=21) | CAA Projects (n=19) | All Projects (n=40) |
| Standard LEDs | 15 | 17 | **32** |
| Air sealing | 10 | 18 | **28** |
| Attic insulation | 10 | 15 | **25** |
| Rim joist insulation | 6 | 14 | **20** |
| Low-flow faucet aerators | 6 | 12 | **18** |
| Bathroom fans | 10 | 8 | **18** |
| Low-flow showerheads | 2 | 13 | **15** |
| Advanced power strips | 13 | N/A[a] | **13** |
| Crawlspace insulation | 2 | 10 | **12** |
| Advanced thermostats | 7 | 4 | **11** |
| Specialty LEDs | 6 | N/A[a] | **6** |
| Furnaces | 5 | N/A[a] | **5** |
| Central air conditioners | 5 | N/A[a] | **5** |
| Pipe insulation | 1 | N/A[a] | **1** |

a. AIC funding does not support certain measures for CAA projects. Customers may have received these measures through IHWAP funding.

Site visits generally included the following activities, when applicable:

- At the beginning of the site visit, we gave each customer an opportunity to provide feedback on their experience with the Initiative. Some customers did not participate in the survey because of time constraints or other factors.
- Where possible based on a visual inspection, we determined whether the measures were still installed and, if removed, the reasons for removal;
- We verified several data tracking elements related to household and equipment characteristics;
- Where possible based on a visual inspection, we reviewed measures for quality installation. We defined quality install specifically for each measure based on industry best practices and AIC, Walker-Miller, and IHWAP installation guidance,[1] where available; and
- We reviewed all homes for potential missed or remaining opportunities. A potential "missed" opportunity is an Initiative measure that could potentially have been applicable for the home based on our visual inspection, but that the Initiative did not provide. Potential "remaining" opportunities include measures that are *not* included in the Initiative but *are* included in the Illinois Technical Reference Manual (IL TRM) Version 7 for residential homes. Appendix A provides the definitions of quality installation and potential missed opportunity for each measure.

Importantly, we refer to missed and remaining opportunities as "potential" opportunities to acknowledge that some of the opportunities we found may not actually be feasible for Initiative projects. For instance, implementation staff may have considered installing the "missed" opportunities we found but did not include them based on the results of a full BPI audit or savings-to-investment ratio (SIR) cost-effectiveness tests. Further, AIC should only consider adding "remaining" opportunities to the Initiative if they are cost-effective.

# 2. Summary of Key Findings

The sections below provide key findings for each of the topics covered during the site visits: ISR, data tracking accuracy, quality installation, potential missed and remaining opportunities, and customer satisfaction feedback.

## 2.1 ISR Findings

ISRs for weatherization and HVAC measures fell within the range we expected based on our evaluations of similar programs and the current assumptions in the IL TRM Version 7. However, ISRs for measures provided during the initial audit were notably lower compared to current IL TRM assumptions and, where they could be compared, CAA ISRs were typically much higher compared to non-CAA ISRs.

Standard LED ISRs for the non-CAA channel are notably low, and much lower than CAA standard LED ISR. Upon investigating this issue, we found that many non-CAA LED measures were left behind in boxes by implementation staff, which is a concern given that the Initiative is designed to directly install LEDs. Table 2

[1] These include the AIC Quality Control Work Inspection Checklist (February 2019), the Walker-Miller Quality Control Process Manual (V4), and the IHWAP Program Operations Manual (July 2019)

summarizes ISR findings for each measure. We provide additional measure-specific findings following the table.

