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Impact and Process Evaluation of 2016 (PY9) Illinois Power Agency Moderate Income Customer Kit Program

Final

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1. Executive Summary

This report presents results from the Program Year 9 (PY9) residential Moderate Income Customer Kit (MICK) Program, one of seven stand-alone Illinois Power Agency (IPA) energy efficiency programs implemented from June 2016 to May 2017. PY9 represents the second and final year of the MICK Program's operation.

AM Conservation Group (AMCG) implemented the MICK Program in PY9, while Leidos Engineering provided program oversight on behalf of Ameren Illinois Company (AIC). AMCG subcontracted with Direct Options to deliver marketing services, including the recruitment letter and marketing materials contained in the kit. AMCG recruited participants and distributed kits containing energy-efficient items via direct mail to residential customers with household incomes ranging from 0% to 300% of the federal poverty level. The kits contained CFLs, faucet aerators, and shower heads, along with installation instructions. The program is intended to increase sales and awareness of ENERGY STAR®-qualified lighting products, along with other IPA and AIC program offerings that reduce energy consumption.

Program Impacts Table 1 summarizes the PY9 MICK Program's gross and net energy savings and demand reduction (1,319 MWh and 0.179 MW, respectively). To determine PY9 gross savings and net realization rates, the evaluation team applied deemed per-unit gross savings inputs, set forth in the Illinois Statewide Technical Reference Manual Version 5.0 (IL-TRM V5.0), in combination with the following:

- PY9 MICK Program survey-based fuel saturation rates for water heaters (20% electric and 80% natural gas) and furnaces (17% electric and 83% natural gas)
- Stakeholder Advisory Group (SAG)–approved MICK Program net-to-gross ratios (NTGRs)
- Net savings for delayed CFL installations attributed to the PY8 MICK Program[1]

Overall, the low gross realization rates for the program are primarily due to considerably lower ex post per-unit savings values for non-CFL measures (compared to ex ante values).

Table 1. PY9 Moderate Income Customer Kit Program Net Impacts

	Ex Ante Gross	Realization Rate	Ex Post Gross	NTGR	Initial PY9 Ex Post Net Savings	PY8 Ex Post CFL Net Savings Realized in PY9	PY9 Ex Post Net Savings
Energy Savings (MWh)							
Total MWh*	1,444	78%	1,125	1.00	1,125	194	1,319
Demand Reduction (MW)							
Total MW*	0.284	56%	0.160	1.00	0.160	0.019	0.179

* Totals may not calculate exactly due to rounding.

Key Findings and Recommendations

As determined through the evaluation team's process review, AIC, Leidos, and implementation staff reported high satisfaction levels with the program's performance in PY9, and participants were satisfied with the

[1] PY8 MICK Program participants' 13-watt and 23-watt CFLs, estimated as installed during PY9 (in accordance with IL-TRM V4.0, used in PY8), are credited to final PY9 MICK Program net impacts.

enrollment process and kit contents. Program stakeholders also reported that operations ran smoothly and no significant issues were encountered. Utility and program staff were pleased with the marketing material updates designed to limit customer confusion with the enrollment process found in the PY8 evaluation and with the refined recruitment efforts that prevented program oversubscription. To encourage MICK Program participants to consider other AIC energy efficiency programs, PY9 marketing materials also included a custom URL, allowing Leidos to track cross-promotional efforts, though a limited number of participants used this link.

Based on the key findings outlined below, the evaluation team identified several improvement opportunities and recommendations:

- **Key Finding #1:** The program materials included a custom URL to track participants' interest in energy efficiency beyond the kit program, but only a handful of kit recipients used the web link. Additional efforts could be done to encourage cross-program promotion.
  - **Recommendation:** Refine methods to track whether the program influences recipients' participation in other energy efficiency programs (customer cross-program participation). For example, in addition to the custom URL included in program materials, the kit could include a coupon or discount code for a free or discounted Home Efficiency Program energy audit. The coupon or code would also provide a record of customer cross-program participation.
- **Key Finding #2:** The MICK Program contributed to building awareness about AIC's other residential energy efficiency programs. Forty-four percent of participants are aware of other energy efficiency programs available to AIC's residential customers, and only a small percentage of these customers (14%) were aware of the programs before receiving the kit. This suggests that the kits are having an important impact on making customers aware of other energy efficiency programs. Additional customer follow-up could increase cross-program awareness.
  - **Recommendation:** In future kit programs, identify opportunities to follow up and remind kit program participants of other energy efficiency programs. On the enrollment form, for example, implementers could designate a location for participants to note interest in other such programs. The program implementer could also perform follow-up calls to interested participants to cross-promote low-cost residential efficiency programs (such as the Home Efficiency Income Qualified Program). Outreach activities and customer conversions should be tracked to measure the follow-up efforts' success.
- **Key Finding #3:** The program implementer did not calculate separate savings estimates for different aerator types, instead using IL-TRM V5.0 inputs associated with an "unknown" aerator type. Actual data showed the "unknown" aerator type assumptions overestimated bathroom faucet aerator savings and underestimated kitchen faucet aerator savings. This issue had been noted in the PY8 MICK Program evaluation report. Updating this calculation would produce more accurate estimates of aerator savings.
  - **Recommendation:** Calculate separate ex ante per-unit savings for bathroom faucet aerators and kitchen faucet aerators.
- **Key Finding #4:** The implementer used a gallons per minute (GPM) base value of 2.16 for faucet aerators, resulting in overestimated savings. The IL-TRM V5.0 prescribes a GPM base value of 1.39 for kitchen and bathroom faucet aerators.
  - **Recommendation:** Calculate separate ex ante per-unit savings for faucet aerators using the 1.39 GPM base value prescribed in IL-TRM V5.0.

2. Evaluation Approach

The evaluation team conducted both process and impact analyses of the PY9 MICK Program. The following sections outline the research objectives and methods employed.

2.1 Research Objectives

To conduct the PY9 MICK Program impact evaluation, the evaluation team sought to provide estimates of gross and net electric and natural gas savings associated with the program by researching several questions:

- How many kits did the program distribute?
- What were the program's estimated gross energy and demand impacts?
- What were the program's estimated net energy and demand impacts?

The team conducted a limited process evaluation, addressing several questions:

- What, if any, implementation challenges occurred in PY9?
- Did the program operate effectively?
- How was the program marketed?
- Did the program achieve its PY9 participation, energy saving, and demand reduction goals?
- What design changes could improve the effectiveness of a future, similar kit program?

2.2 Evaluation Tasks

Table 2 summarizes our PY9 evaluation activities. The activities that informed the MICK Program's PY9 evaluation are outlined in more detail below.

Table 2. PY9 Moderate Income Customer Kit Program Evaluation Methods

Activity	PY9 Process	PY9 Impact	Forward Looking	Details
Program Staff In-Depth Interviews	✓			Interviewed three program and implementation staff members to gain insights into the program design, delivery, and challenges.
Review of Program Materials and Data	✓			Reviewed the implementation plan, program marketing materials, and kit instructional materials.
Database Analysis	✓	✓	✓	Summarized database information to determine participation, key program statistics, savings, and delayed CFL installations that should be credited to future program years.

2.2.1 Program Staff In-Depth Interviews

The evaluation team interviewed one staff member each from AIC, Leidos, and AMCG who were responsible for managing, marketing, and delivering the program in order to assess the program design, implementation, communications, strengths, and weaknesses.

2.2.2 Review of Program Materials and Data

The evaluation team reviewed program materials and data:

- Program database and savings assumptions
- Program marketing and outreach collateral
- Program implementation and marketing plans

2.2.3 Database Analysis

Gross Impact Analysis

The team used the program tracking database to verify the reported distribution of kits and—in combination with PY9 participant survey results—to apply IL-TRM V5.0's per-unit gross savings inputs to estimate gross electric savings values for program measures. To estimate water heater electric energy savings associated with the program, the evaluation team applied a 20% electric water heater saturation rate (calculated from the PY9 MICK participant surveys) to verified installations of energy kit measures. The team used home-type information from the 2013 AIC *Energy Efficiency Market Potential Assessment*[2] to estimate single-family and multi-family weighted averages for ex post gross per-unit savings parameters, in conjunction with parameter

[2] Ameren Illinois Company. *Energy Efficiency Market Potential Assessment*. Report Number 1404. Volume 2: Market Research. June 10, 2013. Available online: http://ilsagfiles.org/SAG_files/Potential_Studies/Ameren/Appendix%204_AIC%20DSM%20Potential%20Study%202013%20Volume%202%20Market%20Research.docx

values prescribed for single- and multi-family participants in the IL-TRM V5.0.[3] Table 3 lists the ex post per-unit electric savings.

Table 3. PY9 Moderate Income Customer Kit Program Ex Post Gross Electric Savings—Per Unit Installed

Measure	Gross kWh	Gross kW
13-Watt CFL	24.0	0.002
23-Watt CFL	39.3	0.004
1.5 GPM Bathroom Faucet Aerator	18.2	0.025
1.5 GPM Kitchen Faucet Aerator	132.4	0.032
1.75 GPM High-Efficiency Shower Head	175.2	0.019

By applying a natural gas water-heating saturation of 80% (based on the PY9 MICK participant surveys) to verified installations, the team estimated the natural gas energy savings associated with the program, as shown in Table 4. The team used the IL-TRM V5.0 deemed per-unit gross natural gas savings inputs for program measures to calculate the gross natural gas savings, as detailed in Appendix A.

Table 4. PY9 Moderate Income Customer Kit Program Ex Post Gross Natural Gas Savings—Per Unit Installed

Measure	Gross Therms
1.5 GPM Bathroom Faucet Aerator	0.8
1.5 GPM Kitchen Faucet Aerator	5.9
1.75 GPM High-Efficiency Shower Head	7.8

Net Impact Analysis

The team applied a NTGR of 1.0 (approved by the Illinois SAG) to PY9 ex post gross savings to determine PY9 ex post net savings. Table 5 shows the NTGRs we used in the net impact analysis.

