



Opinion **Dynamics**

AMEREN MISSOURI - PROGRAM YEAR 2023 ANNUAL EM&V REPORT

VOLUME 2: RESIDENTIAL PORTFOLIO

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I. EXECUTIVE SUMMARY

This volume of the PY2023 Annual Report presents evaluation results from the Ameren Missouri PY2023 portfolio of residential energy efficiency programs as described in Ameren Missouri’s 2019-2021 Missouri Energy Efficiency Investment Act (MEEIA) Energy Efficiency Plan, the subsequent *Unanimous Stipulation and Agreement Regarding the Implementation of Certain MEEIA Programs Through Plan Year 2022* (Stipulation PY2022), and the *Non-Unanimous Stipulation and Agreement Regarding the Implementation of Certain MEEIA Programs Through Plan Year 2023 and Motion for Expedited Treatment* (“Stipulation PY2023”). In this document, the evaluation team provides portfolio-level results for PY2023, as well as detailed findings for each program. Results for the business and demand response portfolios are provided in separate volumes.

During PY2023, Ameren Missouri offered four programs for residential customers. The portfolio of programs included:

- Heating, Ventilation, and Air Conditioning (HVAC)
- Residential Efficient Products (REP)
- Multifamily Market Rate (MFMR)
- Pay as You Save (PAYS®)¹

Additionally, Ameren Missouri offered three programs targeted specifically to residential customers who meet certain income requirements. As such, this volume also covers the Multifamily and Single Family Income Eligible Programs (MFIE and SFIE, respectively), along with the Community Lighting Program. These seven programs are collectively referred to as the “residential programs” throughout this volume.

The following sections present key evaluation findings and recommendations for the residential portfolio. Per Stipulation PY2023, this evaluation focused on the assessment of gross impacts, with no net-to-gross (NTG) work and process-related investigations limited to the PAYS program. In compliance with Missouri 20 CSR 4240-20.094, subsection (4)(J), the evaluation team also conducted an analysis of the effects of participation in Ameren Missouri’s income eligible programs on customers’ ability to pay their electricity bills.

The remainder of this volume is organized as follows:

- Chapter 2 presents the general evaluation approach for the residential programs, including overarching evaluation activities and methodologies for PY2023.
- Chapters 3-9 present evaluation results for the nine residential programs.
- Chapter 10 presents the methodology and results of the income eligible bill payment analysis.

I.1 PORTFOLIO IMPACT RESULTS

At the portfolio level, the PY2023 Ameren Missouri residential programs (not including the income eligible programs) achieved 33,921 MWh in ex post net energy savings and 18.63 MW in ex post net demand savings, achieving 81% and 82%, respectively, of their goal. The savings-weighted portfolio-level gross realization rates (RRs) were 82% for energy savings and 77% for demand savings (see Table 1).

¹ All product or company names that may be mentioned in this publication are tradenames, trademarks, or registered trademarks of their respective owners.

Table 1. PY2023 Residential Portfolio Impact Summary

	Ex Ante Gross	Gross RR	Ex Post Gross	NTGR	Ex Post Net	Goal Net	% of Goal
Energy Savings (MWh)	49,910	82.4%	41,116	82.5%	33,921	41,794	81%
Demand Savings (MW)	29.32	77.0%	22.58	82.5%	18.63	22.58	82%

Portfolio performance in PY2023 was largely driven by the Residential HVAC Program, which contributed approximately 73% of Ameren Missouri's first year residential energy savings. Notably, the HVAC Program came close to its first year energy savings goal and demand savings goal (93% and 98%, respectively). The PAYS Program, on the other hand, which had the second highest savings goals, fell well short of its net savings goals, achieving only 8% of its energy and 7% of its demand savings goal.

Table 2 summarizes annual gross and net savings for all market rate programs in the PY2023 Residential Portfolio.

Table 2. PY2023 Residential Portfolio First Year Impact Summary

	Ex Ante Gross	Gross RR	Ex Post Gross	NTGR	Ex Post Net	Goal Net	% of Goal
First Year Energy Savings (MWh)							
HVAC	38,239	78.4%	29,996	82.5%	24,747	26,571	93%
REP	7,599	99.7%	7,575	82.5%	6,250	3,747	167%
MFMR	3,207	87.7%	2,814	82.5%	2,321	3,763	62%
PAYS	865	84.4%	731	82.5%	603	7,713	8%
Total Residential	49,910	82.4%	41,116	82.5%	33,921	41,794	81%
First Year Demand Savings (MW)							
HVAC	25.03	74.1%	18.55	82.5%	15.30	15.61	98%
REP	2.76	99.7%	2.76	82.5%	2.27	1.32	172%
MFMR	1.21	81.4%	0.98	82.5%	0.81	2.06	39%
PAYS	0.32	91.2%	0.29	82.5%	0.24	3.59	7%
Total Residential	29.32	77.0%	22.58	82.5%	18.63	22.58	82%

Collectively, the residential income eligible programs substantially exceeded first year energy and demand savings goals (see Table 3). At the individual program level, performance against goals was strong in PY2023 with all three programs exceeding first year demand savings goals. Additionally, the MFIE Program performed well against the average percent of energy savings per property metric established in Stipulation PY2023 (i.e., achieving at least 15% per property for MFIE). The MFIE Program achieved an average of 31% savings per property (see Chapter 8.3.1).

Table 3. PY2023 Residential Income Eligible First Year Impact Summary

	Ex Ante Gross	Gross RR	Ex Post Gross	NTGR	Ex Post Net	Goal Net	% of Goal
First Year Energy Savings (MWh)							
Community Lighting	9,843	162.8%	16,022	100%	16,022	3,610	444%
MFIE	7,371	95.7%	7,055	100%	7,055	5,853	121%
SFIE	1,270	88.4%	1,122	100%	1,122	1,087	103%
Total Residential	18,484	130.9%	24,199	100%	24,199	10,550	229%
First Year Demand Savings (MW)							
Community Lighting	1.51	162.9%	2.46	100%	2.46	0.54	455%
MFIE	2.26	89.5%	2.03	100%	2.03	1.60	127%

	Ex Ante Gross	Gross RR	Ex Post Gross	NTGR	Ex Post Net	Goal Net	% of Goal
SFIE	0.63	89.6%	0.56	100%	0.56	0.46	123%
Total Residential	4.40	114.7%	5.05	100%	5.05	2.60	194%

1.2 KEY EVALUATION FINDINGS

In the fifth year of MEEIA Cycle III, the Ameren Missouri residential portfolio had mixed performance against energy and demand savings goals.

- As noted in Section 1.1 the performance of the residential market rate programs and the residential income eligible programs differed in PY2023.
- Market rate residential programs realized 82% and 77% of ex ante gross energy and demand savings, respectively and fell short of first year net savings goals (81% of energy and 82% of demand).
 - Residential portfolio performance was driven largely by the HVAC Program (representing approximately 73% of first year ex post energy savings for the portfolio). Early replacement (ER) rates for HVAC measures continue to be a key driver of HVAC Program impacts. The evaluation team’s application of participant ER rates calculated based on questions included on participants’ terms and conditions (T&C) forms resulted in a significant reduction in savings across central air conditioner and heat pump measures and was the main driver of low realization rates for these measures. Evaluation results show progress in encouraging participants to replace still-functioning but inefficient older units: According to program-tracking data, the mean age of replaced units increased from 20.4 years in PY2022 to 21.3 years in PY2023. Similarly, the rate of early replacement increased from 49% to 57% for central air conditioners and from 48% to 55% for heat pumps. Nevertheless, participant responses to the ER questions on the T&C Form indicate that many customers still wait to upgrade their unit until it is no longer repairable (see Chapter 3 for more detail).
 - The REP Program, the second largest contributor to first year energy savings in the portfolio, performed well against the program’s net savings goals in PY2023 (167% of net energy savings goal). Strong interest in smart thermostats purchased through the online store drove program performance in PY2023 (13,890 thermostats sold through that delivery channel). Additionally, ex ante savings estimates largely aligned with ex post estimates for the Program overall (99.7% gross realization rate for energy and demand).
 - The PAYS Program realized 84% of ex ante gross energy savings in PY2023 but continued to struggle with regard to performance against net savings goals (8%). Participation and challenges converting those who received direct install measures (i.e., Tier 1) into full retrofit participants (i.e., Tier 4) drove the under-performance of the program against savings goals in PY2023.
- Income eligible residential programs realized 131% of ex ante gross energy savings and exceeded first year net savings goals (229% of energy and 194% of demand).
 - The Community Lighting Program was the largest contributor to first year energy savings across the residential income eligible programs (representing 66% of first year energy savings for all three programs combined). While all three residential income-eligible programs performed well against their respective goals, the Community Lighting Program’s strong performance in PY2023 drove performance for the portfolio more broadly. This resulted primarily from a substantial increase in program activity across both Upstream and Food Bank distribution channels in PY2023 as compared to PY2022, along with the introduction of the LED night light measures distributed through the Food Bank channel (see Chapter 6 for more detail).
 - For several residential market rate and income eligible programs, the use of participant-specific information in ex post calculations is a key source of differences from ex ante savings estimates. To calculate ex ante savings, in most cases, the implementation teams used per-unit savings estimates included in Version 6.0 of the TRM, which

incorporate average parameters from previous program evaluations or primary data collection activities. To estimate ex post savings, Opinion Dynamics used the same algorithms included in Version 6.0 of the TRM but estimated project-specific savings by using household characteristics, baseline equipment specifications, and other detailed information collected by members of the implementation team, where this information was available in the program tracking databases. In instances where these parameters were missing from individual records, we relied on average characteristics from the PY2023 participant population for a given program or parameters recommended in Version 6.0 of the TRM.

- Though our primary focus for the PY2023 evaluation was on gross impacts, we completed a limited process evaluation of the PAYS Program with the goal of examining factors that, based on previous evaluations, may be barriers to increasing program participation.
 - Analysis of available program-tracking data suggests that higher copay amounts can deter Tier 4 retrofit participation. In particular, participants who received an Easy Plan and a copay of \$1,000 or less were far more likely to elect to install Tier 4 measures, when compared with those that have higher copay offers. This is consistent with participant research conducted in PY2022 that suggested that high upfront costs presented barriers to increasing PAYS participation (see Chapter 6 for additional detail).
- Based on our bill payment analysis of income eligible participants from the SFIE and MFIE over the MEEIA III Cycle, we found participating leads to a reduction in energy consumption and a corresponding decrease in energy bills observed when holding rate changes constant. The average participant between PY2019 and PY2022 experienced an 8% reduction in their bills following IE Program participation. Additionally, participants in the IE Program have a slightly reduced likelihood of receiving a disconnection notice following participation in the IE Program compared to before their participation (see Chapter 10 for additional detail).

1.3 COST-EFFECTIVENESS RESULTS

Cost-effectiveness analysis compares the benefits of an energy efficiency or demand response program with the cost of delivering it, expressed as the ratio of the net present value (NPV) of lifetime benefits to the costs. A cost-effectiveness ratio of greater than 1.0 means that the benefits generated by the program exceeded its costs. Cost-effectiveness can be assessed from several different “perspectives,” using different tests, with each test including a slightly different set of benefits and costs.

The evaluation team assessed the cost-effectiveness of each of the seven residential energy efficiency programs, using all five costs-effectiveness tests recommended by the California Standard Practice Manual and used in prior evaluations:²

- **Total Resource Cost (TRC) Test:** Perspective of all utility customers (participants and nonparticipants) in the utility service territory
- **Utility Cost Test (UCT):** Perspective of utility, government agency, or third-party program implementer
- **Ratepayer Impact Measure (RIM) Test:** Impact of efficiency measure on nonparticipating ratepayers overall
- **Participant Cost Test (PCT):** Perspective of the customers installing the measures
- **Societal Cost Test (SCT):** Perspective of all utility customers (participants and nonparticipants) in the utility service territory³

² California Standard Practice Manual: Economic Analysis of Demand-Side Programs and Projects. October 2001.

³ Although we developed SCT results as a part of our evaluation, this section does not show the results because they are equivalent to TRC results due to two factors: (1) Ameren Missouri does not include non-energy impacts in cost-effectiveness testing, and (2) Ameren Missouri uses the same planning assumptions for both tests, including the discount rate.