Table 2. ISR Summary, by Measure and Project Type

| Measure | ISR | | | IL TRM V7 Assumptions for ISR |
|---|---|---|---|---|
| | Non-CAA Projects (n=21) | CAA Projects (n=19) | All Projects (n=40) | |
| **Measures Provided During the Initial Audit** | | | | |
| Standard LEDs | 36% (n=256) | 84% (n=403) | 66% (n=659) | 97% |
| Specialty LEDs | 64% (n=28) | N/A[a] | 64% (n=28) | 97% |
| Low-flow faucet aerators | 57% (n=7) | 95% (n=22) | 86% (n=29) | 95% |
| Low-flow showerheads | 100% (n=2) | 71% (n=17) | 74% (n=19) | 98% |
| Advanced power strips | 29% (n=24) | N/A[a] | 29% (n=24) | 100% (direct install)<br>40% (leave-behind) |
| Pipe insulation | Could not assess [b] | N/A[a] | Could not assess [b] | 100% |
| **Weatherization and HVAC Measures** | | | | |
| Air sealing | 80% (n=10) | 100% (n=18) | 93% (n=28) | 100% |
| Attic insulation | 100% (n=10) | 100% (n=15) | 100% (n=25) | 100% |
| Rim joist insulation | 83% (n=6) | 100% (n=14) | 95% (n=20) | 100% |
| Crawlspace insulation | 100% (n=2) | 90% (n=10) | 92% (n=12) | 100% |
| Bathroom exhaust fans | 100% (n=10) | 100% (n=8) | 100% (n=18) | 100% |
| Advanced thermostats | 86% (n=7) | 100% (n=4) | 91% (n=11) | 100% |
| Furnace | 100% (n=5) | N/A[a] | 100% (n=5) | 100% |
| Central air conditioning | 100% (n=5) | N/A[a] | 100% (n=5) | 100% |

a. AIC funding does not support certain measures for CAA projects. Customers may have received these measures through IHWAP funding, but the measure would not be included in AIC tracking data.
b. Only one project the team reviewed had pipe insulation. We were unable to directly inspect the insulation because the team could not access the basement.

We identified the following measure-specific issues:

- **Standard LEDs:** We found that 163 of the 256 LEDs tracked for non-CAA projects were not installed at the time of the visit. The most common reason the bulbs were not installed (two-thirds of uninstalled LEDs) was that Initiative staff left behind a box of LEDs that the customer never installed themselves. These customers collected and showed evaluation team members boxes with unused LED lamps during many of the site visits. Note, the evaluation team collaborated with AIC and Leidos staff to explore this issue further and ultimately determined that the issue was primarily attributable to a single program ally. Table 3 details the reasons why LEDs were not installed according to participating customers.

Table 3. ISR Summary – Standard LEDs

| Reason Not Installed | Number of Measures | | |
|---|---|---|---|
| | Non-CAA Projects | CAA Projects | All Projects |
| Left behind and never installed by customer | 110 | 24 | **134** |
| Customer did not recall receiving the measure | 37 | 18 | **55** |
| Customer had already installed LEDs and reported they did not accept additional LEDs from implementation staff | 16 | 0 | **16** |
| Initiative staff installed new LED fixtures, not LED lamps | 0 | 16 | **16** |
| Removed by the customer, no rationale captured | 0 | 4 | **4** |
| Removed by the customer, broken/not functioning properly | 0 | 2 | **2** |
| *Total Uninstalled Standard LEDs* | *163* | *64* | ***227*** |
| *Total Installed Standard LEDs* | *93* | *339* | ***432*** |
| **ISR** | **36% (n=256)** | **84% (n=403)** | **66% (n=659)** |

- **Specialty LEDs:** We found that 10 of the 28 specialty LEDs tracked for non-CAA projects were not installed at the time of the visit. In nine cases, customers did not recall receiving the measure and we did not observe them in the home.
- **Advanced power strips:** We found that 17 of the 24 strips tracked for non-CAA projects were not installed at the time of the visit. Similar to standard LEDs, the most common reason (10 of 17 strips) was that Initiative staff left the measure behind in a box and the customer never installed it. Note, the Initiative tracking data does clearly track whether an advanced power strip is left behind or directly installed, and the evaluation team applies a different ISR in each case. According to Initiative tracking data, 14 of the 24 strips were directly installed and 10 strips were left behind. There were unverified measures in both cases. Table 4 details the reasons why advanced power strips were not installed.