Table 5. Stakeholder Advisory Group–Approved PY9 Net-to-Gross Ratios

Measure Type	Electric NTGR	Natural Gas NTGR
All Measures	1.00	1.00

Table 6 lists the SAG-approved NTGR and ex post per-unit net electric savings values.

[3] Note that 79% of customers live in single-family homes and 21% live in multi-family homes. The IL-TRM V5.0 reports the average number of people per household in single-family homes as 2.56 and the average number of people in multi-family homes as 2.10. The evaluation team used this information to create a weighted average of 2.46 people per household. Mathematically, this is expressed as ((79%*2.56) + (21%*2.10)) = 2.46.

Table 6. PY9 Moderate Income Customer Kit Program Ex Post Net Electric Savings—Per Unit Installed

Measure	NTGR	Net kWh	Net kW
13-Watt CFL	1.00	24.0	0.002
23-Watt CFL	1.00	39.3	0.004
1.5 GPM Bathroom Faucet Aerator	1.00	18.2	0.025
1.5 GPM Kitchen Faucet Aerator	1.00	132.4	0.032
1.75 GPM High-Efficiency Shower Head	1.00	175.2	0.019

Table 7 lists the SAG-approved NTGR and ex post per-unit net natural gas savings values.

Table 7. PY9 Moderate Income Customer Kit Program Ex Post Net Natural Gas Savings—Per Unit Installed

Measure	NTGR	Net Therms
1.5 GPM Bathroom Faucet Aerator	1.00	0.8
1.5 GPM Kitchen Faucet Aerator	1.00	5.9
1.75 GPM High-Efficiency Shower Head	1.00	7.8

2.3 Sources and Mitigation of Error

Table 8 summarizes possible error sources associated with data collection conducted for the MICK Program. Discussion follows, addressing survey and non-survey error in detail.

Table 8. Possible Sources of PY9 Moderate Income Customer Kit Program Error

Research Task	Survey Error		Non-Survey Error
	Sampling Error	Non-Sampling Error	
Participant Surveys	Yes	Non-response bias	N/A
Gross Impact Calculations	N/A	N/A	Data processing error
Net Impact Calculations	N/A	N/A	Data processing error

Throughout the PY9 evaluation planning and implementation process, the evaluation team took several steps to mitigate potential sources of error.

Survey Error

- **Phone-Based Participant Surveys:** The evaluation team designed the survey sample size to achieve relative precision of ±10% or better at 90% confidence. To mitigate non-response bias, the team selected a random sample of 899 of the 9034 PY9 participants and attempted to contact each participant a minimum of three times. The team received responses from 70 households. The team identified the survey to have a 20% response rate, estimating that 78% of participants of unknown eligibility in the sample were eligible, using the American Association for Public Opinion Research's Response Rate Three.[4]

[4] American Association for Public Opinion Research. *Standard Definitions: Final Dispositions of Case Codes and Outcome Rates for Surveys.* Revised 2016. Available online: http://www.aapor.org/AAPOR_Main/media/publications/Standard-Definitions20169theditionfinal.pdf

Non-Survey Error

- **Data Processing Errors:** The team applied deemed savings values to participant data in the tracking database to calculate gross impacts, and applied the deemed NTGRs to estimate the program net impacts. To minimize data processing errors, different team members reviewed all calculations, verifying the calculations' accuracy.

3. Detailed Evaluation Findings

The following sections present detailed findings from the PY9 evaluation of the MICK Program.

3.1 Program Description

Through the MICK Program, AIC seeks to serve its low- to moderate-income residential customers who may not be able to afford energy-efficient products. The program implementer recruits residential customers through a direct mail campaign, targeting specific areas of AIC's service territory to reach targeted customers and to avoid overlap with another IPA program, Rural Efficiency Kits. Targeted customers return an enrollment form to request an energy-efficient kit.

As shown in **Error! Reference source not found.**, program kits include an array of energy-efficient products, a long with instructions for proper product installation and information on energy-saving opportunities available through other AIC programs.

Table 9. PY9 Moderate Income Customer Kit Program Products

Product	Quantity per Kit
13-Watt CFL	2
23-Watt CFL	2
1.5 GPM Bathroom Faucet Aerator	1
1.5 GPM Kitchen Faucet Aerator	1
1.75 GPM High-Efficiency Shower Head	1
Instructional Materials	N/A

AMCG delivers the program and tracks progress toward its energy-savings goals. Direct Options, AMCG's subcontractor, provides marketing services support, including developing the recruitment letters and materials included in the kit. To ensure participant overlap did not occur between programs, AMCG shared its MICK Program list with CLEAResult, the Rural Efficiency Kits Program implementer, to cross-reference against its customer list prior to delivering kits to households. AMCG mailed the branded kits and marketing materials directly to customers. AMCG reports delivery activities and results to the Leidos and IPA oversight team.

3.2 Process Assessment

3.2.1 Program Operations

Leidos Engineering provides oversight for the program on behalf of IPA, serving as the point of contact for day-to-day operational activities, process issues, and program status tracking. AMCG is responsible for program implementation and for reporting program activities to Leidos. Direct Options subcontracts with AMCG to provide program marketing and outreach.

In PY8, AMCG produced a list of approximately 150,000 customers who were predicted to fall within 0% to 300% of the federal poverty level, and randomly selected 50,000 customers for kit solicitation. AMCG received an overwhelming response in PY8, shipping kits to 10,956 respondents and notifying an additional 4,015 respondents (via a postcard) that they had been put on a wait list for kit delivery in PY9. AMCG shipped kits to the 4,015 wait-listed customers at the onset of PY9. In addition, to reach the two-year 20,000-kit goal, AMCG created a PY9 mailing list of 13,943 customers (who were not contacted in PY8). Direct Options mailed the

solicitation letters and managed the enrollment process. AMCG assembled and shipped 5,235 kits to PY9-enrolled customers from November 2016 through May 2017. AMCG delivered 19,990 kits over the two-year contract period.

3.2.2 Marketing and Outreach

The program encourages prospective customers to use kit items to achieve no-cost simple energy savings and to seek opportunities through other AIC programs. Direct Options, with AMCG and AIC input, developed the recruitment letters and marketing materials contained in the kit. The evaluation team reviewed the customer-facing marketing materials used to generate program awareness and to encourage future energy efficiency activity through AIC.

To meet the kit enrollment and fulfillment goal while testing four customer segments or marketing messages, the implementer developed its mailing list and solicitation letters with four message themes, as shown in Table 10. AMCG used messaging and customer segments that have produced positive enrollment results among its other clients in similar programs. As used in PY8, the implementer marketed a "free" kit message to a segment of the mailing list as well as three other customer segments: low tech retired, single parent, and new mover. The overall enrollment rate was 36.4%; AMCG reported a 39% enrollment rate from customers receiving the letter promoting the "free" kits, which was the highest enrollment rate among the four groups.

Table 10. PY9 Moderate Income Customer Kit Program Enrollment Rates by Message or Segment

Marketing Message or Customer Segment	Enrollment Rate
Free Kit Message	39.4%
Low Tech Retired Segment	38.9%
Single Parent Segment	31.7%
New Mover Segment	31.3%
Total	**36.4%**

In addition to the solicitation letters, Direct Options developed several program marketing materials:

- Trifold brochure with energy-saving tips, including a rationale for installing kit contents;
- Kit content descriptions and installation instructions;
- Home Efficiency Program fact sheet, describing program benefits and special incentive levels for income-qualified customers and including encouragements to visit the program website or to contact the Act on Energy call center to learn about AIC's portfolio energy efficiency programs; and
- Regrets postcard for customers exceeding the program distribution goal.

During the interviews, program staff said they focused changes to program marketing materials on ways to simplify program enrollment. The implementer added a postage-paid, tear-off business reply card within the solicitation letter and included a program phone number, enabling customers to efficiently enroll or follow up with questions. The implementer also created a postcard to deliver to those who requested a kit after the program had closed or was fully subscribed. Both AIC and program staff were pleased with having successfully estimated customer interest in PY9: the implementer reported that it distributed kits to all residential customers who enrolled prior to May 30, 2017, and distributed 22 regrets postcards after June 1, 2017.

Program staff also indicated that opportunities exist to encourage participation in other AIC programs. Leidos staff determined that 11 MICK Program participants visited the program's custom URL (ActOnEnergy.com/NextStep). No other programs used the URL and AIC did not index it on any web search engines. Although AIC did not track participant phone calls to its call center, staff said it is likely that AIC received some calls for the Home Efficiency Income-Qualified Program. While AIC staff said that this analysis did not reflect long-term effects of the cross-promotional potential of participating in the MICK program, they expected more customers to engage in other energy efficiency opportunities over the promotional period. AMCG staff also reported interest in including more cross-promotional materials in the kit and, if the program budget allows, proactively contacting customers following MICK Program participation to encourage them to pursue other energy efficiency options.

3.2.3 Program Goals

AMCG fell just 10 kits short of its two-year, 20,000-kit distribution goal, distributing 10,956 kits in PY8 and 9,034 kits in PY9, for a total of 19,990 kits. The program implementer said it had intended to exceed the kit distribution goal by sending 20,073 kits over PY8 and PY9, but it mailed 83 kits to natural gas-only customers or nonresidential structures (such as a barn or garage), which are ineligible for the program; therefore kits counted toward the program totaled 19,990.

3.2.4 Communications and Cooperation

During PY9 planning, AMCG met with Leidos weekly to ensure customer screening, marketing, and outreach met the program's needs. Once revisions to program materials and activities were under way, program staff reported monthly progress to maintain regular program communications among implementer, Leidos, and utility staff. AMCG reported that AIC was responsive and provided clear feedback. AIC found reporting and data tracking sufficient and reported having good working relationships with Leidos and implementation staff.