Table 4 summarizes the cost-effectiveness results for the seven residential programs, including three residential Income Eligible Portfolio programs. All programs were cost-effective in PY2023 based on the TRC and UCT tests except the Single Family Income Eligible and PAYS programs.⁴ All programs had RIM results below 1.0.

Table 4. Summary of Residential Cost-Effectiveness Results

Program	TRC	UCT	RIM	PCT
Community Lighting	14.37	4.51	0.36	n/a
MFIE	2.40	1.25	0.35	11.43
SFIE	0.61	0.35	0.23	6.46
HVAC	1.75	1.94	0.51	6.01
REP	1.42	1.55	0.46	5.59
MFMR	1.67	1.35	0.39	11.87
PAYS	0.37	0.40	0.24	3.45

Cost-effectiveness results for the overall Residential Portfolio – including the Residential Demand Response Program but excluding the Single Family Income Eligible, Multifamily Income Eligible, and Community Lighting Programs – are presented in Volume 1.

⁴ MEEIA and the Revised Statutes of Missouri (RSMo) acknowledge low-income programs as a special circumstance and do not require the programs to be cost-effective as implemented. Results are shown for comparative and planning purposes.

2. EVALUATION APPROACH

While the evaluation team conducted separate evaluations of each of the residential programs, most research objectives and evaluation activities were common across the programs. To reduce repetition, this chapter discusses research objectives common to all residential programs and presents an overview of the evaluation approach and activities conducted to address the research objectives. Additional program-specific detail is presented in the individual program chapters where needed.

2.1 RESEARCH OBJECTIVES

The evaluation team designed the PY2023 residential portfolio evaluation to address several objectives. The evaluation focused on gross impact evaluation activities and a limited process analysis for the PAYS program. The team also conducted an analysis of bill payments and disconnections for the MFIE and SFIE program participants (see Chapter 10), along with cost-effectiveness research at both the program and portfolio levels.

GROSS IMPACT OBJECTIVES

- Verify program-tracking data.
- Estimate the first-year ex post gross energy (MWh) and demand (MW) savings.

ATTRIBUTION/NET IMPACT OBJECTIVES

- Estimate the first-year ex post net energy and demand savings using deemed NTG values of 82.5% for the market rate programs and 100% for the income eligible programs.

COST-EFFECTIVENESS

- Assess the cost-effectiveness of each residential program and the entire residential portfolio using industry-standard cost-effectiveness tests.
- Ensure alignment of cost-effectiveness testing assumptions and parameters with the PY2023 evaluation results, Ameren Missouri's TRM Version 6.0 and industry best practice.⁵
- Provide total program benefits, costs, net benefits, and cost-effectiveness testing results.

PROCESS OBJECTIVES

- Obtain information on program design and implementation with a focus on differences from PY2022.
- Understand program staff and implementer perceptions, experiences, and expected program impacts.

⁵ Our ex post evaluation relied on most recent TRM version available. Ameren Missouri revised the approved 2019–2021 MEEIA Cycle Appendix F (Deemed Savings Table) and Appendix H and I (TRM Volumes 2 and 3) in October 2022 (referred to as “Ameren Missouri TRM”). The referenced TRM versions, updated in October 2022, include Appendix H, Version 3 and Appendix F, Version 6.0, unless otherwise noted.

CODE OF STATE REGULATIONS (CSR) MANDATED RESEARCH QUESTIONS (20 CSST 4240-22.070(A))

- What are the primary market imperfections that are common to the target market segment?
- Is the target market segment appropriately defined, or should it be further subdivided or merged with other market segments?
- Does the mix of enduse/measures included in the program appropriately reflect the diversity of enduse energy service needs and existing enduse technologies within the target market segment?
- Are the communication channels and delivery mechanisms appropriate for the target market segment?
- What can be done to more effectively overcome the identified market imperfections and to increase the rate of customer acceptance and implementation for select enduses/measures groups included in the program?

2.2 EVALUATION ACTIVITIES AND METHODOLOGIES

The evaluation team met the objectives of the PY2023 evaluation through a combination of research activities largely focused on estimating program impacts. The evaluation team designed research for each program based on its design, level of participation, and type of energy efficiency technologies among other factors. The following subsections provide a general description of each evaluation activity. Program-specific details are included in each program chapter, where relevant.

Table 5. Research Activities by Offering

Research Activity	HVAC	REP	MFMR	PAYS	MFIE	SFIE	CL
Program Staff Interviews	✓	✓	✓	✓	✓	✓	✓
Program Material Review	✓	✓	✓	✓	✓	✓	✓
Tracking System Review	✓	✓	✓	✓	✓	✓	✓
Gross Impact Analysis							
Database Review	✓	✓	✓	✓	✓	✓	✓
Engineering Analysis	✓	✓	✓	✓	✓	✓	✓
Energy Model Analysis	-	-	-	✓	-	-	-
Net Impact Analysis							
Application of deemed NTGR	ü	ü	ü	ü	-	-	-

2.2.1 PROGRAM STAFF INTERVIEWS

To support our evaluation, we conducted interviews with program and implementation staff in the third quarter of the program year. The primary objectives of these interviews were to determine any program changes since PY2022, understand the program team’s perspective on program implementation, and to explore challenges and successes from the program team’s perspective. Additionally, we discussed any details associated with program-tracking data or data collection necessary for estimating ex post impacts.

2.2.2 PROGRAM MATERIAL REVIEW

We conducted a comprehensive review of any new program materials, including marketing and implementation plans, customer communications, and educational and training materials as they become available prior to and during PY2023.

2.2.3 TRACKING SYSTEM REVIEW

The evaluation team reviewed program tracking data reports provided by Franklin Energy twice during the PY2023 evaluation cycle—once to support the interim impact analysis completed in September of 2023 and once to support the annual impact evaluation in January and February of 2024. During both reviews, our team focused on ensuring data were complete and free of data tracking and processing errors. Additionally, we ensured that data included information on specific parameters necessary to estimate ex post savings for each program.

2.2.4 GROSS IMPACT ANALYSIS

With the exception of the PAYS program,⁶ the evaluation team conducted an engineering analysis for the residential programs, based on the Ameren Missouri TRM as well as project-specific inputs available in the program-tracking data.

Our team developed first and last year ex post gross energy demand savings. The following details should be noted:

- We estimated last year savings for the purposes of cost-effectiveness analyses. Last year ex post energy and demand savings reflect baseline adjustments for any early replacement measures. For all other measure types, last year energy and demand savings equal first savings.
- We applied deemed technology-specific coincidence factors (CF) from Ameren Missouri's TRM to ex post energy savings to calculate ex post demand savings.
- To estimate ex post savings, the evaluation team referenced Version 6.0 of the Ameren Missouri TRM in most instances. However, for certain lighting measures we applied a new baseline for measures installed on or after August 1, 2023 to align with the Energy Independence and Security Act (EISA) policy of a 45 lumens/watt efficiency. The updated baseline wattages for applicable measures are reflected in the latest version of the TRM (Version 7.0, approved in November of 2023). For residential income-eligible lighting measures, we applied the 45 lumens/watt baseline for all of PY2023 per the 2022 stipulation agreement.⁷

DATABASE REVIEW AND ENGINEERING ANALYSIS

To determine gross impacts associated with the majority of Ameren Missouri's PY2023 programs, we first reviewed the program-tracking database to check that project data were recorded fully and correctly, and that the database contained all needed information to estimate program savings. We also examined the incented measures to ensure they met all program requirements. We then conducted an engineering analysis, which involved reviewing program-tracking data to verify the correct TRM algorithms and deemed savings assumptions were used to calculate ex ante savings. We then calculated ex post savings using TRM algorithms, deemed savings assumptions, and any participant-

⁶ The evaluation team conducted a review of building simulation models to evaluate PAYS Tier 4 measures. However, our team completed a TRM-based engineering analysis for PAYS Tier 1 (i.e., direct install) measures.

⁷ Per *Nonunanimous Stipulation and Agreement Regarding the Implementation of Certain MEEIA Programs Through the Plan Year 2022*, all income eligible lighting measures should have reflected the 45 lumens per watt baseline beginning in PY2022.

specific information tracked by the program team and included in the tracking data we received as part of this evaluation.

We resolved any discrepancies found in the databases and provide details to any gross savings adjustments in the program-specific chapters of this report.

2.2.5 ATTRIBUTION/NET IMPACT ANALYSIS

Per Stipulation PY2023, “[t]he throughput disincentive for the PY2023 year will utilize an 82.5% net-to-gross factor with no true-up.” As such, this evaluation did not include NTG research for application in PY2023. Net savings for the market rate programs are calculated using the following formula:

$$\textit{Ex post net savings} = \textit{Ex post gross savings} * 0.825$$

As described in the PY2023 Evaluation Plan, we assume that customers served by the income eligible programs would not make energy-efficient improvements on their own due to the cost. Therefore, we assume a NTG value of 1.0 when estimating net savings for these programs. As such, the deemed net-to-gross ratio (NTGR) of 0.825 specified in the PY2023 stipulation does not apply to the income eligible programs.

3. HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)

This section summarizes the evaluation results and methodology for the PY2023 Ameren Missouri Residential Heating, Ventilation, and Air Conditioning (HVAC) Program. The PY2023 evaluation focused on gross and net impact analysis, including the determination of early replacement (ER) classifications.

The Ameren Missouri Residential HVAC Program obtains energy and demand savings by incentivizing the installation of energy-efficient central air conditioning, heat pump,⁸ and advanced thermostat measures. The HVAC Program target market includes single family and multifamily residential homeowners within the Ameren Missouri service territory.

The HVAC Program consists of two channels: Downstream and Midstream. Both channels rely heavily on a network of Trade Allies to promote the installation of high-efficiency HVAC equipment and complete and submit the rebate application on behalf of their customers. In the Downstream channel, the customer may choose to have the rebate sent directly to them or applied as an instant incentive on their invoice. In the latter case, the contractor fronts the incentive cost and receives the rebate from the program after it has been processed. Midstream incentives are paid to the distributors who pass on some or all of the incentive amount to the contractors, who in turn pass it on to the customers as an instant rebate, denoted as a line item on the contractor's receipt to the customers.⁹

The Midstream channel focuses on the highest efficiency equipment, requiring a rated seasonal energy efficiency ratio (SEER) of 18 or higher.¹⁰ The goal of the Midstream channel is to incent this super-efficient equipment more strategically, with the expectation that it will drive changes in distributor stocking and sales patterns. By focusing on the supply side of the equation (i.e., distributors) rather than the demand side (i.e., contractors or customers), the Midstream channel aims to increase the availability of super-efficient units to accelerate market transformation. PY2023 was the Midstream channel's fourth year of implementation.

Contractors are critical to the execution and success of both HVAC Program channels. Contractors influence customer decision-making and can recommend and explain the benefits of energy-efficient (and/or super-efficient) HVAC equipment to their customers. Additionally, contractors obtain and install HVAC equipment for customers, which makes them ideally situated to assist in marketing and promoting the program. To participate in the HVAC Program, contractors must complete the program training course and commit to the Contractor Participation Agreement (CPA) before they may start offering rebates. Once a contractor becomes an Ameren Missouri-approved contractor, they are included on the Ameren Missouri "Find a Contractor" webpage, which is often a customer's first step in the upgrade process. Participating contractors are also assigned a dedicated Account Manager to help communicate changes to the program throughout the year.

Ameren Missouri has continuously implemented mass media and targeted marketing efforts to promote the HVAC Program. Marketing support is provided to contractors through a co-op marketing program, co-branding opportunities, and a public relations tool kit.

3.1 PARTICIPATION SUMMARY

In PY2023, 11,277 customers completed 11,466 HVAC projects through the Downstream channel, and 1,864 customers completed 1,907 projects through the Midstream channel (Table 6). While these participation levels

⁸ Heat pumps eligible for incentives through the HVAC Program include air source heat pumps (ASHPs), ground source heat pumps (GSHPs), and ductless mini split heat pumps (DMSHPs).