Table 4. ISR Summary – Advanced Power Strips

| Reason Not Installed | Number of Measures | | |
|---|---|---|---|
| | Non-CAA Projects | CAA Projects | All Projects |
| Left behind and never installed by customer | 10 | N/A[a] | **10** |
| Removed by the customer, not working properly | 6 | | **6** |
| Removed by the customer, customer plans to reinstall in a different location | 1 | | **1** |
| *Total Uninstalled Advance Power Strips* | *17* | | ***17*** |
| *Total Installed Advance Power Strips* | *7* | | ***7*** |
| **ISR** | **29% (n=24)** | | **29% (n=24)** |

a. AIC funding does not support this measure for CAA projects. Customers may have received this measure through IHWAP funding, but the measure would not be included in AIC tracking data.

- **Low-flow showerheads:** We found that five of the 17 showerheads tracked for non-CAA projects were not installed at the time of the visit. Most commonly (four of five cases), customers did not recall receiving the measure.
- **Low-flow aerators:** We found that three of the seven aerators tracked for non-CAA projects were not installed at the time of the visit. One customer reported that Initiative staff did not have the proper parts or tools to install the aerator and left the part with the customer. The customer purchased and installed their own aerator.
- **Air sealing and insulation:** There were several cases amongst air sealing (two non-CAA projects of 10), rim joist insulation (one non-CAA project of six), and crawl space insulation (one CAA project of 10) where the customer reported not receiving the measure. We only counted the measure as uninstalled if we observed corroborating evidence. For example, one customer reported that air sealing work was not performed at the home and our field staff could not verify window caulking, weatherstripping of doors, door sweeps, or other air sealing efforts.
- **Advanced thermostats:** We found that one of the six advanced thermostats tracked for non-CAA projects was not installed at the time of the visit. The customer reported that he already installed a Nest thermostat in the home and, therefore, did not need or accept an advanced thermostat from the Initiative.

### 2.1.1 Recommendations

- **Finding 1:** The standard LED ISR for the Non-CAA channel is notably low (36%). We found that standard LED measures were left behind in boxes by implementation staff. We confirmed that these were not provided or tracked in Initiative data as kits from community events, and customers collected and showed boxes with unused LED lamps to our field staff during many of the site visits.
  - **Recommendation 1-1:** We recommend that Initiative staff do not leave any LED measures behind for customers to install themselves. By design, the Initiative assumes that LEDs are directly installed, and the evaluation team applies ISRs appropriate for DI measures when estimating savings.
  - **Recommendation 1-2:** Based on Initiative QC process documentation, it is unclear whether there is a formal QC inspection process for Walker-Miller-implemented DI projects. Our understanding, based on Initiative staff interviews, is that a Walker-Miller field supervisor may shadow new field staff during their audits, but Walker-Miller only performs formal QC inspections for projects completed by AIC program allies. If there is no formal QC process for Walker-Miller DI projects, we recommend that AIC consider adopting one. We recommend establishing a target post-installation inspection rate, based on available staff and budget resources, for each of Walker-Miller's field staff to ensure adequate coverage of Initiative projects.
- **Finding 2:** The ISR for advanced power strips was low (29%) in comparison to what the IL-TRM V7 currently assumes for DI (100%) and leave-behind (40%) advanced power strip measures.
  - **Recommendation 2.** We recommend that Initiative staff avoid leaving behind advanced power strips as much as possible. While the Initiative currently tracks whether advanced power strips are left behind or installed, and the evaluation team applies different ISRs in each case, leaving this measure behind carries the risk that it could be installed improperly by the customer given the complex installation process for this measure. We understand that installing advanced power strips can be time-consuming, and as such may negatively impact the cost per unit of energy saved

(i.e., dollars per kWh) for the project. If installing these measures is not cost-effective, we recommend not leaving the measure behind.

- **Finding 3.** There were multiple cases across several measure types, for instance, nine cases for specialty LEDs and four cases for showerheads, where customers did not recall receiving measures or reported that they did not accept them.
  - **Recommendation 3:** We recommend including a detailed review of QA/QC processes for the Initiative as part of future evaluation efforts to help determine the potential cause of this issue (e.g., lack of customer understanding or recollection versus areas for improvement in the QA/QC process).