3.2.5 Screening and Participant Selection Process

AMCG's recruitment efforts in PY8 exceeded expectations, and it placed 4,015 homeowners who requested a kit in PY8 on a waiting list. AMCG shipped kits to these participants in early PY9.

AMCG produced a list of 150,000 potential residential participants with AIC electric accounts in PY8, identifying the following characteristics:

- Zip code located in an urban area (to avoid overlap with the Rural Efficiency Kits Program)
- Age, marital status, education level, homeownership status, length of living in residence, and those likely to fall within 0% to 300% of the federal poverty levels, based on publicly available information

AMCG had only used 50,000 contacts from this list in PY8, so it randomly selected 13,943 customers from the remaining accounts on the list to receive a PY9 kit solicitation letter. Of the program solicitation letters mailed, 5,081 homeowners requested a kit, a 36% response rate. At the close of PY9, AMCG or Leidos provided 22 customers with a postcard, notifying them that they would not receive a kit.

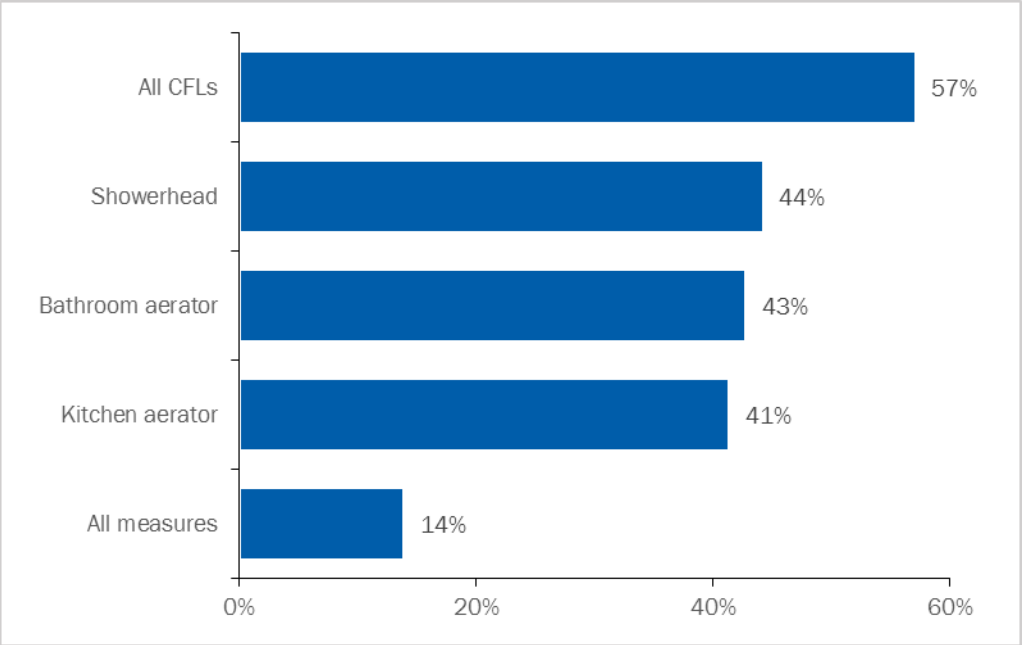
3.2.6 Participant Survey

In August and September 2017, the evaluation team conducted telephone surveys with 70 customers who participated in the MICK Program during PY9. In addition to fuel-type demographics, free-ridership, and spillover topics that informed the impact assessment, the team asked respondents about their program experiences, including their reasons for not installing measures, awareness of other AIC programs, and satisfaction with program components.

Measure Installation

The evaluation team asked survey respondents whether they installed the CFLs, showerhead, and aerators included in their kit. As shown in Figure 1, 57% of participants installed all four CFLs from their kits, 44% installed the showerhead, 43% installed the bathroom aerator, and 41% installed the kitchen aerator; 14% of respondents installed all measures in the kit.

Figure 1. Percentage of Respondents Who Installed Measures

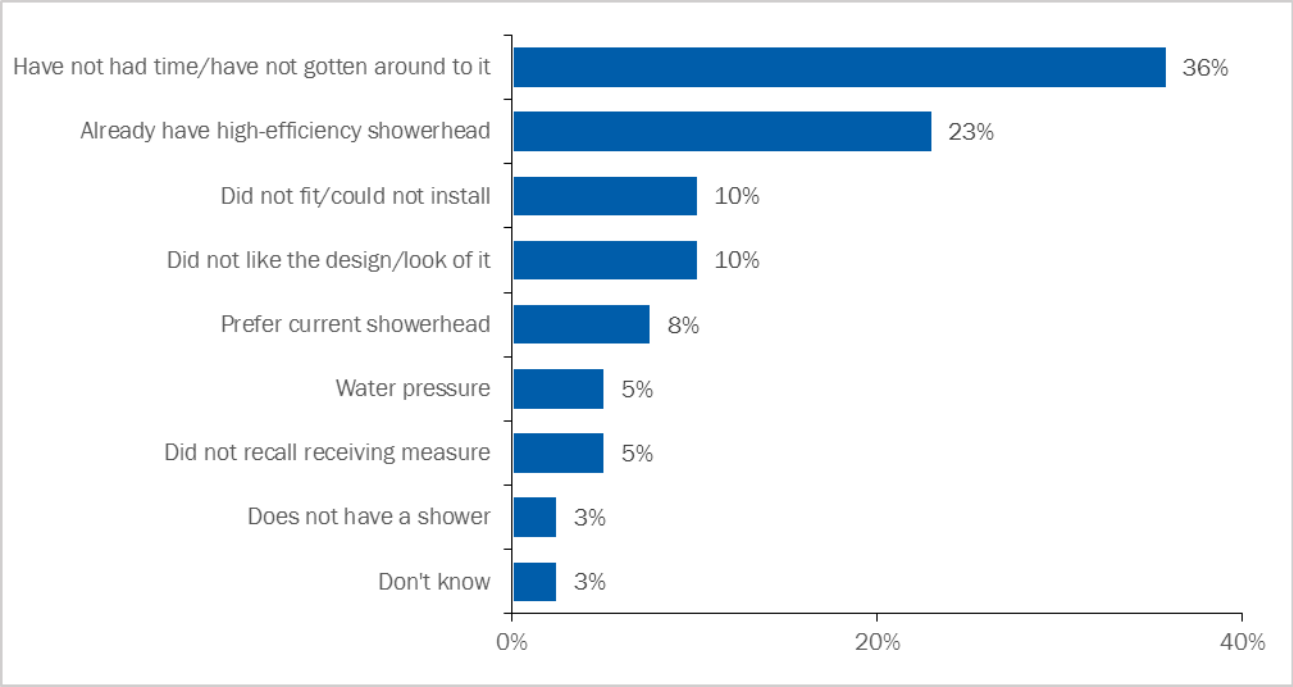


Source: PY9 MICK Program Participant Survey. Question C1: Your kit contained four compact fluorescent light bulbs, or CFLs. How many of the CFLs in your kit are currently installed?; Question C7: Is the showerhead that was included in the kit currently installed in your home?; Question C11: Is the bathroom faucet aerator that was included in the kit currently installed in your home?; and Question C15: Is the kitchen faucet aerator that was included in the kit currently installed in your home? (n=70)

The evaluation team asked respondents about their reasons for not installing measures in their kits. For CFLs, most respondents who were certain that their household had not installed all four CFLs (n=25) indicated they intended to eventually install all of the CFLs. Respondents reported waiting for other bulbs to burn out (68%), not getting around to installing the bulbs (16%), or already having CFLs or LEDs in every socket (12%). One respondent (4%) said the kit contained only two of the four bulbs.

As shown in Figure 2, 36% of respondents (n=39) who did not install the showerhead reported not having time to install the measure; the remainder gave reasons such as already having a high-efficiency showerhead (23%), the measure not fitting their fixture (10%), or not liking the look of the measure (10%).

Figure 2. Reasons Respondents Did Not Install Showerhead



Source: PY9 MICK Program Participant Survey. Question C10: Why is the high-efficiency showerhead not currently installed in your home? Multiple responses allowed. (n=39)

Respondents not installing the bathroom aerator (n=39) provided the following reasons for not implementing the measure:

- Have not had time/have not gotten around to it (56%)
- Did not fit/could not install (31%)
- Did not recall receiving measure (10%)
- Already have a bath aerator in every possible location (3%)

Respondents not installing the kitchen aerator (n=37) offered similar reasons for not implementing the measure:

- Have not had time/have not gotten around to it (41%)
- Did not fit/could not install (35%)
- Already have a kitchen aerator in every possible location (16%)
- Did not recall receiving measure (8%)