⁹ Regardless of how the incentive gets split between the distributor and contractor, a minimum amount is required to go to the enduse customer.

¹⁰ While SEER2 and HSPF2 went into effect on January 1, 2023, the PY2023 program-tracking data continues to show efficiency ratings for all incented central air conditioners and heat pumps in terms of SEER and HSPF.

represent a decrease of approximately 15% for the Downstream channel and 11% for the Midstream channel compared to PY2022, overall program ex ante gross savings held steady at approximately 38 MWh. Notably, the Midstream channel achieved slightly higher ex ante gross savings in PY2023 (8.2 MWh compared to 7.1 MWh in PY2022), driven primarily by a more than two-fold increase of incented Air Source Heat Pumps (ASHPs), which account for 57% of Midstream savings (compared to 39% in PY2022).

Table 6. PY2023 HVAC Project Completions and Ex Ante Gross Savings

Measure	Participants		Projects		Measures		Ex Ante Gross Savings	
	Number	%	Number	%	Number	%	MWh	%
Downstream								
Central Air Conditioner	9,164	81%	9,275	81%	9,676	62%	18,797	62%
ASHP	1,226	11%	1,239	11%	1,286	8%	8,701	29%
Advanced Thermostat	4,124	37%	4,186	37%	4,437	29%	1,683	6%
GSHP	106	1%	110	1%	131	1%	894	3%
Downstream Total	11,277	N/A	11,466	N/A	15,530	100%	30,076	100%
Midstream								
ASHP	570	31%	585	31%	614	18%	4,656	57%
Central Air Conditioner	966	52%	979	51%	1,026	31%	2,384	29%
Advanced Thermostat	1,192	64%	1,211	64%	1,282	38%	572	7%
DMSHP	336	18%	338	18%	433	13%	550	7%
Midstream Total	1,864	N/A	1,907	N/A	3,355	N/A	8,163	100%

Note: Totals reflect unique counts. Measure-level counts and percentages may not sum to totals because some customers installed/some projects included multiple measures.

3.2 EVALUATION METHODOLOGY

The evaluation team performed impact evaluation activities to assess the performance of the PY2023 HVAC Program. In addition to the overarching research objectives outlined for the Residential Portfolio, the evaluation team explored the following HVAC Program-specific objectives:

- Characterize program participation with respect to the number and characteristics of participants and installed measures.
- Provide evaluation results to improve the design and implementation of the HVAC Program.
- Determine ER classifications using ER data collected directly from participants at the time of program participation.

Table 7 provides an overview of the HVAC Program evaluation activities. Following the table, we outline program-specific aspects of key evaluation methodologies.

Table 7. PY2023 Evaluation Activities for the HVAC Program

Evaluation Activity ^A	Description
Program Manager and Implementer Interviews	<ul style="list-style-type: none"> Conducted interviews to assess changes in program design and implementation relative to PY2022, key program successes and challenges, program implementation, and evaluation priorities.
Program Material Review	<ul style="list-style-type: none"> Reviewed new program materials to inform evaluation activities.
Database Review	<ul style="list-style-type: none"> Reviewed program database to check that program data are complete and program-installed measures meet all program requirements.
Engineering Analysis	<ul style="list-style-type: none"> Verified that ex ante savings use correct deemed savings values. Calculated the ER rate based on questions included in the customers' terms and conditions (T&C) form. Applied deemed ISRs based on the average of PY2019–22 participant survey results. Estimated overall and measure-level ex post gross impacts using TRM algorithms, site-specific parameters, deemed savings assumptions, and evaluation-estimated parameters.
Net Impact Analysis	<ul style="list-style-type: none"> Estimated PY2023 net impacts, applying a deemed NTGR of 0.825.

^A The evaluation plan also included a PY2023 participant survey to collect data for the ISR and ER analyses. However, given the stability of ISRs over this program cycle and newly available program-tracking data for estimating ER, we decided a survey was not necessary.

IMPACT ANALYSIS

The evaluation team conducted an engineering analysis of all program measures to estimate ex post gross and net savings. We first reviewed program-tracking data to identify database errors and duplicate records and verify that ex ante savings calculations used correct TRM algorithms and savings assumptions. We then calculated ex post savings using Ameren Missouri TRM algorithms, site-specific parameters from the program-tracking database, and deemed savings assumptions.¹¹ Next, we applied a deemed NTGR of 0.825 to calculate ex post net energy and demand savings. In addition, the evaluation team applied measure-level ISRs based on prior evaluation results and developed ER rates based on program-tracking data for the ex post analysis.

MEASURE VERIFICATION

We developed the PY2023 ISR for each measure group as the average of the evaluated ISRs from the past four years. The ISRs developed for the PY2023 ex post analysis are shown in Table 8.

Table 8. Year-Over-Year HVAC ISR Results

Program Year	Central Air Conditioner	Heat Pump (ASHP, GSHP, DMSHP)	Advanced Thermostat
2019	100.0%	100.0%	100.0%
2020	99.8%	100.0%	100.0%
2021	100.0%	100.0%	99.2%
2022	99.9%	100.0%	97.9%
Average ISR	99.9%	100.0%	99.3%

¹¹ Both ex ante and ex post savings leverage Appendix F Version 6.0 (approved October 2022). See also the *Appendix F Reference Table* in Appendix A.

EARLY REPLACEMENT

The PY2023 evaluation used an operational/functional definition of ER based on data that the program implementer began collecting on the terms and conditions (T&C) form beginning in early 2023. The revised T&C forms collect the same ER data as the PY2022 participant survey (but from a larger number of participants and at the time of participation), which allowed us to use the same ER methodology as in PY2022 but without having to ask these questions in a participant survey. Under this approach, central air conditioner and heat pump units are considered ER if they either already met the conditioning needs of the participant or could have feasibly been repaired. Units that did not meet the participant’s conditioning needs and were not feasible to repair are considered replacement on failure (ROF). Where responses to the functionality and repairability questions do not provide clear information for the ER/ROF classification, we use the age of the replaced unit to make an ER determination.

Table 9 summarizes the ER rates applied in the ex post analysis. Appendix A provides additional details on the ER methodology.

Table 9. PY2023 HVAC ER Rates

Measure Category	ER Rate
Central Air Conditioner	57%
Heat Pump (ASHP, GSHP, DMSHP)	55%

3.3 EVALUATION RESULTS

3.3.1 IMPACT RESULTS

This section summarizes impact results for the PY2023 HVAC Program, which contributed the highest ex post net energy and demand savings for the residential market-rate portfolio in PY2023 (73% and 82%, respectively). As presented in Table 10, the PY2023 HVAC Program achieved gross realization rates of 78.4% for energy savings and 74.1% for demand savings, resulting in 24,747 MWh and 15.11 MW of ex post net savings. The program achieved 93% of its net energy savings goal and 98% of its net demand savings goal.

Table 10. PY2023 HVAC Program Savings Summary

	Ex Ante Gross	Gross RR	Ex Post Gross	NTGR ^a	Ex Post Net	Goal/Target Net	% of Goal
Energy Savings (MWh)	38,239	78.4%	29,996	82.5%	24,747	26,571	93%
Demand Savings (MW)	25.03	74.1%	18.55	82.5%	15.30	15.61	98%

^a Per Stipulation PY2023, PY2023 NTGRs are deemed at 82.5% for the HVAC Program.

Table 11 summarizes the PY2023 HVAC Program ex ante and ex post gross energy savings (MWh), demand savings (MW), and realization rates by channel and measure. The Downstream channel accounted for the majority of ex post gross energy savings (78%), slightly down from PY2022 (81%). Central air conditioners continued to provide the majority of the program’s ex post gross energy savings (52%, down from 58% in PY2022), followed by ASHPs (37%, up from 33% in PY2022). The remaining measures comprised the other 11% of program ex post gross energy savings.

Table 11. PY2023 HVAC Program First Year Gross Savings by Measure Category

Measure Category	Energy Savings			Demand Savings		
	Ex Ante (MWh)	Realization Rate	Ex Post (MWh)	Ex Ante (MW)	Realization Rate	Ex Post (MW)
Downstream Channel						
Central Air Conditioner	18,797	73.7%	13,856	17.81	73.7%	13.13
ASHP	8,701	82.7%	7,196	2.15	65.9%	1.42
Advanced Thermostat	1,683	90.0%	1,515	0.80	84.0%	0.67
GSHP	894	93.1%	833	0.32	83.4%	0.27
Downstream Total	30,076	77.8%	23,400	21.08	73.5%	15.48
Midstream Channel						
ASHP	4,656	80.7%	3,757	1.31	70.2%	0.92
Central Air Conditioner	2,384	81.4%	1,942	2.26	81.4%	1.84
Advanced Thermostat	572	84.9%	485.2	0.23	74.5%	0.2
DMSHP	550	75.0%	413	0.15	88.1%	0.13
Midstream Total	8,163	80.8%	6,596	3.95	77.5%	3.07

Note: Individual values may not sum to the shown totals due to independent rounding.

We detail the reasons for the discrepancies that impacted the energy and demand savings realization rates for the PY2023 HVAC Program below.¹² While realization rates for measures differ by channel, we discuss the Downstream and Midstream channels together because the same overarching themes influenced the discrepancies.

- Central Air Conditioners:** The combined gross realization rate for central air conditioners is 75% for electric energy and demand savings.
 - The primary driver of central air conditioner realization rates was the evaluation team's application of the ex post ER rate of 57%, compared to the ex ante rate of 72%. This change reduced first year savings by 26% for both energy savings and demand savings.
 - Ex post savings also reflect a desk review factor (DR%) of 98.3% to account for past evaluation findings relating to data tracking discrepancies not accounted for in our engineering analysis.
 - Application of the ER rate and the DR% accounts for the majority of the discrepancy between ex ante and ex post savings. Without these factors, the first year energy and demand savings realization rate would have both been 103% due to the ex post analysis using program-tracked system characteristics in place of Appendix F deemed assumptions.
- Air Source Heat Pumps:** The combined gross realization rates for ASHPs are 82% for electric energy and 68% for demand savings.
 - Similar to central air conditioners, the application of the ex post ER rate of 55%, compared to the ex ante rate of 85%, was a major driver of differences, reducing first year energy savings by 9%.
 - The evaluation team also applied a DR% of 90.2% to account for past evaluation findings.

¹² Note that for measures with both heating and cooling savings, energy and demand realization rates might differ because energy savings reflect both heating and cooling impacts while demand savings reflect cooling impacts only.

- Application of the ER rate and the DR% accounts for the majority of the discrepancy between ex ante and ex post savings from ASHPs. Without these factors, the first year realization rates would have been 100% for both energy and demand savings.
- **Advanced Thermostats:** The combined gross realization rates for Advanced Thermostats are 89% for electric energy and 82% for demand savings.
 - The implementation team claimed savings for multiple thermostats per household. According to Ameren Missouri TRM Appendix I, installing more than one thermostat per household does not accrue additional savings. The evaluation team only awarded savings for one thermostat per household, identified via unique electric account numbers. As a result, 436 thermostats (327 or 7.4% of Downstream thermostats and 109 or 8.5% of Midstream thermostats) received zero ex post savings. This decreased both energy and demand savings by 8%.
 - Another driver of advanced thermostat realization rates was the use of TRM cooling capacity (36,000 Btuh) and efficiency (SEER 13) assumptions by the implementation team. The evaluation team used actual values cross-referenced from the program-tracking data for customers who also received central air conditioning, ASHP, or GSHP measures. The average full home capacity was 42,400 Btuh, increasing savings, while the average SEER efficiency was SEER 16.6, reducing savings. The net impact was a reduction in energy savings of 5%.
 - The implementation team classified 2% of thermostats as controlling an unknown HVAC system, which is inconsistent with the information provided in the program-tracking data. The evaluation team reassigned these units to the appropriate TRM reference ID based on the system type provided in the program-tracking data, which increased energy savings by 1%.
 - Ex post savings applied an ISR of 99.3% for advanced thermostats, slightly decreasing first year energy and demand savings.
- **Ground Source Heat Pumps:** The gross realization rate for Ground Source Heat Pumps (GSHPs), incented through the Downstream channel only, is 93% for electric energy and 83% for demand savings.
 - The driving factors of realization rates for GSHPs were a combination of the application of the evaluated ER value and the use of tracked system characteristics. The evaluation team applied an evaluated ER rate of 55% compared to the 62% ER rate in the program data. The evaluation team also used the actual tracked GSHP system characteristics in place of the Appendix F values used by the implementation team.
- **Ductless Mini-Split Heat Pumps:** The gross realization rate for Ductless Mini-Split Heat Pumps (DMSHPs), incented through the Midstream channel only, is 75% for electric energy and 88% for demand.
 - The driver of DMSHP realization rates was the evaluation team's use of actual tracked values. Actual cooling and heating capacity values were, on average, 11% and 17% lower than Appendix F deemed values, respectively. The average efficient equipment's Heating Seasonal Performance Indicator (HSPF) was 9% lower (i.e., less efficient) than deemed values, leading to decreased savings overall.
 - The evaluation team applied an evaluated ER rate of 55% for DMSHP compared to 74% of DMSHP records listed as ER in the program data. The application of the evaluated ER rate had a small effect on savings because the program-tracking data identified the majority of DMSHPs (89%) as new construction units, to which the ER determination does not apply.