## 2.2 Accuracy of Other Data Tracking Findings

The evaluation team reviewed the accuracy of Initiative tracking data related to several home and equipment characteristics. Specifically, we verified Initiative data tracking records for:

- Water heater fuel type;
- Space heating system type;
- Central cooling presence;
- Whether crawlspaces are vented or unvented.

We found that the Initiative accurately tracked this information for all 40 sites, where applicable.

## 2.3 Quality Installation Findings

Based on visual inspections, the evaluation team found that the majority of non-CAA and CAA measures were quality installations (refer to Appendix A for more detail on the criteria for each measure). A quarter of projects we reviewed (10 of 40) had a quality install issue of some kind, including five of 21 Non-CAA projects and five of 19 CAA projects. Nine of these 10 projects had an issue with one type of measure, and one Non-CAA project had issues with three types of measures.

CAA projects had fewer issues compared to non-CAA projects, which is to be expected because a single CAA project could receive up to four QC inspections, though in most cases they receive one or two.[2] Non-CAA projects, which either Walker-Miller or program allies implement, also had very few challenges. The notable exceptions for non-CAA projects were that three of seven advanced power strips had quality installation issues, and three projects had air sealing issues. Walker-Miller performs field inspections on behalf of Leidos for approximately 10% of program ally projects but, based on available QC process documentation, our understanding is that Walker-Miller does not perform field inspections of Walker-Miller-implemented DI work before projects move on to program allies for further weatherization work. Walker-Miller does, however, shadow new field staff as they perform assessments for training purposes.

[2] The evaluation team recently interviewed nine CAAs who implement projects using Initiative funds. All nine CAAs reported that, per IHWAP rules, every weatherization project must receive a final QC inspection upon completion of the project. Some CAAs also conduct inspections during the installation process for 25% of their projects. IHWAP also conducts random QC inspections of CAA work. Finally, Leidos conducts QC inspections for the Initiative on a selection of CAA projects.

Table 5 below summarizes quality installation pass rates for each measure, and we provide more detail on measure-specific issues following the table.

Table 5. Quality Installation Pass Rate, by Measure and Project Type

| Measure | Quality Installation Pass Rate | | |
|---|---|---|---|
| | Non-CAA Projects | CAA Projects | All Projects |
| Standard LEDs | All (n=93) | 228 of 229 (99%) | 431 of 432 (99.7%) |
| Specialty LEDs | All (n=18) | N/A [a] | All (n=18) |
| Low-flow faucet aerators | All (n=4) | All (n=21) | All (n=25) |
| Low-flow showerheads | All (n=2) | All (n=12) | All (n=14) |
| Advanced power strips | 4 of 7 | N/A[a] | 4 of 7 |
| Pipe insulation | Could not assess [b] | N/A[a] | Could not assess [b] |
| Air sealing | 5 of 8 | 17 of 18 | 22 of 26 |
| Attic insulation | All (n=10) | All (n=15) | All (n=25) |
| Rim joist insulation | All (n=5) | All (n=14) | All (n=19) |
| Crawlspace insulation | All (n=2) | All (n=9) | All (n=11) |
| Bathroom exhaust fans | 9 of 10 | 7 of 8 | 16 of 18 |
| Advanced thermostats | All (n=6) | All (n=4) | All (n=10) |
| Furnace | All (n=5) | N/A[a] | All (n=5) |
| Central air conditioners | All (n=5) | N/A[a] | All (n=5) |

Note: the base (n) for this analysis is installed measures. Orange highlighting indicates a pass rate less than 100%.
a. AIC funding does not support this measure for CAA projects.
b. Only one project the team reviewed had pipe insulation. We were unable to directly inspect the insulation because the team could not access the basement.