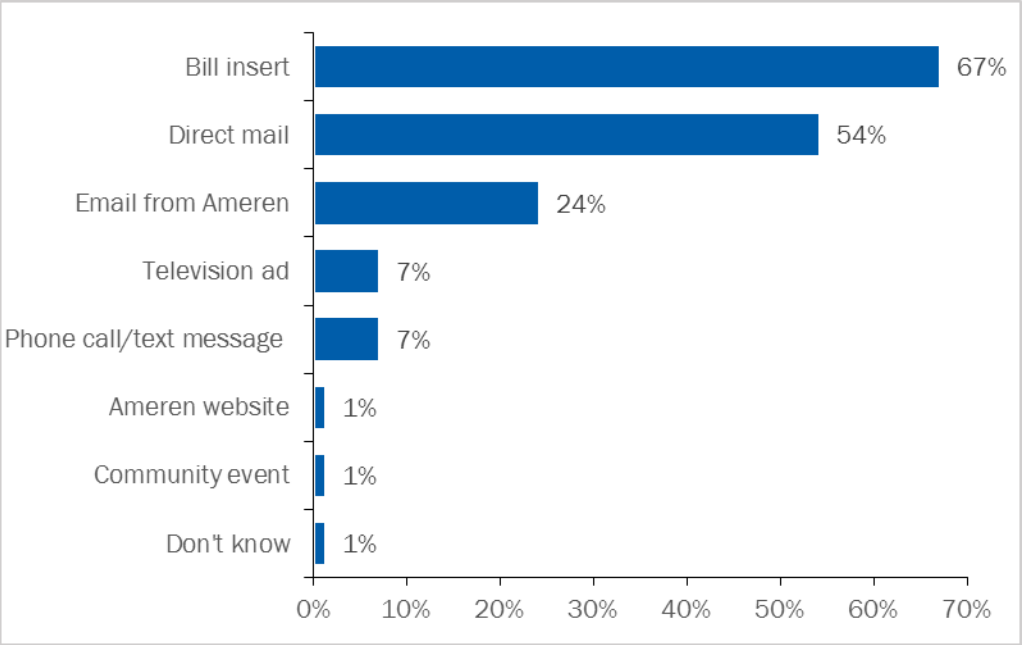
Awareness of Ameren's Energy Efficiency Programs

The evaluation team asked survey respondents about their awareness of other energy efficiency programs available to AIC's residential customers. Forty-four percent of respondents (n=70) were aware of AIC's

residential energy efficiency programming. Fourteen percent of these respondents (n=31) said they had not been aware of programs before receiving their kit through the MICK Program. When asked how familiar they were with AICs residential energy efficiency programs, 81% (n=31) said they were *very* or *somewhat familiar*.

The team asked respondents the best ways for AIC to inform homeowners about its other programs. Shown in Figure 3, most respondents (n=70) said bill inserts (67%), direct mail (54%), or email (24%).

Figure 3. Best Ways to Inform Homeowners about Other AIC Programs

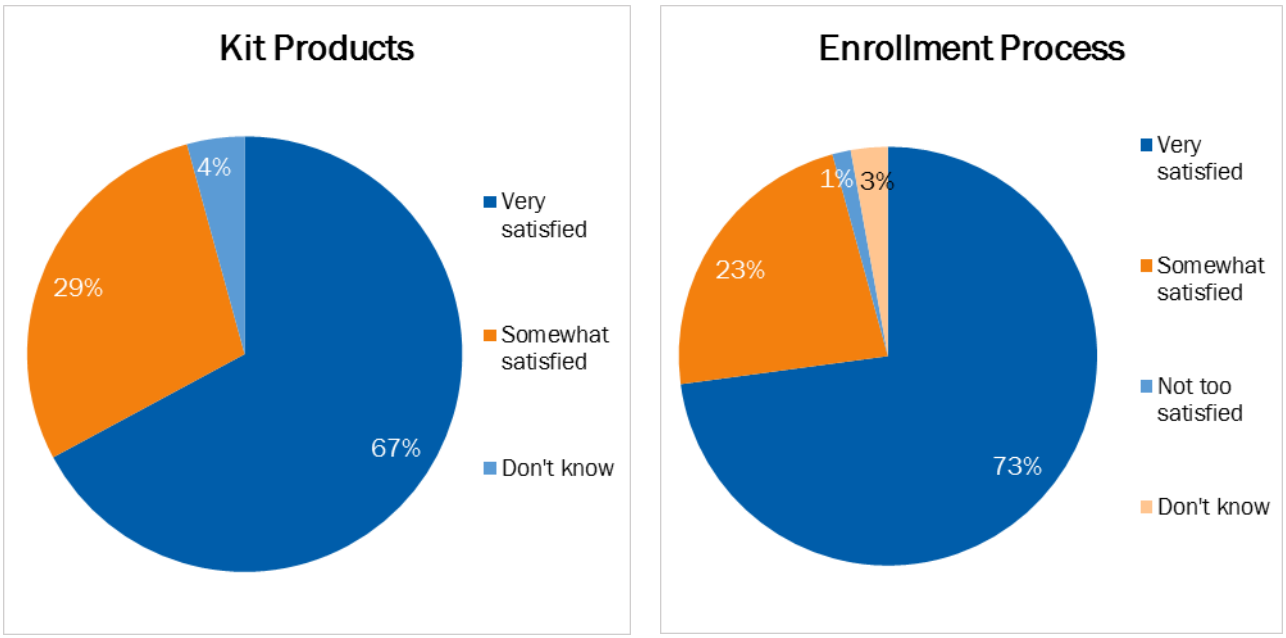


Source: PY9 MICK Program Participant Survey. Question E9: What are the best ways for Ameren Illinois to inform you about other programs it offers to help you save energy in your home? Multiple responses allowed. (n=70)

Participant Satisfaction

Most survey respondents reported satisfaction with the contents of the kit and the process for requesting a kit. Figure 4 shows the breakdown of respondents' satisfaction levels for the kit products and the enrollment process, with 67% and 73% of respondents *very satisfied* with the products included in the kit and the enrollment process, respectively.

Figure 4. Participant Satisfaction with Kit Contents and Enrollment Process



The evaluation team asked respondents the reasons behind their rating for satisfaction with the kit products. *Very satisfied* respondents who provided a reason (n=34) most-commonly gave a general compliment about the program or the kit contents (41%), mentioned the energy or cost savings involved with the product (24%) or the products' usefulness or quality (24%). *Somewhat satisfied* respondents who shared their reasons (n=16) primarily said their rating was because they had not tried all of the products (38%) or did not like (38%) one or more of the products. All three respondents who said *don't know* mentioned that this was because they had not tried the products.

3.3 Impact Assessment

3.3.1 Gross Impacts

The evaluation team used the IL-TRM V5.0 estimates for kit item installation rates. Table 11 lists reported ex ante and evaluated ex post installation rates[5] for each kit measure used in the electric and natural gas savings calculations.[6] The implementer's ex ante savings calculations used installation rates derived from the IL-TRM V5.0. As illustrated in Table 12, the ex ante and ex post installation rates are either identical (for CFLs) or very close to one another (for aerators).

[5] Cadmus. *Ameren Missouri Efficient Products Impact and Process Evaluation: Program Year 2014*. May 15, 2015. Available online: https://www.efis.psc.mo.gov/mpsc/commoncomponents/viewdocument.asp?DocId=935933387

[6] Natural gas savings are presented in Appendix A of this report.

Table 11. PY9 Moderate Income Customer Kit Program Installation Rates

Measure	Reported Ex Ante Installation Rate	Evaluated Ex Post Installation Rate
13-Watt CFL	66%	66%
23-Watt CFL	66%	66%
1.5 GPM Bathroom Faucet Aerator	61%[a]	63%
1.5 GPM Kitchen Faucet Aerator	61%[a]	60%
1.75 GPM High-Efficiency Shower Head	65%	65%

[a] The implementer estimated savings for a single "unknown" aerator type, producing a single weighted in-service rate (ISR) using the kitchen- and bathroom-specific ISR's from the IL-TRM V5.0 in conjunction with the 70/30 weighting that the IL-TRM V5.0 uses for the drain factor (based on the assumption that 70% of household water runs through the kitchen faucet and 30% through the bathroom faucet).

Table 12 lists the reported ex ante and evaluated ex post per-unit electric savings. There are large differences between ex ante and ex post per-unit gross savings for non-CFL measures, which are detailed following Table 13.

Table 12. PY9 Moderate Income Customer Kit Program Ex Ante and Ex Post Per-Unit Electric Savings

Measure	Reported Ex Ante Gross kWh	Evaluated Ex Post Gross kWh	Reported Ex Ante Gross kW	Evaluated Ex Post Gross kW
13-Watt CFL	24.1	24.0	0.002	0.002
23-Watt CFL	39.4	39.3	0.004	0.004
1.5 GPM Bathroom Faucet Aerator	194.4	18.2	0.083	0.025
1.5 GPM Kitchen Faucet Aerator	194.4	132.4	0.083	0.032
1.75 GPM High-Efficiency Shower Head	220.3	175.2	0.024	0.019

Overall, based on reported program participation and ex post savings values, the program achieved total gross electric savings of 1,125 MWh and demand reduction of 0.160 MW. Table 13 shows ex ante and ex post gross electric and demand impacts.

Table 13. PY9 Moderate Income Customer Kit Program Ex Post Gross Electric Impacts

Measure	Reported Ex Ante Installation Rate	Ex Ante Gross Impacts		Reported Measures[ab]	Evaluated Ex Post Installation Rate[c]	Verified Measures[d]	Ex Post Gross Impacts		Gross Realization Rate[e]	
		MWh	MW				MWh	MW	MWh	MW
13-Watt CFL	66%	287	0.027	18,068	66%	11,925	287	0.028	100%	103%
23-Watt CFL	66%	470	0.045	18,068	66%	11,925	468	0.046	100%	101%
1.5 GPM Bathroom Faucet Aerator	61%	214	0.091	1,807	63%	1,138	21	0.029	10%	32%
1.5 GPM Kitchen Faucet Aerator	61%	214	0.091	1,807	60%	1,084	144	0.035	67%	38%
1.75 GPM High-Efficiency Shower Head	65%	259	0.029	1,807	65%	1,174	206	0.022	80%	78%
Total[f]	**66%**	**1,444**	**0.284**	**41,556**	**66%**	**27,247**	**1,125**	**0.160**	**78%**	**56%**

[a] Based on the PY9 MICK participant surveys, the evaluation team estimated that 20% of total verified water-saving measures were installed in homes with electric water heating.
[b] Reported measures represent those distributed through the kits and is not adjusted for installation rates.
[c] Reported percentages are rounded from their true values.
[d] The difference between reported measures and verified measures results from the application of installation rates derived from IL-TRM V5.0.
[e] Realization rates differing from 100% result from differences between ex ante and ex post installation rates and per-unit savings: gross realization rate = ex post gross savings / ex ante gross savings.
[f] Totals may not sum due to rounding.