3.3.2 PROCESS RESULTS

The PY2023 evaluation did not include an assessment of program processes for the HVAC Program. However, to meet the requirements of Missouri CSR for demand-side process evaluations, as set in 20 CSR 4240-22.070(8), we respond to the five required process evaluation questions in Table 12.

Table 12. Summary of Responses to CSR Process Evaluation Requirements

CSR Required Process Evaluation Questions	Findings
<p>What are the primary market imperfections that are common to the target market segment?</p>	<p>The primary market imperfections for the HVAC Program include the upfront cost of high-efficiency heating and cooling equipment, a lack of customer awareness regarding the long-term benefits of energy efficiency, and a tendency among customers to hold on to their inefficient equipment until it fails.</p> <p>Incentives are designed to defray the high upfront cost. The Downstream channel is more accessible to low- to moderate-income households as the systems incented through this channel typically cost less than systems incented through the Midstream channel. According to PY2022 participant research, there are differences between customer segments in Midstream and Downstream channels. Midstream participants tend to be highly educated and have moderate to high incomes. Downstream participants have similar education levels to Midstream participants but tend to have lower incomes than Midstream participants. Contractors play an important role in educating customers about the benefits of higher-efficiency equipment compared to standard-efficiency equipment and promoting program incentives. In addition, Midstream channel distributors educate and encourage contractors to purchase high-efficiency equipment who in turn educate and upsell customers looking to replace their HVAC equipment.</p> <p>The availability of the highest-efficiency equipment is another potential market imperfection the Midstream channel aims to address. The channel seeks to encourage distributors to increase their inventory of this highest-efficiency equipment to ensure it is available when customers need it. Responses to the PY2022 participant survey indicate that some Midstream customers would only wait a short time for a new, highest-efficiency system if it were not immediately available; otherwise, they would select a less efficient system.</p>
<p>Is the target market segment appropriately defined, or should it be further subdivided or merged with other market segments?</p>	<p>The HVAC Program’s target market segment includes single family and multifamily residential homeowners with older central cooling systems that need replacement before failure. Low-income customers are served by the CommunitySavers® Program and are not part of the program’s target market. The introduction of the Midstream channel, which focuses on more costly systems of the highest efficiency, resulted in a de facto sub-segmentation of the non-low income market by income: Based on contractor research conducted in PY2020, systems available through the Midstream channel tend to be inaccessible to a large portion of the non-low income market, due to the even higher upfront cost compared to equipment incented through the Downstream channel. This is supported by the PY2022 participant survey, which showed that Midstream participants tend to have higher incomes than Downstream participants.</p>
<p>Does the mix of enduse measures included in the program appropriately reflect the diversity of enduse energy service needs and existing enduse technologies within the target market segment?</p>	<p>The HVAC Program is one of several residential programs offered by Ameren Missouri. It focuses on major heating and cooling equipment (central air conditioners and heat pumps) at various efficiency levels and offers smart thermostats to achieve additional savings by better managing the use of the new equipment. While the HVAC Program does not offer the full range of potential HVAC measures (and measures of other enduses) that might be of interest to the target market, this focus is appropriate given the program’s specialized delivery through a network of approved Trade Allies (and distributors, in the case of the Midstream channel).</p>
<p>Are the communication channels and delivery mechanisms appropriate for the target market segment?</p>	<p>The HVAC Program’s participation is primarily driven by contractors and customer-facing marketing materials. Aside from contractors, marketing materials such as e-mails, newsletters, bill inserts, the Ameren Missouri website, home energy reports, and mass</p>

CSR Required Process Evaluation Questions	Findings
	media advertising contribute to program awareness. Collectively, these channels are effectively reaching a wide range of customers, but as noted above, some customers are still likely limited from accessing energy-efficient HVAC equipment for various reasons.
What can be done to more effectively overcome the identified market imperfections and to increase the rate of customer acceptance and implementation for select enduses/measure groups included in the Program?	<p>Segment the HVAC customer population for outreach to ensure messaging alignment with the unique barriers and needs faced by the different segments.</p> <p>Continue to encourage the early replacement of still functioning but inefficient older units. According to program-tracking data, the mean age of replaced units increased from 20.4 years in PY2022 to 21.3 years in PY2023. Similarly, the rate of early replacement increased from 49% to 57% for central air conditioners and from 48% to 55% for heat pumps, indicating some success based on this metric.</p> <p>The Midstream channel should continue to work with distributors to increase their inventory of the highest-efficiency units to ensure that systems are available when customers need/want them.</p>

3.4 CONCLUSIONS AND RECOMMENDATIONS

Based on the results of this evaluation, the evaluation team offers the following conclusions and recommendations for the HVAC Program:

- **Conclusion #1:** At the beginning of 2023, the implementation team included ER questions from the PY2022 participant survey on the T&C Form all participants receive and complete. While completion of the ER questions is not mandatory, we found the collected data to be of high quality and suitable to support the determination of ER.
- **Recommendation:** We recommend that the implementation team continue to collect this information to support future ER analyses. We also recommend that the implementation team use this information in their calculation of ex ante savings instead of the currently used compressor operating status (operating vs. failed), which has shown significantly higher rates of ER. This change would provide the program team with more realistic, real-time information on program progress against goals and improve alignment between ex ante and ex post savings, which would lead to higher realization rates.
- **Conclusion #2:** Evaluation results show progress in encouraging participants to replace still-functioning but inefficient older units. According to program-tracking data, the mean age of replaced units increased from 20.4 years in PY2022 to 21.3 years in PY2023. Similarly, the rate of early replacement increased from 49% to 57% for central air conditioners and from 48% to 55% for heat pumps. Nevertheless, participant responses to the ER questions on the T&C Form indicate that many customers still wait to upgrade their unit until it is no longer repairable.
- **Recommendation:** The implementation team should continue to explore enhancing customer-facing marketing efforts to promote increased system checks for aging HVAC systems and to encourage replacement *before* failure. By expanding outreach initiatives through targeted e-mails, informative newsletters, prominently placed bill inserts, or engaging content on the Ameren Missouri website, the program can effectively educate customers about the efficiency levels of their existing units and the benefits of replacing them earlier. Emphasizing the importance of regular system checks enhances customer awareness about their HVAC system’s efficiency and provides an opportunity to advocate for early replacement where necessary. Through these efforts, customers can better understand the potential energy savings and improved comfort associated with upgrading to high-efficiency equipment.
- **Conclusion #3:** While SEER2 and HSPF2 went into effect on January 1, 2023, the PY2023 program-tracking data continues to show efficiency ratings for all incented central air conditioners and heat pumps in terms of SEER and

HSPF. Deemed savings algorithms in the Ameren Missouri TRM are also still based on SEER/HSPF, but the TRM includes conversion factors for equipment that uses the new SEER2/HSPF2 metrics. Based on conversations with implementation staff, equipment manufactured in or prior to 2022 would be provided a grace period to transition to the new SEER2 rating system, as a SEER2 rating for that equipment may not be available.

- **Recommendation:** To ensure that savings for central air conditioners and heat pumps are correctly calculated and evaluated, the program-tracking data should clearly indicate whether tracked values are based on the old or the new efficiency metrics and if the TRM conversion factor has been applied. For equipment manufactured in or before 2022, the data should also include the year of manufacture to evaluate savings correctly.

4. RESIDENTIAL EFFICIENT PRODUCTS (REP)

This chapter summarizes the PY2023 evaluation methodology and results for the Residential Efficient Products (REP) Program. The PY2023 evaluation of the REP Program included an engineering analysis to develop net and gross energy and demand savings estimates.

The REP Program raises residential customer awareness of the benefits of high-efficiency products, educates customers about energy use in their homes, and offers customers information, products, and services to save energy cost-effectively. The target market comprises all Ameren Missouri service territory residential customers.

The REP Program is an umbrella program incorporating various program partners, products, and program-delivery strategies. It is flexible by design: as the program evolves and evaluation activities track program performance, Ameren Missouri may revise the assortment of eligible measures, incentive amounts, or qualification criteria as the market dictates.

In PY2023, Ameren Missouri offered rebates for four measures through the program: advanced thermostats, Tier 1 power strips, Tier 2 power strips,¹³ and heat pump water heaters. Table 13 summarizes the incentive levels and program requirements.

Table 13. PY2023 Measures Offered Through the REP Program

Measure	Rebate Offered
Advanced Thermostats	\$100 rebate per unit; limited to one thermostat per system and up to three thermostats per residential electric account
Tier 1 Power Strips	\$10 rebate per unit; limited to five power strips per residential electric account
Tier 2 Power Strips ^a	\$25 per unit; limited to three power strips per residential electric account
Heat Pump Water Heaters	\$550 rebate per unit; limited to two rebates per residential electric account

^a Tier 2 power strips were eliminated from the program during PY2023.

As in past years, the REP Program provided two delivery channels in PY2023 (although, of the following, the Online Store channel is the path that nearly all participating Ameren Missouri customers use):

- **Online Store Channel:** Ameren Missouri's Online Store sells advanced thermostats and power strips directly to customers and applies rebates immediately at checkout.
- **Mail-In Channel:**¹⁴ Customers can purchase program-qualified thermostats and heat pump water heaters anywhere and then submit a rebate application via mail-in or email.¹⁵

4.1 PARTICIPATION SUMMARY

The vast majority of PY2023 program activity was associated with the Online Store channel (91% of participants and 92% of measures). The Online Store channel served the most participants, sold the most measures, and generated the greatest ex ante gross savings; the remaining savings, constituting 14% of the total, were associated with mail-in rebates (Table 14).

¹³ Rebates for Tier 2 power strips were eliminated from the program during PY2023.

¹⁴ The Mail-In Channel will be discontinued in PY2024, and heat pump water heaters will become available on the online store.

¹⁵ PY2020 was the first year that the Mail-In Channel rebated thermostats. Only the Online Store rebated thermostats prior to PY2020.

Table 14. PY2023 REP Program Participation by Channel

Channel	Participants		Measures		Ex Ante Savings	
	Number	%	Number	%	MWh	%
Online Store	14,151 ^A	91%	15,382	92%	6,565	86%
Mail-In	1,358	9%	1,368	8%	1,034	14%
Total	15,487^B	100%	16,750	100%	7,599^C	100%

^A The Online Store offers several measures, but this table only includes the counts for measures for which Ameren Missouri claims savings (advanced thermostats, Tier 1 and 2 advanced power strips, and heat pump water heaters).

^B The total number of participants shown in the table (15,487) is less than the sum of the number of participants across both channels (15,509) because 22 participants (defined by unique electric account numbers) purchased products from more than one channel.

^C Totals may not sum due to rounding.

Advanced thermostats were the most popular product the REP Program offered in PY2023, accounting for approximately 90% of all measures sold through the Online Store and Mail-In channels combined (Table 15). Given the high savings associated with heat pump water heaters, the Mail-In channel had a much more even split in ex ante savings by measure category than the Online Store channel, which was dominated by savings from advanced thermostats. Savings for Tier 2 power strips were considerably lower in PY2023 than in PY2022; however, this is to be expected, as Tier 2 power strips were eliminated from the program during PY2023.