The evaluation team observed the following quality installation issues:

- **Advanced power strips (3 cases):** We observed that the equipment was not properly connected to the "control", "always on", and "switched" outlets. In two cases, the customer reported that they had not altered the implementation staff's work. In one case, the customer had reconfigured the advanced power strip and used it as a basic power strip.
- **Air sealing (4 cases):** Air sealing issues we observed during site visits included gaps in door weatherstripping (1 case, non-CAA), untreated basement bypasses (1 case, non-CAA), and air leakage at exterior wall outlets (2 cases, 1 CAA and 1 non-CAA).
- **Bathroom exhaust fan (2 case):** For one non-CAA measure, the fan did not appear to operate at the time of the site visit. For one CAA measure, we observed gaps around the base of the exhaust fan.
- **Standard LEDs (1 case)**: One CAA project bulb was not functioning. It is unclear whether this was a burnt-out bulb or a problem with the fixture.

### 2.3.1 Recommendations

- **Finding 4.** We observed that three of the seven installed advanced power strips were not quality installations. We also found that despite an initial quality install, one customer repurposed the

advanced power strip in a way that does not save energy, and six removed the measure after installation because they did not think it worked properly (see Table 4 in the ISR findings section).

- **Recommendation 4:** We recommend that AIC and its implementation partners take two actions to address quality installation issues with advanced power strips. First, to ensure that power strips are appropriately installed, we recommend developing trainings and/or a guidance document for field staff. Note, we requested all field staff instructions, audit forms, and QC inspection checklists from Leidos, but did not find installation instructions for advanced power strips in the documents we received. We recommend that Leidos and/or their partners specifically provide guidance on how advanced power strips are different from standard power strips, typical applications that benefit from advanced power strips, and the definitions of the "control", "always on", and "switched" outlets on the strip. Second, Walker-Miller should consider walking the customer through the instruction manual that comes with the measure, if it is available and clearly explains the topics above. Otherwise, we recommend proving educational collateral about advanced power strips to the customer. Note, AIC began partially funding advanced power strips for CAA projects in 2020, and the IHWAP manual is similarly missing guidance on advanced power strips. As such, we recommend that CAAs also receive this additional training and materials to the extent possible.

## 2.4 Potential Missed Opportunity Findings

The evaluation team defined a potential "missed" opportunity as an Initiative measure that could potentially have been applicable for the home based on our visual inspection, but that the Initiative did not provide. Please refer to Appendix A for more detail on the specific definition for each measure. The goal of this analysis was to identify potential gaps in the treatment of participating homes. However, it is important to note that there may be legitimate reasons why certain measures were not installed in a given home (e.g., Initiative staff determined a measures was not appropriate for the home or did not include it for cost-effectiveness reasons Notably, six non-CAA projects had only received DI measures at the time of the evaluation team's onsite visit. Based on the design of the Initiative, it is possible that these homes received HVAC and weatherization upgrades from the Initiative later in 2019 or will receive them in 2020. As such, we did not count any HVAC or weatherization missed opportunities for these six projects. We also excluded any unverified measures from this analysis.[3]

Each home we visited had a potential missed opportunity of some kind. CAA projects generally had fewer potential missed opportunities than non-CAA projects, which may be in part due to the availability of IHWAP funding. CAA projects had two to three potential missed opportunities, on average, with the most potential missed opportunities in a single home being six. Non-CAA projects had five to six potential missed opportunities, on average, with the most potential missed opportunities in a single home being ten. Table 6 below provides a full list of potential missed opportunities we observed.

The Initiative appears to have taken advantage of all opportunities to provide heating and cooling systems to the homes we visited, as there were no potential missed opportunities for those measures. Weatherization measures (i.e., insulation and air sealing) were the most common type of potential missed opportunity for both channels. There were also many potential opportunities to install more standard LEDs, as we noted 165

[3] If measures were tracked as provided in the Initiative tracking data, but we did verify them as installed, we removed hose cases from the missed opportunities analysis. For example, if we noted 15 sockets that could have received LEDs, but we did not verify 10 tracked LEDs, the number of potential missed opportunities would be five LEDs.

potential opportunities across the 40 projects (about four per project, on average). However, we note that given the limited horizon for standard LEDs savings it likely does not make sense to expand LED distribution beyond current levels. For non-CAA projects, there were also 30 potential missed opportunities for Specialty LEDs (one or two per project, on average), including linear lights for hallways and exterior flood lamps. Finally, there were multiple potential missed opportunities for domestic hot water measures.