The evaluation team received ex ante electric savings estimates from the MICK Program implementer and compared the assumed estimates with the ex post electric savings methodologies. The differences between total ex ante and ex post electric savings estimates are primarily a result of differences between the ex ante and ex post gross electric per-unit savings assumptions. The following descriptions address discrepancies for each program measure:

- **Bathroom Faucet Aerators.** The ex ante bathroom faucet aerator per-unit savings estimate of 194.4 kWh was significantly higher than the ex post per-unit savings estimate of 18.2 kWh, calculated in accordance with the IL-TRM V5.0. The implementer did not calculate separate savings estimates for different aerator types, but used 194.4 kWh and 0.083 kW gross per-unit savings estimates for both bathroom and kitchen faucet aerators, relying on IL-TRM V5.0 inputs associated with an "unknown" aerator type, thus overestimating bathroom aerator gross savings.

  A component of the ex ante per-unit kWh savings estimate that, holding all else equal, resulted in underestimated ex ante kWh savings was the implementer used a single weighted ISR of 61%, calculated from the kitchen- and bathroom-specific ISR's in the IL-TRM V5.0 in conjunction with the 70/30 weighting that the IL-TRM V5.0 uses for the drain factor (based on the assumption that 70% of household water runs through the kitchen faucet and 30% through the bathroom faucet). The team used a bathroom faucet aerator-specific ISR of 63% from the IL-TRM V5.0 to calculate ex post gross savings.

- **Kitchen Faucet Aerators.** The ex ante kitchen faucet aerator per-unit savings estimate of 194.4 kWh was higher than the ex post per-unit savings estimate of 132.4 kWh, calculated in accordance with the IL-TRM V5.0. The implementer did not calculate separate savings estimates for different aerator types, using 194.4 kWh and 0.083 kW gross per-unit savings estimates for kitchen and bathroom faucet aerators, relying on IL-TRM V5.0 inputs associated with an "unknown" aerator type.

  The ex ante per-unit savings estimate was overestimated because the implementer used a base value of 2.16 GPM. The team followed the PY9 IPA Evaluation Plan and used the kit-specific 1.39 GPM base value prescribed in the IL-TRM V5.0.

  A component of the ex ante per-unit kWh savings estimate that, holding all else equal, resulted in overestimated ex ante kWh savings was the implementer used a single weighted ISR of 61%, calculated using the kitchen- and bathroom-specific ISRs in the IL-TRM V5.0 in conjunction with the 70/30 weighting that the IL-TRM V5.0 uses for the drain factor. The team used a kitchen faucet aerator-specific ISR of 60% from the IL-TRM V5.0 to calculate ex post gross savings.

- **Shower Heads.** The ex ante shower head per-unit savings estimates of 220.3 kWh and 0.024 kW were more than the ex post per-unit savings estimates of 175.2 kWh and 0.019 kW, which the evaluation team calculated in accordance with the IL-TRM V5.0. The ex ante per-unit savings estimate was overestimated because the implementer used a base value of 2.5 GPM, calculated by averaging the direct-install and kit-specific values from the IL-TRM V5.0. The team followed the PY9 IPA Evaluation Plan and used the kit-specific 2.35 GPM base value prescribed in the IL-TRM V5.0.

In addition to gross savings achieved from measure installations in PY9, the evaluation team calculated gross savings from delayed CFL installations, per the IL-TRM V5.0. In particular, the IL-TRM V5.0 assumed that consumers would install 93% of kit CFLs within three years. Table 14 shows savings from bulbs provided to participants (and realized) in PY9, along with later installations assumed for PY10 and PY11.

Table 14. Yearly Gross Impact of PY9 Moderate Income Customer Kit Program Residential Lighting Measures by Assumed Installation Year

Measure	Energy (MWh)			Demand (MW)		
	PY9	PY10	PY11	PY9	PY10	PY11
13-Watt CFL	287	61	52	0.028	0.006	0.005
23-Watt CFL	468	99	85	0.046	0.010	0.008
Total	**755**	**160**	**137**	**0.074**	**0.016**	**0.013**

The PY10 and PY11 savings will not be included in future evaluation reports for this program, as PY9 was the last year the MICK Program will be offered.

3.3.2 Net Impacts

The program achieved total net electric savings and demand reduction of 1,125 MWh and 0.160 MW, respectively, based on verified program participation. The IL-TRM V5.0 deemed per-unit gross savings values and ISRs, and the SAG-approved NTGR of 1.00.

Table 15 shows net electric savings results by measure. Additionally, the evaluation team included the PY8 MICK Program net CFL savings realized in PY9, bringing the totals to 1,319 MWh and 0.179 MW.[7] The PY8 MICK Program-delayed CFL installations resulted in 194 MWh of gross energy savings and 0.019 MW of gross demand reduction, which are the same values after the team applied the SAG-approved NTGR of 1.00.

Table 15. Total PY9 Moderate Income Customer Kit Program Net Electric Savings by Measure

Measure	Ex Ante Net Savings		Initial Ex Post Net Savings		PY8 Ex Post CFL Net Savings Realized in PY9		PY9 Ex Post Net Savings (MWh)	
	MWh	MW	MWh	MW	MWh	MW	MWh	MW
13-Watt CFL	287	0.027	287	0.028	74	0.007	360	0.035
23-Watt CFL	470	0.045	468	0.046	120	0.012	589	0.057
1.5 GPM Bathroom Faucet Aerator	214	0.091	21	0.029	-	-	21	0.029
1.5 GPM Kitchen Faucet Aerator	214	0.091	144	0.035	-	-	144	0.035
1.75 GPM High-Efficiency Shower Head	259	0.029	206	0.022	-	-	206	0.022
Total	**1,444**	**0.284**	**1,125**	**0.160**	**194**	**0.019**	**1,319**	**0.179**
Net Realization Rate			**78%**	**56%**			**91%**	**63%**

[7] The team credited the delayed 13-watt and 23-watt CFL installations by PY8 MICK Program participants, estimated as installed during PY9, to final PY9 MICK Program net impacts.

Table 16 shows gross and net savings associated with CFLs distributed and installed during PY9 as well as with gross and net savings associated with CFLs distributed in PY7 and PY8, but installed during PY9.

Table 16. PY9 Rural Kits Program Total Savings Claimed for CFL Measures by Program Year

Program Year / CFL Wattage	Reported CFLs Distributed	1st Year Installation Rate	2nd Year Installation Rate	CFLs Installed in PY9	Ex Post Gross Per-Unit kWh	Ex Post Gross Per-Unit kW	Ex Post Gross Impacts kWh	Ex Post Gross Impacts kW	NTGR	Ex Post Net Impacts kWh	Ex Post Net Impacts kW
PY9 / 13-watt	18,500	66%	-	11,925	24.0	0.0023	286,681	28	1.00	286,681	28
PY9 / 23-watt	18,500	66%	-	11,925	39.3	0.0038	468,245	46	1.00	468,245	46
PY8 / 13-watt	21,480	-	14%	3,068	24.0	0.0023	73,749	7	1.00	73,749	7
PY8 / 23-watt	21,480	-	14%	3,068	39.3	0.0038	120,456	12	1.00	120,456	12
Total							**949,131**	**93**		**949,131**	**93**

4. Conclusions and Recommendations

In PY9, AMCG delivered 9,034 MICK Program kits to low- and moderate-income residential customers, and in PY8 delivered 10,956 kits, thus falling short of the two-year, 20,000-kit goal by less than 1%. As the evaluation team determined through process review, AIC, Leidos, and implementation staff reported high satisfaction with the program's performance in PY9, and participants were satisfied with the enrollment process and kit contents. Stakeholders also reported that operations ran smoothly and no significant issues were encountered. Utility and program staff were pleased with the marketing material updates designed to limit the customer confusion with the enrollment process found in the PY8 evaluation, and with the refined recruitment efforts that prevented program oversubscription. To encourage MICK Program participants to consider other AIC energy efficiency programs, Leidos also used PY9 marketing materials to track cross-program promotional efforts through a custom URL, though a limited number of participants used this link.

The evaluation team identified several improvement opportunities and recommendations:

- **Key Finding #1:** The program materials included a custom URL to track participants' interest in energy efficiency beyond the kit program, but only a handful of kit recipients used the web link. Additional efforts could be done to encourage cross-program promotion.
  - **Recommendation:** Refine methods to track whether the program influences recipients' participation in other energy efficiency programs. For example, in addition to the custom URL included in program materials, the kit could include a coupon or discount code for a free or discounted Home Efficiency Program energy audit. The coupon or code would also provide a record of customer cross-program participation.
- **Key Finding #2:** The MICK Program contributed to building awareness about AIC's other residential energy efficiency programs**.** Forty-four percent of participants are aware of other energy efficiency programs available to AIC's residential customers, and only a small percentage of these customers (14%) were aware of the programs before receiving the kit. This suggests that the kits are having an important impact on making customers aware of other energy efficiency programs. Additional customer follow-up could increase cross-program awareness.
  - **Recommendation:** In future kit programs, identify opportunities to follow up and remind kit program participants of other energy efficiency programs. On the enrollment form, for example, implementers could designate a location for participants to note interest in other such programs. The program implementer could also perform follow-up calls to interested participants to cross-promote low-cost residential efficiency programs (such as the Home Efficiency Income Qualified Program). Outreach activities and customer conversions should be tracked to measure the follow-up efforts' success.
- **Key Finding #3:** The program implementer did not calculate separate savings estimates for different aerator types, instead using IL-TRM V5.0 inputs associated with an "unknown" aerator type. Actual data showed the "unknown" aerator type assumptions overestimated bathroom faucet aerator savings and underestimated kitchen faucet aerator savings. This issue had been noted in the PY8 MICK Program evaluation report. Updating this calculation would produce more accurate estimates of aerator savings.
  - **Recommendation:** Calculate separate ex ante per-unit savings for bathroom faucet aerators and kitchen faucet aerators.