Table 15. PY2023 REP Program Participation Summary by Measure

Channel	Measure	Participants		Measures		Ex Ante Savings	
		Number	%	Number	%	MWh	%
Online Store	Advanced Thermostats	13,864	90%	13,890	83%	6,476	85%
	Tier 1 Power Strips	608	4%	1,443	9%	81	1%
	Tier 2 Power Strips	35	<1%	49	<1%	7	<1%
Mail-In	Advanced Thermostats	1,152	7%	1,152	7%	538	7%
	Heat Pump Water Heaters	211	1%	218	1%	496	7%
Total		15,489^a	100%^b	16,752	100%^b	7,599	100%^b

Note: Counts include all records included in the PY2023 end-of-year tracking data. Discrepancies resulting in a change in ex post savings are detailed under Section 4.3.1 Gross Impact Results.

^a The total number of participants shown in the table (15,489) is less than the sum of the number of participants across all channels and measures (15,569) because 381 participants (defined by unique electric account numbers) purchased products from more than one channel and measure category.

^b Totals may not sum due to rounding.

4.2 EVALUATION METHODOLOGY

For PY2023, similar to other programs, the evaluation team focused efforts on an impact evaluation. Table 16 provides an overview of the PY2023 REP Program evaluation activities.

Table 16. PY2023 Evaluation Activities for the REP Program

Evaluation Activity	Description
Program Manager and Implementer Interviews	<ul style="list-style-type: none"> Conducted interviews in Q3 of PY2023 to understand program staff's perspective on program implementation.
Program Material Review	<ul style="list-style-type: none"> Reviewed new program materials to inform evaluation activities.
Gross Impact Analysis: Database Review	<ul style="list-style-type: none"> Reviewed program database to check that program data were complete and included the parameters required to estimate ex post savings.

Evaluation Activity	Description
Gross Impact Analysis: Engineering Analysis	<ul style="list-style-type: none"> Verified ex ante savings used the correct TRM-based deemed savings values. Estimated overall and measure-level ex post gross impacts using TRM algorithms and deemed savings assumptions.
Net Impact Analysis	<ul style="list-style-type: none"> Estimated PY2023 net impacts, applying a deemed NTGR of 0.825.

4.3 EVALUATION RESULTS

4.3.1 IMPACT RESULTS

This section provides the PY2023 REP Program impact findings. Overall, the REP Program contributed the second-highest energy and demand savings for the residential market-rate portfolio (18% and 12%, respectively). Table 17 compares first-year ex ante and ex post gross savings, along with net savings comparisons against goals at the program level. The PY2023 REP Program achieved a gross realization rate of 99.7% for energy and demand savings, resulting in 6,250 MWh and 2.27 MW of ex post net savings. The program achieved 167% of Ameren Missouri's net energy savings goal and 172% of the net demand savings goal.

Table 17. PY2023 REP Program Savings Summary

	Ex Ante Gross	Gross Realization Rate	Ex Post Gross	NTGR ^a	Ex Post Net	Goal/Target Net	% of Goal
Energy Savings (MWh)	7,599	99.7%	7,575	82.5%	6,250	3,747	167%
Demand Savings (MW)	2.76	99.7%	2.76	82.5%	2.27	1.32	172%

^{3a} Per Stipulation PY2023, PY2023 NTGRs are deemed at 82.5% for the REP Program.

Table 18 shows the ex post gross savings and realization rates by channel and measure. The realization rates are 100% for Tier 2 power strips rebated through the Online Store channel and advanced thermostats and heat pump water heaters rebated through the Mail-In channel. The realization rate is 99.6% for advanced thermostats rebated through the Online Store channel and 99.8% for Tier 1 power strips through the Online Store channel.

Table 18. PY2023 REP Gross Savings by End Use

Channel	Measure Category/Enduse	Energy Savings			Demand Savings		
		Ex Ante (MWh)	Realization Rate	Ex Post (MWh)	Ex Ante (MWh)	Realization Rate	Ex Post (MW)
Online Store	Advanced Thermostats	6,476	99.6%	6,453	2.50	99.6%	2.49
	Tier 1 Power Strips	81	99.8%	81	0.01	99.8%	0.01
	Tier 2 Power Strips	7	100.0%	7	<0.01	100%	<0.01
Mail-In	Advanced Thermostats	538	100.0%	538	0.21	100%	0.21
	Heat Pump Water Heaters	496	100.0%	496	0.04	100%	0.04
Total		7,599	99.7%	7,575	2.76	99.7%	2.76

Discrepancies between ex ante savings calculated by the program team and ex post savings calculated by the evaluation team are primarily due to updates to parameter values in Ameren Missouri Technical Resource Manual (TRM) Version 6.0, Appendix F (updated October 2022), and the use of participant-specific information from the program tracking data when available instead of TRM default values.

Below, we detail the key reasons, by channel and measure, for realization rate discrepancies:

- Online Store: Advanced Thermostats (85% of ex post energy savings and 91% of ex post demand savings):** The gross realization rate for energy and demand was 99.7%.
 - Ex ante estimates included multiple thermostats for individual households (defined by unique electric account number). Ameren Missouri TRM, Version 6.0, Appendix I, Section 3.4.1, states: *“Energy savings are applicable at the household level; installation of multiple advanced thermostats per home does not accrue additional savings.”* When calculating ex post savings, the evaluation team limited savings to one thermostat per household. As a result, 49 Online Store thermostats received zero ex post savings, seven because of thermostat records with a quantity of two, and 42 because of individual households with multiple thermostat records. This decreased electric energy and electric demand savings for advanced thermostats.
 - To avoid double counting savings between program years, the evaluation team excluded one advanced thermostat record from the PY2023 evaluation because it was already included in the PY2021 evaluation. This decreased electric energy and electric demand savings for advanced thermostats.
- Online Store: Tier 1 Advanced Power Strips (1% of ex post energy savings and 0.3% of ex post demand savings):** The gross realization rate for Tier 1 advanced power strips is 99.8% for electric energy and demand.
 - To avoid double counting savings between program years, the evaluation team excluded one Tier 1 advanced power strip record (quantity of three) from the PY2023 evaluation because it was already included in the PY2022 evaluation. This decreased electric energy and demand savings for Tier 1 advanced power strips.

4.3.2 PROCESS RESULTS

To meet the requirements of Missouri CSR for demand-side process evaluations, we respond to the five required process evaluation questions in Table 19. As we did not conduct any process evaluation activities for PY2023, we based the information in the table below, in part, on prior evaluations.

Table 19. Process Evaluation Response

CSR Required Process Evaluation Questions	Findings
<p>What are the primary market imperfections that are common to the target market segment?</p>	<p>The primary market imperfections for the REP Program are a lack of customer awareness of energy-efficient product options and their benefits and the higher price of efficient products. In terms of knowledge, many customers are unaware of energy efficiency and energy-efficient technologies. Moreover, even those aware are often unaware of actual energy savings opportunities available in their homes.</p> <p>For programs like the REP Program, customer awareness of the availability of the rebate is paramount. Customers need to be proactive and search out the rebates or learn of them via marketing or a contractor. For PY2019, we found that only 36% of residential customers were aware of the REP Program, which limits participation.</p> <p>Additionally, while nearly every home has at least one thermostat, thermostats do not routinely fail, so customers need another reason to replace existing thermostats. The desire for advanced technology is a factor driving advanced thermostat uptake. Thermostats have become a consumer product, and like other advanced technologies, many people appreciate and want the technology. Still, others do not and could view advanced thermostats as overly complicated or expensive. Greater customer awareness of new thermostat technology and its energy savings potential could help drive customers to advanced thermostats.</p>
<p>Is the target market segment appropriately defined, or should it be further subdivided or merged with other market segments?</p>	<p>Officially (per MEEIA III), the target market for the REP Program is all residential customers within the Ameren Missouri service territory. However, when we consider the program’s mix of measures (heat pump water heaters, advanced power strips, and advanced thermostats), the market is predominantly homeowners and does not require further subdivision.</p>

CSR Required Process Evaluation Questions	Findings
Does the mix of enduse measures included in the program appropriately reflect the diversity of enduse energy service needs and existing enduse technologies within the target market segment?	The REP Program offered four measures in PY2023: (1) advanced thermostats, (2) Tier 1 power strips, (3) Tier 2 power strips, and (4) heat pump water heaters. Tier 2 power strips were eliminated from the Program in PY2023. When considering the diversity of energy-consuming items for typical residential customers (the target market), a wide range of other enduse measures appear potentially applicable to the REP Program. Of course, we need to consider cost-effectiveness and overlap with other programs. The development of program targets/goals in 2018 included ENERGY STAR® room air conditioners, air purifiers, and dehumidifiers, so these devices may be good candidates for measure expansion.
Are the communication channels and delivery mechanisms appropriate for the target market segment?	Between PY2020 and PY2023, program marketing activities included TV/radio ads, social media ads, paid search optimization, e-mail campaigns, rebate information on energy statements or Home Energy Reports, and location-based ads and promotions. The most effective outreach strategy appeared to be email. Outreach primarily focused on promoting smart thermostats. In PY2019, most participants who purchased products through the Online Store reported learning about the program directly from Ameren Missouri or the Ameren Missouri website. Customers who purchased pool pumps and heat pump water heaters were more likely to learn about the program through a contractor than through other communication channels. Expanding outreach to contractors to increase their involvement with the program could increase participation in these measures.
What can be done to overcome the identified market imperfections more effectively and to increase the rate of customer acceptance and implementation for select enduses/measure groups included in the program?	In PY2019, customers seemed largely satisfied with the Online Store and Mail-In channels. Increased participation can likely be attained by expanding the breadth of measures rebated under the program; however, it may be more effective to focus additional marketing efforts on contractors and increasing general customer awareness of the energy efficiency opportunities as well as available rebates.

4.4 CONCLUSIONS AND RECOMMENDATIONS

The evaluation team offers the following conclusions and recommendations for the REP Program moving forward:

- Conclusion #1:** Similar to findings in PY2021 and PY2022, the REP Program requirements around advanced thermostats contributed to discrepancies between ex ante and ex post savings in PY2023. Notably, while the program team allows rebates for multiple thermostats purchased per household (defined by a unique electric account number), the Ameren Missouri TRM limits claimable thermostat savings to one unit per household. The number of households with ex ante savings for more than one thermostat was minimal compared to previous program years, indicating improved data tracking.
- Recommendation #1:** The evaluation team recommends continuing efforts to track advanced thermostats accurately to avoid overcounting. We want to note that the TRM allows savings to be claimed for a whole home’s HVAC system as long as a thermostat controls each system. Savings may not be claimed for multiple thermostats associated with one system. However, as the REP program stands, it is not possible to verify if additional thermostats purchased beyond the one-per-household are associated with stand-alone HVAC units in the home. Program administrators might explore the potential for redirecting participants looking to purchase multiple thermostats to other programs where additional household information is collected, opening the potential for capturing savings associated with multiple HVAC systems in the home.

5. MULTIFAMILY MARKET RATE (MFMR)

This chapter presents the PY2023 evaluation methodology and results for the MFMR Program. We present additional details on the methodology in Appendix A.

The MFMR Program aims to deliver long-term energy savings and bill reductions to Ameren Missouri customers living in multifamily properties with three or more units. The program, which targets multifamily property managers and owners, provides a one-stop-shop approach to assist these customers in overcoming barriers to completing comprehensive retrofits. Eligible measures include lighting, refrigerators, advanced thermostats, advanced power strips, domestic hot water, building shell, and HVAC equipment.

Resource Innovations (RI) became the primary implementer of the program in PY2022, taking over implementation from the International Center for Appropriate and Sustainable Technology (ICAST). As part of the program's one-stop-shop approach, RI offers a suite of concierge-style services to assist participants in identifying and executing energy efficiency projects. RI spearheads customer recruitment, assists with the application process, recommends project scopes, estimates incentives, and assists participants in coordinating installations. Customers can contract the installation work to a program-approved Trade Ally or install measures themselves. RI staff also conduct post-installation QA/QC activities, submit final project data to Franklin Energy for invoicing, and provide customers with their rebates after the project.