Table 6. Potential Missed Opportunities Observed, by Project Type

| Potential Missed Opportunity | Number of Projects Where A Potential Missed Opportunity Was Observed | | |
|---|---|---|---|
| | Non-CAA Projects (n=21) | CAA Projects (n=19) | All Projects (n=40) |
| **Weatherization Measures** | | | |
| Wall insulation | 17 | 14 | 31 |
| Air sealing | 10 | 5 | 15 |
| Duct sealing | 11 | N/A[a] | 11 |
| Attic insulation | 3 | 1 | 4 |
| Rim joist insulation | 3 | 0 | 3 |
| Crawlspace insulation | 1 | 0 | 1 |
| **Direct Install Measures** | | | |
| Standard LEDs | 12 | 10 | 22 |
| Low-flow faucet showerheads | 15 | 4 | 19 |
| Specialty LEDs | 14 | N/A[a] | 14 |
| Pipe insulation | 11 | N/A[a] | 11 |
| Low-flow faucet aerators | 7 | 2 | 9 |
| Advanced power strips | 5 | N/A[a] | 5 |
| **HVAC Measures** | | | |
| Advanced thermostats | 6 | 8 | 14 |

Note: The unit of analysis is the number of projects with each type of opportunity, not number of measures.

### 2.4.1 Recommendations

- **Finding 6:** We identified at least one potential missed opportunity at each home we visited. We noted numerous potential opportunities for standard and specialty LEDs.
  - **Recommendation 6-1:** We recommend that AIC and its implementation partners ensure they are maximizing all opportunities to provide the measures listed above, within the limits of budget and Savings-to-Investment Ratio (SIR) requirements. As mentioned earlier, it is likely that some of the potential missed opportunities were not feasible for the home based on BPI audit results or from a project cost-effectiveness standpoint.
  - **Recommendation 6-2:** We recommend that AIC and its implementation partners discuss with field staff the most common types of specialty LED opportunities that they are unable to address, and why. We specifically identified opportunities for exterior flood lamps, but there could be other common specialty LED opportunities that field staff are unable to address. Reasons for not addressing these applications could be, for instance, that certain specialty applications do not

meet SIR requirements, that they run out of certain types of specialty LEDs, or that the specialty application is relatively rare. Based on these discussions, AIC could consider making changes to the mixture of LED types field staff bring to visits.

## 2.5 Potential Remaining Opportunity Findings

The evaluation team defined a potential "remaining" opportunity as a measure that is *not* included in the Initiative but *is* included in the IL TRM Version 7 for residential homes. As with the missed opportunities analysis, it is important to note that it may not be feasible for the Initiative to offer all these measures. However, we felt it was valuable to highlight these opportunities for future consideration by AIC and program implementation staff.

Overall, we noted at least one potential remaining opportunity in each of the 40 homes we visited. Considering the expected phase out of LEDs, we paid special attention to opportunities to add measures with electric savings potential. The top opportunity was lighting controls, which may have been applicable in almost every home we visited. There were also several types of opportunities for domestic hot water and appliance replacement measures that may provide additional electric savings to the Initiative. Notably, as we show at the bottom of the table, there were many instances for CAA projects where neither the Initiative nor IHWAP funding supported certain DI measures. However, the Initiative will now support these measures for CAA projects in 2020. Table 7 below provides the full list of potential remaining opportunities we observed.