- **Key Finding #4:** The implementer used a gallons per minute (GPM) base value of 2.16 for faucet aerators, resulting in overestimated savings. The IL-TRM V5.0 prescribes a GPM base value of 1.39 for kitchen and bathroom faucet aerators.
  - **Recommendation:** Calculate separate ex ante per-unit savings for faucet aerators using the 1.39 GPM base value prescribed in IL-TRM V5.0.

Appendix A. Moderate Income Customer Kit Program Assumptions and Algorithms

Compact Fluorescent Lights

The evaluation team used the following equations from the IL-TRM V5.0 to estimate energy savings and demand reduction for CFLs.

Equation 1. ENERGY STAR CFL Energy Algorithm

$$\Delta kWh = \left(\frac{Watts_{base} - Watts_{EE}}{1{,}000}\right) \times ISR \times (1 - Leakage) \times Hours \times WHFe$$

Equation 2. ENERGY STAR CFL Demand Algorithm

$$\Delta kW = \left(\frac{Watts_{base} - Watts_{EE}}{1{,}000}\right) \times ISR \times WHFd \times CF$$

Table 17 provides assumptions used to estimate *ex post* savings for CFL measures.

Table 17. PY9 Moderate Income Customer Kit Program Ex Post Assumptions for ENERGY STAR CFLs

Parameter	Value	Units	Notes/Reference
$Watts_{base}$	13W CFL: 43 23W CFL: 72	watts	Base watts incandescent equivalent (IL-TRM V5.0)
$Watts_{EE}$	13W CFL: 13 23W CFL: 23	watts	Wattage of CFL installed (IL-TRM V5.0)
ISR	66%	N/A	Installation rate (IL-TRM V5.0 "Direct Mail Kits"). The evaluation team applied the 66% ISR to reported measures distributed and did not apply any ISR to the per-unit savings values reported in the PY9 evaluation report.
Leakage	0	N/A	Adjustment to account for the percentage of program bulbs moving out of the utility jurisdiction. Kits were not delivered to non-AIC customers, determined through evaluating the program tracking data.
Hours	759	Hours	Hours (IL-TRM V5.0 "Residential Interior and in-unit Multi Family")
WHFe	Single Family: 1.06 Multi Family: 1.04	N/A	Waste heat factor for energy (IL-TRM V5.0). The evaluation team used SF/MF values in conjunction with the 79% SF/21% MF customer population distribution from the 2013 *Market Potential Assessment*[a] to calculate a weighted average waste heat factor for energy of 1.056.
1,000	1,000	W/kW	Conversion factor
WHFd	Single Family: 1.11 Multi Family: 1.07	N/A	Waste heat factor for demand (IL-TRM V5.0). The evaluation team used the 79% SF/21% MF customer population distribution to calculate a weighted average waste heat factor for demand of 1.102.
CF	7.1%	N/A	Summer peak coincidence factor (IL-TRM V5.0)

[a]. EnerNOC Utility Solutions Consulting. *Ameren Illinois Energy Efficiency Market Potential Assessment. Report Number 1404. Volume 2: Market Research.* June 10, 2013. Available online: http://ilsagfiles.org/SAG_files/Potential_Studies/Ameren/Appendix%204_AIC%20DSM%20Potential%20Study%202013%20Volume%202%20Market%20Research.docx

Lighting Measures Heating Penalty

The team determined heating penalties for different heating fuel types using the algorithms below. Based on the agreement between the Illinois Commerce Commission and AIC, we did not include heating penalties in the ex post energy savings, but will include this in the data for the PY9 cost-effectiveness analysis. The team used the PY9 MICK Program participant survey results to estimate that 20% of PY9 MICK Program participants have electric resistance space heating and 80% have natural gas space heating.

Equation 3. Electric Heating Penalty Algorithm

$$\Delta kWh = \left(\left(\frac{Watts_{base} - Watts_{EE}}{1{,}000}\right) \times ISR \times Hours \times HF\right) \div nHeat$$

Equation 4. Natural Gas Heating Penalty Algorithm

$$\Delta therms = \left(\left(\frac{Watts_{base} - Watts_{EE}}{1{,}000}\right) \times ISR \times Hours \times HF \times 0.03412\right) \div nHeat$$

Where:

WattsBase = Wattage of existing equipment (see Table 17)

WattsEE = Wattage of installed CFLs (see Table 17)

ISR = In-service rate, or the percentage of units rebated that get installed (see Table 17)

Hours = Annual operating hours (see Table 17)

HF = Heating factor (= 0.49)

ηHeat = Efficiency of heating equipment (see Table 18)

Table 18. PY9 Moderate Income Customer Kit Program ηHeat for Lighting Heating Penalties

Measure	ηHeat	Units
Heat Pump (Before 2006)	2.00	COP
Heat Pump (2006–2014)	2.26	COP
Heat Pump (2015 and Beyond)	2.40	COP
Electric Resistance	1.00	COP
Natural Gas Heating	0.70	AFUE

Table 19 summarizes heating penalties for the program lighting measures by heating equipment type.

Table 19. PY9 Moderate Income Customer Kit Program Per-Measure Heating Fuel Penalties for CFL Lighting

Heating Equipment	Measure	ΔkWh	Δtherms
Electric Resistance Heating	13-Watt CFL	−1.90	N/A
	23-Watt CFL	−2.04	N/A
Natural Gas Heating	13-Watt CFL	N/A	-0.45
	23-Watt CFL	N/A	-0.74

Bathroom and Kitchen Faucet Aerators

The evaluation team used the following equations from the IL-TRM V5.0 to estimate energy savings and demand reduction for faucet aerators.

Equation 5. Faucet Aerator Electric Energy Algorithm

$$\Delta kWh = \%ElectricDHW \left(\frac{(GPM_{base} * L_{base} - GPM_{low} * L_{low}) * Household * 365.25 * DF)}{FPH}\right) \times EPG\_electric \times ISR$$

Equation 6. Faucet Aerator Natural Gas Energy Algorithm

$$\Delta kWh = \%FossilDHW \left(\frac{(GPM_{base} * L_{base} - GPM_{low} * L_{low}) * Household * 365.25 * DF)}{FPH}\right) \times EPG\_gas \times ISR$$

Equation 7. Faucet Aerator Demand Reduction Algorithm

$$\Delta kW = \left(\frac{\Delta kWh}{Hours}\right) \times CF$$

Table 20 provides assumptions used to estimate *ex post* savings for bathroom faucet aerators.

Table 20. PY9 Moderate Income Customer Kit Program Ex Post Assumptions for Bathroom Faucet Aerators

Parameter	Value	Units	Notes/Reference
%ElectricDHW	100%	N/A	In accordance with the PY9 IPA Evaluation Plan, we used the PY9 MICK participant survey data to estimate that 20% of program measures were installed in homes with electric water heating and 80% were installed in homes with natural gas water heating. The evaluation team applied these fuel saturations to installed measures to create separate analyses for electric and natural gas.
%FossilDHW	100%	N/A	
GPM_{base}	1.39	gal/min	Base case flow (IL-TRM V5.0)
GPM_{low}	0.94	gal/min	Low case flow (IL-TRM V5.0)
L_{base}	1.6	min/day	Base case use length (IL-TRM V5.0)
L_{low}	1.6	min/day	Low case use length (IL-TRM V5.0)
Household	Single Family: 2.56 Multi Family: 2.10	# of people	Average number of people per household (IL-TRM V5.0). The evaluation team used SF/MF values in conjunction with the 79% SF/21% MF customer population distribution from the 2013 *Market Potential Assessment* to calculate a weighted average people per household value of 2.46.
365.25	365.25	days	Days in a year, on average (IL-TRM V5.0)
DF	90%	Percent	Drain factor (IL-TRM V5.0 "Bath")
FPH	Single Family: 2.83 Multi Family: 1.50	Faucets per household	Bath faucets per household (IL-TRM V5.0). The evaluation team used the 79% SF/21% MF customer population distribution to calculate a weighted average bathroom faucets per household value of 2.55.
EPG_electric	0.0795	kWh/gal	Energy per gallon of hot water supplied by electricity (IL-TRM V5.0 "Bath")

Parameter	Value	Units	Notes/Reference
EPG_gas	Single Family: 0.00341 Multi Family: 0.00397	Therm/gal	Energy per gallon of hot water supplied by natural gas (IL-TRM V5.0 "Bath"). The evaluation team used the 79% SF/21% MF customer population distribution to calculate a weighted average energy per gallon of hot water supplied by natural gas value of 0.00353.
ISR	63%	N/A	Installation rate (IL-TRM V5.0 "Efficiency Kit Bathroom Aerator"). The team applied the 63% ISR to reported measures distributed, and did not apply ISRs to per-unit savings values reported in the evaluation report.
Hours	Single Family: 14 Multi Family: 22	Hours/Year	Annual electric water heating recovery hours for faucet use per faucet (IL-TRM V5.0 "Bathroom"). The evaluation team used the 79% SF/21% MF customer population distribution to calculate a weighted average recovery hours per faucet value of 16.
CF	0.022	N/A	Coincidence factor for electric load reduction (IL-TRM V5.0)

Table 21 provides assumptions used to estimate *ex post* savings for kitchen faucet aerators.