Franklin Energy serves as the overall administrator of the program leads the development of marketing collateral (in collaboration with Ameren Missouri and RI), provides engineering oversight, and processes incentive payments. Franklin Energy also facilitates communication between Ameren Missouri and the program implementation team.

5.1 PARTICIPATION SUMMARY

In PY2023, the program treated 34 accounts across 38 projects.¹⁶ These projects resulted in the installation of 5,140 energy-efficient measures, as shown in Table 20.

Table 20. PY2023 Multifamily Market Rate Participation Summary

Participation Metrics	Unique Accounts	Unique Projects	Measure Count
MFMR Program	34	38	5,140

Table 21 provides the quantity and ex ante savings of each measure type delivered to participating customers through the MFMR Program. Common area lighting (Lighting BUS) and advanced thermostats account for most of the measures installed through the program in PY2023. Furthermore, common area lighting and advanced thermostats accounted for the largest share (71%) of ex ante gross savings for the program in 2023.

Table 21. PY2023 Multifamily Market Rate Program Participation by Measure Category

Measure Category	Measures	Ex Ante Savings	
	Number	MWh	%
Lighting BUS	2,838	1,185	37%
Advanced Thermostat	991	696	22%

¹⁶ For projects that were completed in multiple phases, each phase is listed as a unique project in the program tracking data. As a result, multiple projects can be associated with the same account.

Measure Category	Measures	Ex Ante Savings	
	Number	MWh	%
HVAC RES	156	393	12%
HVAC BUS	2	330	10%
Central Air Conditioner (CAC)	172	269	8%
Electronically Commutated Motors (ECM)	258	150	5%
Heat Pump Water Heater (HPWH)	24	55	2%
Air Source Heat Pump (ASHP)	7	51	2%
Ceiling Insulation	1	45	1%
Lighting RES	576	12	>1%
Air Conditioner Tune-Up	47	11	>1%
Lighting BUS Exterior	9	6	>1%
Filter Alarm	57	5	>1%
Packaged Terminal Air Conditioner (PTAC)	2	0.26	>1%
Total	5,140	3,207	100%

Note: Values may not sum to the total presented due to rounding.

5.2 EVALUATION METHODOLOGY

The evaluation team focused almost exclusively on conducting impact evaluation activities to assess the performance of the MFMR Program in PY2023. Table 22 provides an overview of the MFMR Program evaluation activities.

Table 22. PY2023 Multifamily Market Rate Program Evaluation Activities

Evaluation Activity	Description
Program Manager and Implementer Interviews	<ul style="list-style-type: none"> Conducted interviews in Q3 of 2023 to understand program changes and staff perspectives on program implementation.
Program Material Review	<ul style="list-style-type: none"> Reviewed new program materials to inform evaluation activities.
Gross Impact Analysis—Database Review	<ul style="list-style-type: none"> Reviewed program database to verify that program data are complete and within range and that program-installed measures meet all program requirements.
Gross Impact Analysis—Engineering Analysis	<ul style="list-style-type: none"> Verified that ex ante savings estimates used correct TRM algorithms and deemed savings values where applicable. Estimated overall and measure-level ex post gross impacts using TRM algorithms, deemed savings assumptions, and site-specific parameters for custom analyses.
Net Impact Analysis	<ul style="list-style-type: none"> Estimated PY2023 net impacts, applying a deemed NTGR of 0.825.

5.3 EVALUATION RESULTS

5.3.1 IMPACT RESULTS

This section summarizes the impact evaluation results for the PY2023 MFMR Program. Overall, the MFMR Program was the third largest contributor to the residential portfolio in terms of ex post net energy and demand savings (7% and 4%, respectively). Table 23 compares MFMR first year ex ante and ex post gross savings and shows ex post net savings performance against program goals for the year. The ex post savings are 88% and 81% of the ex ante savings for energy and peak demand, respectively, and achieved 2,321 kWh and 0.81 kW of net energy and demand savings. The

program achieved 62% of Ameren Missouri’s first year net energy savings goal and 39% of the first year net demand savings goal for the year.

Table 23. PY2023 Multifamily Market Rate Impact Summary

	Ex Ante Gross	Gross Realization Rate	Ex Post Gross	NTGR ^a	Ex Post Net	Goal/Target Net	% of Goal
Energy Savings (MWh)	3,207	87.7%	2,814	82.5%	2,321	3,763	62%
Demand Savings (MW)	1.21	81.4%	0.98	82.5%	0.81	2.06	39%

^a In accordance with Stipulation PY2023, PY2023 NTGRs are deemed at 82.5% for the Multifamily Market Rate Program.

The evaluation team completed analyses on the following program measures: common area lighting (Lighting BUS); advanced thermostats and air source heat pump replacements (HeatCool); packaged terminal heat pumps, dirty filter alarms, custom air source heat pump replacements, and electronically commutated motors (HVAC RES); common area HVAC equipment replacement (HVAC BUS); central air conditioners and air conditioner tune-ups (Cooling RES); heat pump water heaters (Water Heating RES); ceiling insulation improvements (Building Shell RES); in-unit lighting (Lighting RES); exterior lighting (EXT Lighting BUS); and packaged terminal air conditioners (Cooling BUS). The remainder of this chapter summarizes the evaluation team’s ex post analysis. We detail all calculation methodology, parameters, and assumptions in this chapter and source the information in Appendix A.

Table 24 summarizes the total PY2023 MFMR Program ex ante and ex post energy and demand savings and realization rates by enduse.

Table 24. PY2023 Multifamily Market Rate Gross Savings by Enduse

Enduse	Energy Savings			Demand Savings		
	Ex Ante (MWh)	Realization Rate	Ex Post (MWh)	Ex Ante (MW)	Realization Rate	Ex Post (MW)
Lighting BUS	1,185	96.7%	1,146	0.225	96.7%	0.218
HeatCool	747	86.8%	648	0.192	96.9%	0.186
HVAC RES	548	99.1%	542	0.204	98.8%	0.202
HVAC BUS	330	40.9%	135	0.300	40.9%	0.123
Cooling RES	281	86.6%	243	0.260	88.5%	0.230
Water Heating RES	55	78.1%	43	0.005	78.1%	0.004
Building Shell RES	45	99.6%	44	0.021	99.6%	0.021
Lighting RES	12	52.8%	6	0.002	55.0%	0.001
EXT Lighting BUS	6	97.7%	5	0.000	97.7%	0.000
Cooling BUS	0.26	140.6%	0.36	0.000	140.6%	0.000
Total	3,207	87.7%	2,814	1.210	81.4%	0.984

Note: Values may not sum to the total presented due to rounding.

Table 25 summarizes the MFMR Program’s total PY2023 ex ante and ex post electric energy and demand savings and realization rates by measure category. The gross realization rates of 88% for electric energy savings and 81% for demand savings indicate that the evaluated (ex post) gross savings achieved by the program are close to the program’s tracked ex ante savings.

Table 25. PY2023 Multifamily Market Rate Gross Savings by Measure Category

Measure Category	Energy Savings			Demand Savings		
	Ex Ante (MWh)	Realization Rate	Ex Post (MWh)	Ex Ante (MW)	Realization Rate	Ex Post (MW)
Lighting BUS	1,185	96.7%	1,146	0.225	96.7%	0.218
Advanced Thermostat	696	87.3%	608	0.179	102.0%	0.182
HVAC RES	393	100%	393	0.132	100.0%	0.132
HVAC BUS	330	40.9%	135	0.300	40.9%	0.123
Central Air Conditioner (CAC)	269	86.1%	232	0.255	86.1%	0.220
Electronically Commutated Motors (ECM)	150	96.5%	145	0.070	96.5%	0.068
Heat Pump Water Heater (HPWH)	55	78.1%	43	0.005	78.1%	0.004
Air Source Heat Pump (ASHP)	51	79.8%	40	0.013	27.9%	0.004
Ceiling Insulation	45	99.6%	44	0.021	99.6%	0.021
Lighting RES	12	52.8%	6	0.002	55.0%	0.001
Air Conditioner Tune-Up	11	100.0%	11	0.005	214.1%	0.011
Exterior Lighting	6	97.7%	5	<0.001	97.7%	<0.001
Filter Alarm	5	100.0%	5	0.002	100.0%	0.002
Packaged Terminal Air Conditioner (PTAC)	0.26	140.6%	0.36	<0.001	140.6%	<0.001
Total	3,207	87.7%	2,814	1.210	81.4%	0.984

Note: Values may not sum to the total presented due to rounding.

REASONS FOR DISCREPANCIES

Discrepancies between ex ante and ex post savings stem from multiple sources. The following list highlights the largest contributors to differences between ex ante and ex post savings:

- **Lighting BUS (41% of ex post energy savings and 22% of ex post demand savings):** Only two records were prescriptive, and the other 49 were custom. The gross realization rate is 97% for both energy and demand savings.
 - For two prescriptive records, ex ante estimates were based on the deemed savings values from Appendix F of Missouri TRM Version 6.0. The evaluation team used the program tracking data to determine key inputs, such as WattEE and Wattbase, for ex post savings, which decreased energy and demand savings realization rates.
 - For three custom records, the ex ante estimates were based on the incandescent baseline. The evaluation team used the EISA standard baseline (45 Lumens/Watt) for ex post calculations because these records had installation dates after August 1, 2023. Using the EISA standard baseline decreased ex post savings for these records.
 - The evaluation team could not replicate the program team's ex ante energy and demand savings calculations for three custom records. Using the custom workbooks that accompanied these three records, we calculated the ex post energy and demand savings to be higher than the ex ante estimates, which increased the energy and demand savings realization rates.
- **Advanced Thermostat (22% of ex post energy savings, and 19% of ex post demand savings):** The gross realization rate is 87% for energy savings and 102% for demand savings.

- Savings estimates for advanced thermostat projects involve inputs from the type of system the thermostat controls. Ex ante savings estimates were based on default assumptions for the existing HVAC equipment from Missouri TRM Version 6.0 Appendix F, while the evaluation team used key inputs for the controlled equipment from the program tracking data for ex post savings calculations.
 - There were 14 projects where key inputs from the program tracking data (e.g., Base Heating/Cooling and SEER) differed from the parameters applied in the ex ante savings estimates. This decreased the energy realization rate and increased the realization rate for demand.
 - The evaluation team also found that one advanced thermostat project co-occurred with a custom HVAC project. For this case, the evaluation team used the inputs from the corresponding custom measures (e.g., Heating Equipment, Cooling Equipment, and Efficient SEER), while the ex ante estimates were based on the parameters of the replaced equipment. This decreased the realization rates for energy and demand savings for this project.
- **HVAC BUS (5% of ex post energy savings and 12% of ex post demand savings):** The realization rate is 41% for both energy savings and demand savings.
 - The ex ante estimate was based on the Equivalent Full Load Hours(EFLH) value (2,836 hours/season) listed in custom workbooks. As this EFLH value is much higher than all EFLHs provided in Section 2.5 in Missouri TRM Version 4.0 Appendix H, the evaluation team modified the EFLH to align with what is expected of a multifamily building according to the TRM (1,171 hours/season) in ex post savings. This heavily reduced the realization rates.
- **Central Air Conditioner (CAC) (8% of ex post energy savings and 22% of ex post demand savings):** The gross realization is 86% for energy and demand savings.
 - Ex ante savings are based on the SEER value from Missouri TRM Version 6.0 Appendix F, while the evaluation team used the SEER existing value from the program tracking data for ex post savings calculations. This existing SEER from the tracking data was lower than the value used in ex ante calculations, which decreases realization rates.
 - For one record, ex ante savings were based on Missouri TRM Version 5.0 Appendix F and not Version 6.0 (used in ex post calculations), which decreased realization rates for energy and demand.
- **Electronically Commutated Motor (ECM) (5% of ex post energy savings and 7% of ex post demand savings):** The gross realization rate is 97% for energy and demand savings.
 - For two records, the program team claimed ECM savings for projects that involved replacing room air conditioners and baseboard heating with centrally-ducted HVAC equipment. However, ECM savings can only be claimed when the replaced equipment is centrally-ducted HVAC equipment. As such, the evaluation team removed the ECM savings for these two records, decreasing the energy and demand savings realization rates.