Table 7. Potential Remaining Opportunities Observed, by Project Type

| Potential Remaining Opportunity | Number of Projects Where A Potential Remaining Opportunity Was Observed | | |
|---|---|---|---|
| | Non-CAA Projects (n=21) | CAA Projects (n=19) | All Projects (n=40) |
| **Lighting Controls** | | | |
| Occupancy sensor | 21 | 18 | 39 |
| Photocell sensors | 21 | 18 | 39 |
| **Domestic Hot Water** | | | |
| Shower timer | 19 | 17 | 36 |
| Thermostatic restrictor shower valve [a] | 14 | 9 | 23 |
| Water heater temperature setback | 15 | 8 | 23 |
| Water heater replacement | 6 | 0 | 6 |
| Water heater tank wrap | 1 | 5 | 6 |
| **Appliances** | | | |
| ENERGYSTAR® refrigerator | 19 | 12 | 31 |
| ENERGYSTAR® clothes dryer | 13 | 16 | 29 |
| ENERGYSTAR® clothes washer | 11 | 14 | 25 |
| ENERGYSTAR® dishwasher | 6 | 7 | 13 |
| ENERGYSTAR® freezer | 3 | 7 | 10 |
| ENERGYSTAR® room A/C | 4 | 0 | 4 |
| ENERGYSTAR® dehumidifier | 2 | 0 | 2 |

| Potential Remaining Opportunity | Number of Projects Where A Potential Remaining Opportunity Was Observed | | |
|---|---|---|---|
| | Non-CAA Projects (n=21) | CAA Projects (n=19) | All Projects (n=40) |
| **Ductwork** | | | |
| Duct insulation | 15 | 7 | 22 |
| Duct sealing | N/A[a] | 7 | 7 |
| **HVAC Tune-ups** | | | |
| Central A/C tune-up | 9 | 2 | 11 |
| Heating equipment tune-up | 10 | 0 | 10 |
| **Direct Install Measures (not supported by AIC for CAA projects in 2019)** | | | |
| Advanced power strips | N/A[b] | 15 | 15 |
| Specialty LEDs | N/A[b] | 10 | 10 |
| Pipe insulation | N/A[b] | 3 | 3 |

a. Thermostatic restrictor shower valves are not available through the audits, but the Initiative does provide them in kits distributed to income-qualified gas-only customers at community events.

b. This measure is provided through the non-CAA channel, as such it cannot qualify as a remaining opportunity for non-CAA projects.

## 2.6 Customer Satisfaction

At the beginning of the site visit, we gave each customer an opportunity to provide feedback on their experience with the Initiative. Some customers did not participate in the survey because of time constraints or other factors. We asked customers to rate their degree of satisfaction with the Initiative and several components of their participation experience. We found that overall, most participants, both CAA and Non-CAA, were highly satisfied with the quality of the energy efficiency measures installed in their homes, and the care and professionalism of Initiative staff. Many had also begun to see positive benefits (i.e. lower charges) in their home energy bills. Further, 27 of 36 respondents (75%) reported that their opinion of AIC was more favorable after participating in the Initiative (five said it stayed the same, one said it was less favorable, and three "did not know"). Table 8 below summarizes the satisfaction scores provided by respondents across various elements of the Initiative.

Table 8. Satisfaction Scores for the Initiative, by Project Type

| Component | Average Score | |
|---|---|---|
| | Non-CAA Respondents | CAA Respondents |
| The Home Energy Assessment | 8 (n=20) | 10 (n=16) |
| Initiative staff | 8 (n=17) | 8 (n=16) |
| Efforts to reduce disruptiveness of the work | 9 (n=20) | 9 (n=16) |
| Time from scheduling to completion | 8 (n=20) | 9 (n=16) |
| Measures installed | 9 (n=19) | 9 (n=16) |
| Initiative overall | 9 (n=20) | 10 (n=16) |

Note: Average score on a scale of 0 to 10, where 0 is very dissatisfied and 10 is very satisfied. Average scores exclude invalid responses (e.g., "don't know", "no response").

## 2.7 Conclusion

Our site visits results indicate that both single family channels of the Initiative are successful at providing quality installation services to customers and tracking key home characteristics that are useful for estimating savings. However, there is room for improvement in terms of DI measure delivery and QA/QC processes that may help maximizes in-service rates. Specifically, leaving behind measures, while potentially a cost-effective strategy, typically results in a lower ISRs compared to directly installing measures. The IL TRM currently accounts for this with a significantly lower ISR for leave-behind measure, but these site visits results strongly suggest a need for the evaluation team to continue to monitor the ISR of these measures through participant surveys and, potentially, additional site visits.