Table 21. PY9 Moderate Income Customer Kit Program Ex Post Assumptions for Kitchen Faucet Aerators

Parameter	Value	Units	Notes/Reference
%ElectricDHW	100%	N/A	In accordance with the PY9 IPA Evaluation Plan, we used the PY9 MICK participant survey data to estimate that 20% of program measures were installed in homes with electric water heating and 80% were installed in homes with natural gas water heating. The evaluation team applied these fuel saturations to installed measures to create separate analyses for electric and natural gas.
%FossilDHW	100%	N/A	
GPM_{base}	1.39	gal/min	Base case flow (IL-TRM V5.0)
GPM_{low}	0.94	gal/min	Low case flow (IL-TRM V5.0)
L_{base}	4.5	min/day	Base case use length (IL-TRM V5.0)
L_{low}	4.5	min/day	Low case use length (IL-TRM V5.0)
Household	Single Family: 2.56 Multi Family: 2.10	# of people	Average number of people per household (IL-TRM V5.0). The evaluation team used SF/MF values in conjunction with the 79% SF/21% MF customer population distribution from the 2013 *Market Potential Assessment* to calculate a weighted average people per household value of 2.46.
365.25	365.25	days	Days in a year, on average (IL-TRM V5.0)
DF	75%	Percent	Drain factor (IL-TRM V5.0 "Kitchen")
FPH	1.0	faucets	Kitchen faucets per household (IL-TRM V5.0)
EPG_electric	0.0969	kWh/gal	Energy per gallon of hot water supplied by electricity (IL-TRM V5.0 "Kitchen")
EPG_gas	Single Family: 0.00415 Multi Family: 0.00484	Therm/gal	Energy per gallon of hot water supplied by natural gas (IL-TRM V5.0 "Kitchen"). The evaluation team used the 79% SF/21% MF customer population distribution to calculate a weighted average energy per gallon of hot water supplied by natural gas value of 0.00429.
ISR	60%	N/A	Installation rate (IL-TRM V5.0 "Efficiency Kit Kitchen Aerator"). The team applied the 60% ISR to reported measures distributed, and did not apply ISRs to per-unit savings values reported in the

Parameter	Value	Units	Notes/Reference
			evaluation report.
Hours	Single Family: 94 Multi Family: 77	Hours/Year	Annual electric water heating recovery hours for faucet use per faucet (IL-TRM V5.0 "Kitchen"). The evaluation team used the 79% SF/21% MF customer population distribution to calculate a weighted average recovery hours per faucet value of 90.
CF	0.022	N/A	Coincidence factor for electric load reduction (IL-TRM V5.0)

Shower Heads

The evaluation team used the following equations from the IL-TRM V5.0 to estimate energy savings and demand reduction for shower heads.

Equation 8. Shower Head Electric Energy Algorithm

$$\Delta kWh = \%ElectricDHW \left(\frac{(GPM_{base} * L_{base} - GPM_{low} * L_{low}) * Household * SPCD * 365.25)}{SPH}\right) \times EPG\_electric \times ISR$$

Equation 9. Shower Head Natural Gas Energy Algorithm

$$\Delta kWh = \%FossilDHW \times ISR \left(\frac{(GPM_{base} * L_{base} - GPM_{low} * L_{low}) * Household * SPCD * 365.25}{SPH}\right) \times EPG\_gas$$

Equation 10. Shower Head Demand Algorithm

$$\Delta kW = \left(\frac{\Delta kWh}{Hours}\right) \times CF$$

Table 22 provides assumptions used to estimate *ex post* savings for shower heads.

Table 22. PY9 Moderate Income Customer Kit Program Ex Post Assumptions for Shower Heads

Parameter	Value	Units	Notes/Reference
%ElectricDHW	100%	N/A	In accordance with the PY9 IPA Evaluation Plan, we used the PY9 MICK participant survey data to estimate that 20% of program measures were installed in homes with electric water heating and 80% were installed in homes with natural gas water heating. The evaluation team applied these fuel saturations to installed measures to create separate analyses for electric and natural gas.
%FossilDHW	100%	N/A	
GPM_{base}	2.35	gal/min	Base case flow (IL-TRM V5.0)
GPM_{low}	1.5	gal/min	Low case flow (IL-TRM V5.0)
L_{base}	7.8	min/day	Base case use length (IL-TRM V5.0)
L_{low}	7.8	min/day	Low case use length (IL-TRM V5.0)
Household	Single Family: 2.56 Multi Family: 2.10	# of people	Average number of people per household (IL-TRM V5.0). The evaluation team used SF/MF values in conjunction with the 79% SF/21% MF customer population distribution from the 2013 *Market Potential Assessment* to calculate a weighted average people per household value of 2.46.

Parameter	Value	Units	Notes/Reference
SPCD	0.6	Showers	Showers per capita per day (IL-TRM V5.0)
365.25	365.25	days	Days in a year, on average (IL-TRM V5.0)
SPH	Single family: 1.79 Multi Family: 1.30	Shower heads per household	Shower heads per household (IL-TRM V5.0). The evaluation team used the 79% SF/21% MF customer population distribution to calculate a weighted average shower heads per household value of 1.69.
EPG_electric	0.117	kWh/gal	Energy per gallon of hot water supplied by electricity (IL-TRM V5.0)
EPG_gas	Single Family: 0.00501 Multi Family: 0.00583	Therm/gal	Energy per gallon of hot water supplied by natural gas (IL-TRM V5.0). The evaluation team used the 79% SF/21% MF customer population distribution to calculate a weighted average energy per gallon of hot water supplied by natural gas value of 0.00518.
ISR	65%	N/A	Installation rate (IL-TRM V5.0 "Efficiency Kits--One Showerhead Kit"). The team applied the 65% ISR to reported measures distributed, and did not apply ISRs to per-unit savings values reported in the evaluation report.
Hours	Single Family: 266 Multi Family: 218	Hours/Year	Annual electric water heating recovery hours for shower head use (IL-TRM V5.0 "EE Kits"). The evaluation team used the 79% SF/21% MF customer population distribution to calculate a weighted average recovery hours per faucet value of 256.
CF	0.0278	N/A	Coincidence factor for electric load reduction (IL-TRM V5.0)

Appendix B. Moderate Income Customer Kit Program Natural Gas Impacts

Gross Impacts

Table 23 lists the reported ex ante and evaluated ex post per-unit natural gas savings. There are large differences between ex ante and ex post per-unit gross savings for the bathroom and kitchen faucet aerators because the implementer did not calculate separate savings estimates for the different aerator types.

Table 23. PY9 Moderate Income Customer Kit Program Ex Ante and Ex Post Per-Unit Natural Gas Savings

Measure	Reported Ex Ante Gross (therms)	Evaluated Ex Post Gross (therms)
1.5 GPM Bath Faucet Aerator	8.5	0.8
1.5 GPM Kitchen Faucet Aerator	8.5	5.9
1.75 GPM High-Efficiency Shower Head	9.8	7.8

The evaluation team used the 80% natural gas water heater saturation calculated from the PY9 participant survey data to estimate natural gas measure installations and natural gas savings achieved by the MICK Program. Based on verified program participation, the MICK Program achieved total gross natural gas energy savings of 65,578 therms. Table 24 shows ex ante and ex post gross natural gas impacts.

Table 24. PY9 Moderate Income Customer Kit Program Ex Ante and Ex Post Gross Natural Gas Impacts

Measure	Reported Ex Ante Installation Rate	Ex Ante Gross Impacts (therms)	Reported Measures[a]	Evaluated Ex Post Installation Rate	Verified Measures[b]	Ex Post Gross Impacts (therms)	Gross Realization Rate[c]
1.5 GPM Bath Faucet Aerator	61%	37,581	7,227	63%	4,553	3,671	10%
1.5 GPM Kitchen Faucet Aerator	61%	37,581	7,227	60%	4,336	25,450	68%
1.75 GPM High-Efficiency Shower Head	65%	46,254	7,227	65%	4,698	36,457	79%
Total[d]	**62%**	**121,417**	**21,682**	**63%**	**13,587**	**65,578**	**54%**

[a] Based on PY9 MICK Program participant survey, the evaluation team assumed that 80% of total verified water-saving measures were installed in homes with natural gas water heating.
[b] The difference between reported measures and verified measures resulted from the application of installation rates derived from the IL-TRM V5.0.
[c] Realization rates different from 100% resulted from differences between ex ante and ex post installation rates and per-unit savings. Mathematically, this is expressed as gross realization rate = ex post gross savings / ex ante gross savings. Reported results have been rounded.
[d] Totals may not sum due to rounding.

The evaluation team received ex ante natural gas savings estimates from the program implementer and compared the assumed estimates to the ex post natural gas savings methodologies. The differences between total ex ante and ex post electric savings estimates resulted from differences in ex ante and ex post gross

electric per-unit savings assumptions and installation rates. Descriptions follow addressing discrepancies for each program measure:

- **Bathroom Faucet Aerators.** The ex ante bathroom faucet aerator per-unit savings estimate of 8.5 therms was more than the ex post per-unit savings estimate of 0.8 therms, calculated in accordance with the IL-TRM V5.0. The implementer did not calculate separate savings estimates for different aerator types, but used 8.5 therms gross per-unit savings estimate for both bathroom and kitchen faucet aerators' ex ante gross savings calculations, relying on IL-TRM V5.0 inputs associated with an "unknown" aerator type, thus overestimating bathroom aerator gross savings.

  A component of the ex ante per-unit kWh savings estimate that, holding all else equal, resulted in overestimated ex ante kWh savings was the implementer used a single weighted ISR of 61%, calculated using the kitchen- and bathroom-specific ISR's from the IL-TRM V5.0 in conjunction with the 70/30 weighting that the IL-TRM V5.0 uses for the drain factor (based on the assumption that 70% of household water runs through the kitchen faucet and 30% through the bathroom faucet). The team used a bathroom faucet aerator–specific ISR of 63% from the IL-TRM V5.0 to calculate *ex post* gross savings.