5.3.2 PROCESS RESULTS

The MFMR Program aims to assist owners and managers of multifamily properties in identifying and implementing comprehensive energy efficiency projects that result in deep savings and bill reductions for Ameren Missouri customers.

Throughout PY2023, the program team worked to improve upon the processes it established during its first year of implementation (PY2022). The program team maintained its network of preferred contractors, to whom they refer projects as they come in from customer inquiries. The team also worked to enroll new contractors as Trade Allies. Newly enrolled contractors complete an hour-long training that provides an orientation to the program workflow and contractor responsibilities.

There were no changes to the program’s design between PY2022 and PY2023. However, the implementation team made one notable change to their implementation process. Beginning in PY2023, the MFMR program team began providing additional support to contractors when completing data entry for their projects. Whereas the PY2022 program guidelines involved contractors being primarily responsible for data entry, in PY2023, the program team worked with contractors to co-enter and check project information entered in PowerPath, the MFMR program-tracking database. The program implementation team noted that, even with this additional support, contractors did not always provide sufficient detail in PowerPath, which lengthened the process of confirming project information. Specifically, the implementation team found that in several cases, information entered into PowerPath as seen on contractor work orders, did not match as-built conditions at participating sites.

In addition to data entry difficulties, the MFMR Program navigated one other challenge in PY2023 that involved the project pipeline. The program experienced a setback when a key customer canceled multiple projects because of budgetary issues. The team addressed this setback by filling the pipeline with several other customers who had applied.

Complementing the program team’s observations about PY2023, the evaluation team offers responses to the five process evaluation questions required by Missouri Code of State Regulations (CSR) for demand-side process evaluations in Table 26. Given that the PY2023 evaluation did not include process evaluation activities, the findings here are based largely on process evaluation activities conducted in PY2020.

Table 26. Summary of Responses to CSR Process Evaluation Requirements

CSR Required Process Evaluation Questions	Findings
What are the primary market imperfections that are common to the target market segment?	Market imperfections specific to the market rate multifamily sector include (1) the split incentive for in-unit measures between property owners, managers, and residents; ^a (2) awareness of the potential for saving money and energy through energy efficiency upgrades; (3) costs associated with larger non-lighting measure upgrades; (4) knowledgeable staff available to install energy-efficient upgrades; and (5) the time investment to plan, budget, and implement energy efficiency upgrades.
Is the target market segment appropriately defined, or should it be further subdivided or merged with other market segments?	Yes, the target market is appropriately defined as market rate buildings comprised of three or more units with Ameren Missouri electric service. This program addresses the need for both common area and in-unit upgrades.
Does the mix of enduse measures included in the program appropriately reflect the diversity of enduse energy service needs and existing enduse technologies within the target market segment?	Yes, the program offers measures that cover all major multifamily common area and in-unit enduse needs, including lighting, appliances, space cooling, space heating, ventilation, building shell (e.g., insulation and windows), and water heating. The program team can continue to increase the comprehensiveness of solutions offered to the target market segment by encouraging participation in the one-stop-shop channel.
Are the communication channels and delivery mechanisms appropriate for the target market segment?	The primary recruitment channel used is RI’s network of relationships with local contractors and larger property management companies. The program also leverages relationships with community-based organizations and trade organizations. This varied approach generates participation from varying customer types in the target market segment.
What can be done to more effectively overcome the identified market imperfections and to increase the rate of customer acceptance and implementation for select enduses/measure groups included in the Program?	One potential strategy to overcome split incentive issues is the promotion of Green Leases. ^b Green Leases are contracts between landlords and tenant(s) that negotiate the mutual benefit of installing energy-efficient or green measures in shared buildings. For shared buildings, owners are burdened with green upgrade costs, while tenants benefit from lower operating costs. Without green leases, there is little incentive for owners to make green upgrades to tenant units. Green leases are designed to allow both parties financial benefits and incentives, and multifamily building types are ideal buildings for their use. The other market imperfections outlined above are largely targeted by the program’s one-stop-shop model. As such, increasing participation and/or the

CSR Required Process Evaluation Questions	Findings
	share of projects in the program utilizing those services should help to overcome imperfections, such as lack of awareness and information, project costs, limited staff knowledge, and the time needed to more effectively plan energy efficiency projects.

^a The split incentive occurs when the tenant pays the cost of the electricity use, but the owner is responsible for choices that affect building and equipment efficiency.

^b Consortium for Building Energy Innovation (CBEI). “Creating an Energy Savings Win-Win for Owners and Tenants.” Split Incentives and Green Leases. Last modified July 27, 2020. <http://www.cbei.psu.edu/split-incentives-and-green-leases/index.html>.

5.4 CONCLUSIONS AND RECOMMENDATIONS

The evaluation team offers the following conclusions and recommendations for the MFMR Program based on the results of the PY2023 evaluation:

- **Conclusion #1:** Consistent with PY2022, the current program-tracking database lacks key inputs for calculating ex ante energy and demand savings and verifying ex post savings. The missing inputs and additional supporting information are often only available in external documents such as the project-specific or custom workbooks the implementation team provides.
- **Recommendation:** For projects using site-specific, “custom” parameters, project workbooks include detailed documentation of the development of ex ante estimates. We recommend that the implementation team incorporate more of the key parameters from these workbooks into the program-tracking database, given their use in prescriptive algorithms (e.g., cooling capacity, heating capacity, and baseline conditions, which were all provided but not for every record in the database). Incorporating these inputs into the tracking database will improve the efficiency of program quality control measures and evaluation and may also positively impact gross realization rates.
- **Conclusion #2:** In the custom analysis, there were cases where ex ante savings estimates were based on inputs that differed from the expected values from TRM. Notably, the EFLHs used in the ex ante estimates for the business HVAC projects were vastly different from the EFLHs in the TRM for multifamily buildings. The program team did not provide supporting documentation to explain the use of a different input for these projects.
- **Conclusion #3:** The source of the discrepancy for ECMs between ex post and ex ante is the condition in which savings can be claimed. According to the CFR (430.32(y)), ECMs are part of the baseline for new construction, replace-on-fail, time-of-sale, and early replacement scenarios. As such, ECM savings can only be claimed when a ducted system exists for the project.
- **Recommendation:** We recommend ensuring that ECM savings are only claimed when baseline equipment is centrally ducted and not when baseline equipment is a baseboard heating or an in-window air conditioning unit.

6. PAY AS YOU SAVE (PAYS)

This chapter summarizes the PY2023 evaluation methodology and results for the Pay As You Save (PAYS) Program. The PY2023 evaluation of the PAYS Program included both gross impact and process activities. We present details on the methodologies in Section 6.2, and Appendix C.

The PAYS Program is a tariff on-bill financing offering that launched in PY2021. The PAYS Program targets residential customers with energy usage higher than expected based on certain housing characteristics. It does not target or qualify participants based on income level. Targeted customers receive custom marketing materials,¹⁷ and interested customers can enroll online. The program provides a range of energy efficiency measures—including LED lighting, domestic hot water, insulation, air sealing, and HVAC equipment—to residential customers.

Program implementer staff deliver some smaller equipment at no cost to customers during an initial home assessment. Qualified customers can also receive other items as part of a more involved retrofit, some of which are eligible for program incentives. For these retrofit projects, an on-bill financing incentive design allows participating customers to pay back the cost of energy efficiency projects incrementally through their utility bill in the form of a tariff charge. The tariff charge element means that the project cost remains associated with the premise rather than the customer. Therefore, if the customer moves out of the treated home before paying back the cost of the project, the new occupant continues to pay the remaining balance through their utility bill.

The program design includes an 80/20 rule, which means the cost of a measure cannot exceed 80% of the estimated post-upgrade savings over 80% of its expected lifecycle. The remaining 20% of savings must flow to the participant. The monthly loan payments are structured to ensure the expected energy savings exceed the project cost. Consequently, the participant will have a reduced monthly utility bill compared to the scenario where the project was not undertaken.

Franklin Energy administers the program on behalf of Ameren Missouri, and EETility operates as the program implementer (also referred to as the “implementation team” throughout this chapter). EETility classifies participation into four tiers:

- **Tier 1:** Once a customer enrolls, the implementer schedules an in-person appointment at the customer’s home. During the appointment, an energy advisor conducts a visual inspection of the home, provides more program information, and may provide the participant with direct install measures.
- **Tier 2:** If the home is clear of health and safety issues and the participant chooses to move forward, the implementer conducts a home assessment in which program staff complete a comprehensive audit and energy assessment. The assessment considers building characteristics and HVAC system specifications and may include direct-air and duct leakage tests.
- **Tier 3:** Staff from the implementation team enters data from the home assessment into a customized version of the proprietary OptiMiser® modeling software to estimate savings associated with upgrading measures in the home. Participants receive an Easy Plan outlining recommended upgrades. If the project does not meet the program’s 80/20 rule, participants receive a quote for the copay needed to move forward under program requirements.
- **Tier 4:** For participants who accept the plan, the program team works with a network of registered Trade Allies to install the measures, and the program places a tariff charge on the participant’s bill. The implementer conducts remote quality control for 100% of the Tier 4 projects and additional on-site review for 10% of Tier 4 projects.

¹⁷ The program utilizes phone calls, texts, and emails to reach potential participants.

In addition to on-bill financing, if the measures installed are also eligible for any other relevant Ameren Missouri energy efficiency program incentives, the incentives are automatically applied to the project cost without additional action required from the participant. While the program team applies rebates from other programs based on measure eligibility, they only claim savings through the PAYS Program. The evaluation team checked participation in the PAYS Program against other programs and found only one potential instance of double-counting across programs. This suggests the program process for avoiding double-counting is successful.

6.1 PARTICIPATION SUMMARY

In PY2023, the PAYS Program completed 1,562 Tier 1 and 179 Tier 4 projects in 1,693 participating households, summarized in Table 27. Nearly all participants (87%) received at least one advanced power strip, and slightly less than half received water heater pipe wrap (40%) and standard LED lighting measures (35%). Among Tier 4 participants, approximately two-thirds received an HVAC system (60%) and attic insulation (67%), and more than half received smart thermostats (53%).

Table 27. PY2023 PAYS Program Participation Summary

Channel	Measure Category	Participants		Measures		Ex Ante Savings	
		Number	%	Number	%	MWh	%
Tier 1 Direct Install	Standard LED Lighting	605	37%	3,006	30%	98	11%
	Advanced Power Strip	1,519	93%	1,596	16%	47	5%
	Low-Flow Showerhead	302	18%	363	4%	32	4%
	Bathroom Faucet Aerator	339	21%	496	5%	17	2%
	Water Heater Pipe Wrap	697	43%	3,177	32%	15	2%
	Kitchen Faucet Aerator	116	7%	117	1%	13	2%
<i>Subtotal Tier 1</i>		1,562	95%	8,755	87%	222	26%
Tier 4 Retrofit	HVAC	106	6%	111	1%	441	51%
	Attic Insulation	121	7%	121	1%	80	9%
	Smart Thermostat	96	6%	105	1%	59	7%
	Air Sealing	71	4%	71	1%	30	3%
	Specialty LED Lighting	42	3%	854	9%	22	2%
	Duct Sealing	7	0.4%	7	0%	12	1%
	Tier 1 Measures ^a	N/A	N/A	N/A	N/A	1	<1%
<i>Subtotal Tier 4</i>		179	10%	1,269	13%	644	74%
Total		1,639^b	100%	10,024	100%	865^c	100%

^a Reflects savings associated with Tier 1 measures delivered during Tier 4 retrofit installation. Participant counts and measure quantities for these measures are captured in the Tier 1 measure categories.

^b All Tier 4 participants received Tier 1 measures during an initial home assessment. Several Tier 4 participants received Tier 1 measures outside of this evaluation period. Hence, the total number of participants does not equal the sum of Tier 1 and Tier 4 participants.

^c Due to rounding, total/subtotal energy (MWh) or demand (MW) savings may not equal the sum of constituent values.