Finally, this research identified numerous potential opportunities to expand the portfolio of eligible measures in ways that may shore-up the electric savings of the Initiative as standard LEDs begin to phase out over the next few years. Namely, amongst the homes we visited, we identified the potential to add a few entirely new categories of measures to the Initiative (lighting controls, appliances upgrades, and HVAC tune-ups), as well as additional measures within existing categories like domestic hot water and ductwork should these measures screen as cost effective.

# Appendix A. Key Definitions

Table 9 below describes the criteria we used to determine quality installation and potential missed opportunities. In developing the quality installation criteria, we reviewed AIC, Walker-Miller, and IHWAP installation guidance documentation to ensure that there were no conflicts with the evaluation team's criteria. Notably, these criteria are limited to facets that we could observe through a visual inspection.

Table 9. Definition of Quality Installation and Potential Missed Opportunity, by Measure

| Measure | Quality Installation | Potential Missed Opportunity |
|---|---|---|
| LEDs | LEDs are functioning. Specialty lamps are installed in appropriate applications. | A socket or application that could have received an LED but did not. |
| Low-flow faucet aerators | Faucet aerators are installed on hot water faucets only and are functioning properly. The installed aerator is properly sealed with plumbers' tape such that there are no leaks. | A faucet that could have received an aerator but did not. |
| Low-flow showerheads | Showerheads are functioning properly. The installed showerhead is properly sealed with plumbers' tape such that there are no leaks. | An inefficient showerhead that was not replaced. |
| Advanced power strips | Advanced power strips are installed in appropriate locations (e.g. where TVs or computers exist with peripheral devices). The appropriate types of appliances are plugged in and are plugged into the correct sockets on the advanced power strip (e.g., "always on", "control", and "switched"). | An advanced power strip was not installed in an area of the home that has at least one "control" device (e.g., TV, PC) and one peripheral that could be controlled (e.g. a speaker). |
| Pipe insulation | The insulation is installed on the correct pipe (the hot water pipe), covers the entire exposed piping from water heater to wall/floor/ceiling (no visible gaps), and is properly taped. The pipe is of the proper thickness for the pipe, the first six feet of both the hot and cold water pipe are insulated, and the pipe insulation is at least three inches away from the flue. | There is exposed hot water pipe that was not insulated and could be safely insulated. |
| Air sealing | The air sealing has no obvious gaps, compressions, or thin areas. There are no drafts around windows, doors, and outlets. | Attics, crawlspaces, windows, doors, or outlets that are drafty or have obvious sealing gaps |
| Duct sealing | The ducts are properly taped there is no ripped, torn, or crushed ductwork. | A duct system in poor condition (crushed, ripped, torn) that was not remediated by the initiative. |
| Attic, rim joist, and crawlspace insulation | The insulation has no gaps, compressions, or areas that are too thin. | Attics, rim joists, or crawlspaces that are uninsulated. |
| Bathroom exhaust fans | The exhaust fan is operating, is pulling air out of the room, and there are no gaps around the casement. The exhaust fan includes a light, if needed. | A bathroom without an existing efficient exhaust fan. |
| Advanced thermostats | The thermostat is connected to the internet, and to the customer's phone if desired. The thermostat properly operates heating and cooling equipment. The thermostat has a programmed schedule. | An existing manual thermostat |

| Measure | Quality Installation | Potential Missed Opportunity |
|---|---|---|
| Furnaces | The furnace delivers heating to the home and there are no issues with airflow or any "comfort gaps" (e.g., cold spots) in any part of the home. | A boiler was not installed in a gas heating home that has a failed or functioning heating system at or below current code. |
| Central air conditioners | The central air conditioner delivers cooling to the home and there are no issues with airflow or any "comfort gaps" (e.g., warm spots) in any part of the home. | An existing HVAC system that is below code. |
| Air source heat pumps | The air source heat pump delivers heating and cooling to the home and there are no issues with airflow or any "comfort gaps" (e.g. hot/cold spots) in any part of the home. | An existing HVAC system that is below code. |