- **Kitchen Faucet Aerators.** The 8.5 therm ex ante kitchen faucet aerator per-unit savings estimate was less than the 5.9 therm ex post per-unit savings estimate, calculated in accordance with the IL-TRM V4.0. The implementer did not calculate separate savings estimates for the different aerator types, using an 8.5 therm gross per-unit savings estimate for both kitchen and bathroom faucet aerators' ex ante gross savings calculations, relying on IL-TRM V5.0 inputs associated with an "unknown" aerator type and underestimating kitchen aerator gross savings.

  The ex ante per-unit savings estimate was overestimated because the implementer used a base value of 2.16 GPM. The team followed the PY9 IPA Evaluation Plan and used the kit-specific 1.39 GPM base value prescribed in the IL-TRM V5.0.

  A component of the ex ante per-unit kWh savings estimate that, holding all else equal, resulted in overestimated ex ante kWh savings was the implementer produced a single weighted ISR of 61%, calculated using the kitchen- and bathroom-specific ISR's from the IL-TRM V5.0 in conjunction with the 70/30 weighting that the IL-TRM V5.0 uses for the drain factor. The team used a kitchen faucet aerator–specific ISR of 60% from the IL-TRM V5.0 to calculate *ex post* gross savings.

- **Shower Heads.** The 9.8 therm ex ante shower head per-unit savings estimate was slightly more than the ex post per-unit savings estimate of 7.8 therms, calculated by the evaluation team in accordance with the IL-TRM V5.0. A component of the ex ante per-unit kWh savings estimate that, holding all else equal, resulted in overestimated ex ante savings was the implementer used a base value of 2.5 GPM, which they calculated by averaging the direct-install and kit-specific values from the IL-TRM V5.0. The team followed the PY9 IPA Evaluation Plan and used the kit-specific 2.35 GPM-base value prescribed in the IL-TRM V5.0.

Net Impacts

The program achieved total net natural gas savings of 67,578 therms, based on the verified program participation, the IL-TRM V5.0 deemed per-unit gross savings values, installation rates in accordance with the PY9 IPA Evaluation Plan, and the SAG-approved NTGRs. Table 25 shows net natural gas savings results by measure. The overall net realization rate for the program is less than 100% due to the implementer only

calculating and applying a single aerator savings value to both bathroom and kitchen faucet aerators, thus overestimating bathroom faucet aerator ex ante gross savings.

Table 25. PY9 Total Moderate Income Customer Kit Program Net Natural Gas Savings by Measure

Measure	Ex Ante Net Savings (therms)	Ex Post Net Savings (therms)
1.5 GPM Bathroom Faucet Aerator	37,581	3,671
1.5 GPM Kitchen Faucet Aerator	37,581	25,450
1.5 GPM High-Efficiency Shower Head	46,254	36,457
Total	**121,417**	**65,578**
Net Realization Rate[a]		**54%**

[a] Mathematically, the net realization rate = ex post net savings / ex ante net savings.

Appendix C. Moderate Income Customer Kit Program Net-to-Gross Research

Free-ridership is based on participants' anticipated plans had the program not been available. Given this definition, a free-rider is a participant who indicates they would have purchased and installed the same measures at the same time in the program's absence. Spillover can be calculated using participant survey questions, which ask participants about energy-savings actions they have taken on their own since participating in the program. Questions were asked to establish if respondents' participation in the MICK program influenced them to make any additional improvements. No PY9 MICK program participants surveyed reported the kit items or information in the kit influenced their decision to make energy-efficient improvements and the spillover rate for the MICK program measures is 0.00.

Table 26 lists the number of respondents, freeridership rate, spillover rate and NTGR for the PY8 MICK participant survey effort.

Table 26. PY9 Moderate Income Customer Kit Program NTG Summary

Measure	Number of Respondents	Free-ridership Rate	Spillover Rate	NTGR
13 & 23-Watt CFLs	57	0.38	0.00	0.62
1.5 GPM Bathroom Faucet Aerator	30	0.39	0.00	0.61
1.5 GPM Kitchen Faucet Aerator	29	0.40	0.00	0.60
1.75 GPM High-Efficiency Shower Head	30	0.35	0.00	0.65

Free-ridership

PY9 free-ridership calculations include the following components: timing (T), efficiency (E) and quantity (Q).

An outline of the free-ridership components and their associated survey questions follow:

Timing (T). The Timing (T) Score accounts for earlier installation of measures due to the program by asking respondents about their likelihood, on a scale from 0 to 10, where 0 Is not at all likely and 10 is extremely likely, they would have installed an item of any efficiency within 6 months, had they not received it through the program

Efficiency (E). The Efficiency (E) Score is based on a question asking respondents to rate the likelihood that they would have installed the exact same measures had they not received them for free through the kit (on a 0 to 10 scale, where 0 is not at all likely and 10 is extremely likely). A higher likelihood value means a higher level of free ridership (i.e., a lower attribution level for the program).

Quantity (Q). The question to compute the Quantity (Q) Score (only applicable for CFLs) asks respondents about the likelihood that they would have installed fewer CFLs without the program (on a 0 to 10 scale, where 0 is not at all likely and 10 is extremely likely). The response to this question was subtracted from 10 to compute the Quantity Score, as a lower score means a greater likelihood the respondent would have installed the same or a greater number of measures.

The overall final free-ridership value for each measure installed was be calculated by taking the minimum of the Timing, Efficiency, and Quantity Scores, as shown in the following equation:

$$Freeridership\ (FR) = Min\ (T, E, Q)$$

Table 27 lists the number of respondents, average rating, and percent of respondents missing for each Timing, Efficiency and Quantity free-ridership component.

Table 27. PY9 Moderate Income Customer Kit Program Freeridership Summary

Measure	Number of Respondents	Timing (T)		Efficiency (E)		Quantity (Q)		Minimum Average Rating	Freeridership Rate
		Average Rating	Percent Missing	Average Rating	Percent Missing	Average Rating	Percent Missing		
13 & 23-Watt CFLs	57	5.6	0.0%	6.0	3.5%	4.8	3.5%	3.8	0.38
1.5 GPM Bathroom Faucet Aerator	30	4.4	0.0%	4.4	3.3%	NA	NA	3.9	0.39
1.5 GPM Kitchen Faucet Aerator	29	4.1	0.0%	4.3	0.0%	NA	NA	4.0	0.40
1.75 GPM High-Efficiency Shower Head	30	5.0	0.0%	3.9	0.0%	NA	NA	3.5	0.35

Spillover

No PY9 MICK program participants surveyed reported the kit items or information in the kit influenced their decision to make energy-efficient improvements, and the spillover rate for the kits program measures is 0.00.

Appendix D. Moderate Income Customer Kit Program Cost-Effectiveness Inputs

Heating Penalty Description

Efficient lighting products generate less waste heat than baseline lighting products. When customers replace baseline products with more efficient lighting, they must use more space heating to compensate for the "lost" heat from the previous lighting. The heating penalty represents this increased natural gas usage for space heating.[8] The penalty is used in analyzing program cost-effectiveness.

Heating Penalty Results

In addition to the gross heating penalty from measure installations in PY9, the evaluation team calculated the gross heating penalty from delayed CFL installations, per the IL-TRM V5.0 assumption that consumers would install 93% of kit CFLs within three years. Table 28 shows the gross electric-heating penalty, and Table 29 shows the gross electric-heating penalty resulting from efficient lighting installations provided to participants in PY9 and realized in PY9 and, given later installations, in PY10 and PY11.

Table 28. PY9 Moderate Income Customer Kit Program Yearly Gross Electric-Heating Penalty Impact of Lighting Measures by Assumed Installation Year

Measure	Gross Heating Penalty (MWh)		
	PY9	PY10	PY11
13-Watt CFL	-23	-5	-4
23-Watt CFL	-24	-5	-4
Total*	**-47**	**-10**	**-9**

* Totals may not sum due to rounding.

Table 29 shows the gross gas-heating penalty resulting from efficient lighting installations provided to participants in PY9 and realized in PY9 and, given later installations, in PY10 and PY11.

Table 29. PY9 Moderate Income Customer Kit Program Yearly Gross Natural Gas–Heating Penalty Impact of Lighting Measures by Assumed Installation Year

Measure	Gross Heating Penalty (Therms)		
	PY9	PY10	PY11
13-Watt CFL	-5,383	-1,142	-979
23-Watt CFL	-8,792	-1,865	-1,599
Total*	**-14,175**	**-3,007**	**-2,577**

* Totals may not sum due to rounding.

[8] The team used the PY9 MICK participant survey data to estimate 17% of MICK program participants had electric space heating and 83% gas space heating.

Table 30 shows the net electric impacts for cost-effectiveness inputs.

Table 30. Net Electric Impacts

Measure	Net Electric Impacts (MWh)		
	PY9	PY10	PY11
13-watt CFL	264	-5	-4
23-watt CFL	444	-5	-5
1.0 GPM Bath Faucet Aerator	21	N/A	N/A
2.0 GPM Kitchen Faucet Aerator	144	N/A	N/A
1.75 GPM High-Efficiency Shower Head	206	N/A	N/A
Total	**1,078**	**-10**	**-9**

Table 31 shows the net gas impacts for cost-effectiveness inputs.

Table 31. Net Gas Impacts

Measure	Net Gas Impacts (therms)		
	PY9	PY10	PY11
13-watt CFL	-5,383	-1,142	-979
23-watt CFL	-8,792	-1,865	-1,599
1.0 GPM Bath Faucet Aerator	3,671	N/A	N/A
2.0 GPM Kitchen Faucet Aerator	25,450	N/A	N/A
1.75 GPM High-Efficiency Shower Head	36,457	N/A	N/A
Total	**51,404**	**-3,007**	**-2,577**

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