6.2 EVALUATION METHODOLOGY

For PY2023, the evaluation team completed a comprehensive gross impact evaluation as well as a limited process evaluation. Table 28 provides an overview of the PAYS Program evaluation activities (see Chapter 2 for an overarching discussion of evaluation activities common to all residential program evaluations included in this report).

Table 28. PY2023 Evaluation Activities for the PAYS Program

Evaluation Activity	Description
Implementer Interviews	<ul style="list-style-type: none"> Conducted interviews in Q3 of PY2023 to understand program changes and staff perspectives on program implementation.
Program Material Review	<ul style="list-style-type: none"> Reviewed program materials to inform evaluation activities.
Database Review	<ul style="list-style-type: none"> Reviewed the program database to check that program data are complete and program-installed measures meet all program requirements.
Engineering Analysis	<ul style="list-style-type: none"> Completed TRM-based engineering savings analysis to estimate ex post savings for Tier 1 measures. Completed a review and update of building energy model parameters for a sample of 20 projects to estimate ex post savings for Tier 4 projects.
Net Impact Analysis	<ul style="list-style-type: none"> Estimated PY2023 net impacts, applying a deemed NTGR of 0.825.
Process Evaluation	<ul style="list-style-type: none"> Analyzed the effects of copay amounts on customer attrition between Tier 3 and Tier 4. Analyzed the effects of the time gap between Tiers on customer attrition between Tiers.

6.2.1 GROSS IMPACT ANALYSIS

The PY2023 impact evaluation of the PAYS Program consisted of several steps. We began by reviewing program-tracking data for accuracy and completeness and to confirm that it included the necessary level of detail for subsequent components of the analyses. For Tier 1 measures, we reviewed ex ante per-unit savings assumptions and applied appropriate per-unit savings from the Ameren Missouri TRM. For Tier 4 measures, we conducted a comprehensive review of available tracking data and detailed project documentation for a sample of 20 Tier 4 projects. We updated associated OptiMiser models to align with verified measure details, household characteristics, and weather information based on all available data and documentation. Lastly, we applied ISRs developed as part of the PY2022 evaluation for each Tier 1 and Tier 4 measure category. The remainder of this subsection provides information about our gross impact evaluation methodology; Appendix C includes a detailed discussion of our Tier 1 and Tier 4 gross impact analyses.

REVIEW OF PROGRAM-TRACKING DATA

As a first step in our gross impact analysis, the evaluation team received and reviewed the following program-tracking data reports provided by the program administrator:

- The PAYS program-tracking database includes the following information for all (Tier 1 and Tier 4) participants who received at minimum one Tier 1 measure: detailed participant data, installation date, measure quantity, and deemed energy and demand savings for Tier 1 measures received by the participant.
- For Tier 4 participants, the data included detailed participant data, key participation dates, measure details and quantities, water heating fuel type, HVAC system information, and total energy and demand savings for all (Tier 1 and Tier 4) measures received by each participant who completed a Tier 4 retrofit.
- For Tier 4 participants, the database included Tier 1 measures already accounted for in Tier 1 records, sometimes with negative or otherwise unreasonable savings values. To avoid double-counting of Tier 1 measure savings, the evaluation team excluded Tier 1 measures from ex post savings developed for Tier 4 participants.

ENGINEERING ANALYSIS FOR TIER I MEASURES

The Tier 1 analysis began with a review of the program-tracking database to verify that it included the necessary level of detail. We then reviewed all program-tracked ex ante per-unit savings and the parameters used to develop those savings estimates. To estimate ex post savings, we updated certain assumptions embedded in the per-unit savings values included in Appendix F (Version 6.0) to more accurately reflect the PY2023 participant population (e.g., water heating fuel type) and, where available, we used participant-specific values included the program-tracking data for savings calculations. We also applied survey based ISRs developed during the PY2022 evaluation to calculate ex post savings.

ENERGY MODEL ANALYSIS FOR TIER 4 RETROFIT MEASURES

The Tier 4 energy savings analysis consisted of a desk review of project documentation and OptiMiser energy models, a proprietary modeling software, for 20 sampled projects. We developed gross realization rates for energy and demand savings for the sample, weighted by ex-ante savings. We then applied those realization rates to ex ante energy and demand savings for all Tier 4 projects to estimate ex post gross savings for the population of Tier 4 projects.

We drew a simple random sample of 20 projects from the population of Tier 4 retrofits completed in PY2023. The sample represents 11% of the total Tier 4 project count and took the seasonality of installation and measure mix into account. The evaluation team then requested OptiMiser modeling files and all available project documentation for the 20 sampled projects, which included electricity consumption data, invoices, equipment specification sheets, photos of baseline and efficient equipment. Project documentation provided by the implementation team to inform the energy model review included invoices as well as pre- and post-installation verification photos for all 20 projects. In 2023, the implementation team provided additional details on pre- and post-intervention conditions in the home, including photos of attic insulation, insulation depth measurements, blower door testing results, and additional photos of existing home heating and cooling equipment. These details substantially improved the evaluation team's ability to verify and ensure accuracy of key savings assumptions.

We reviewed these materials and used the information to update model parameters with verified baseline and efficient measure specifications, household characteristics, and weather information for the ex post analysis. We then recalibrated and reran the OptMiser models to calculate ex post savings for each Tier 4 measure category.

Based on revised OptiMiser model outputs, we developed project-level realization rates for each sampled project. We then applied the savings-weighted average of these realization rates as well as survey-based ISRs to ex ante savings across the entire population of Tier 4 measures to develop ex post gross savings. Appendix C includes savings details (ex ante and ex post), realization rates, and details of key drivers of differences for ex ante and ex post for each of the projects included in the sample.

6.2.2 PROCESS ANALYSIS

The evaluation team conducted a limited process analysis for the PAYS Program in PY2023. Building on the process evaluation that we conducted in PY2022, we focused on highlighting key factors that may present barriers to increasing participation in the program—that is, characterizing the relationship between copay amounts and attrition and also the time that it took PY2023 participants to move through the different participation Tiers.

For this analysis, we primarily used data from the Enrollment Data Report and the Process Data Report provided by the implementation team. Enrollment Data Report contains demographic data and (incomplete) data on reasons for enrollment in the program for 2023 enrollees. The Process Data Report provides data on key project tiers/phases, their corresponding dates, and copay amounts for projects where the direct installation and home assessment took place in

2023. When necessary, we supplemented our analysis with data from the Post Retrofit Report.¹⁸ Further, we conducted an in-depth interview with the program implementer staff to get insights into any changes, benefits, or drawbacks to program implementation in PY2023 and reviewed new program documentation.

The PY2023 process analysis was somewhat limited by data availability. Among Tier 3 and Tier 4 projects indicated as “paused” or “completed” in the tracking data that we received for this evaluation, copay amounts were included for 43% of the projects. Additionally, our original process evaluation scope included an analysis of communication records tracked by the implementation team (i.e., the method, frequency, and timing of follow-up communications between prospective participants and the implementation team). However, the implementation team was unable to provide the required data in format suitable for evaluation purposes.

6.3 EVALUATION RESULTS

6.3.1 IMPACT RESULTS

This section summarizes impact results for the PY2023 PAYS Program. The PAYS Program was the smallest contributor to the residential portfolio, representing 2% of ex post net energy and 1% of ex post net demand savings for the portfolio. Table 29 compares first year ex ante and ex post gross savings, along with ex post net savings performance against goals at the program level. The program achieved first year ex post net energy and demand savings of 603 MWh and 0.24 MW, respectively, representing only 8% and 7%, respectively, of its net energy and demand savings goals.

Table 29. PY2023 PAYS Impact Summary

Column	Ex Ante Gross	Gross Realization Rate	Ex Post Gross	NTGR ^a	Ex Post Net	Goal/Target Net	% of Goal
Energy Savings (MWh)	865	84.4%	731	82.5%	603	7,713	8%
Demand Savings (MW)	0.32	89.3%	0.29	82.5%	0.24	3.59	7%

^a In accordance with Stipulation PY2023, PY2023 NTGRs are deemed at 82.5% for the PAYS Program.

Table 30 summarizes total Tier 1 and Tier 4 ex post gross savings and realization rates, by measure category. In PY2023, Tier 4 retrofit measures accounted for 81% of ex post gross energy savings and 94% demand savings. HVAC upgrades alone accounted for most of the program savings (56% of ex post gross energy savings and 66% of demand savings). LED lighting accounted for the largest portion of Tier 1 ex post gross energy and demand savings (47% and 60%, respectively).

¹⁸ In contrast to these data sources, the program-tracking data used for the impact includes all participants with any measure installation activity in 2023, regardless of the enrollment date, or the direct install and assessment date. As a result, slightly different sets of participants are included in the process and impact analyses, although there is a significant overlap.

Table 30. PY2023 PAYS Gross Savings by Channel and Measure Category

Channel	Measure Category	Energy Savings			Demand Savings		
		Ex Ante (MWh)	Realization Rate	Ex Post (MWh)	Ex Ante (MW)	Realization Rate	Ex Post (MW)
Tier 1 Direct Install	Standard LED Lighting	98	68.8%	67	0.015	69.4%	0.011
	Advanced Power Strip	47	78.2%	37	0.005	78.2%	0.004
	Low-Flow Showerhead	32	65.1%	21	0.003	42.4%	0.001
	Bathroom Faucet Aerator	17	36.0%	6	0.002	36.0%	0.001
	Water Heater Pipe Wrap	15	44.0%	6	0.001	44.0%	0.001
	Kitchen Faucet Aerator	13	36.2%	5	0.001	36.2%	0.000
<i>Subtotal Tier 1</i>		222	64.1%	142	0.027	63.9%	0.017
Tier 4 Retrofit	HVAC	441	92.6%	408	0.205	92.6%	0.190
	Attic Insulation	80	90.6%	72	0.037	90.6%	0.034
	Smart Thermostat	59	88.4%	52	0.028	88.4%	0.024
	Air Sealing	30	90.6%	27	0.014	90.6%	0.013
	Specialty LED Lighting	22	83.5%	18	0.003	83.5%	0.003
	Duct Sealing	12	90.6%	11	0.006	90.6%	0.005
	Tier 1 Measures ^a	1	N/A	N/A	0.000	N/A	N/A
<i>Subtotal Tier 4</i>		644	91.4%	588	0.293	91.7%	0.269
Total		865	84.4%	731	0.320	89.3%	0.286

^a Ex post savings associated with Tier 1 measures included in Tier 4 projects are captured in the Tier 1 measure categories in this table.

As shown in Table 30, the PAYS Program achieved gross realization rates of 84.4% and 89.3% for energy and demand savings, respectively. We summarize the explanations for key differences between ex ante and ex post savings below, and present more detailed results in Appendix C.

TIER 1 DIRECT INSTALL MEASURES

Three overarching factors drove the differences between Tier 1 ex ante and ex post savings: (1) the evaluation team applied the Energy Independence and Security (EISA) regulated baseline lamp efficacies (45 lumens/watt) for lamps installed on or after August 1, 2023; (2) the evaluation team applied survey-based ISRs developed as part of the PY2022 evaluation, whereas ex ante savings relied on deemed per-unit savings values from Appendix F of the Ameren Missouri TRM that reflected different ISR assumptions, and (3) the evaluation team applied Ameren Missouri TRM-recommended assumptions for certain parameters to reflect, for example, the range of fuel types used for water heating where participant-specific data was not available in the program tracking database. We provide more detailed explanations of these differences below:

- In 2023, the DOE final rule reinstating the 45 lumen per watt baseline efficiency for all general service lamps between 310 and 3,300 lumens became effective with full enforcement beginning August 1, 2023. The evaluation team applied this baseline to lighting measures offered through the PAYS Program with installation dates on or after August 1, 2023, whereas the implementation team used a halogen baseline throughout the year. This affected 42% of all lighting measures in Tier 1, resulting in a 13% reduction in energy and a 16% reduction in demand savings for the program channel.
- In PY2022, the evaluation team developed measure-specific ISRs, which are applied as part of this evaluation to estimate ex post gross savings. Ex ante savings used deemed per-unit savings from Appendix F of the Ameren

Missouri TRM that reflect ISRs from prior research and evaluations of other residential programs. ISRs developed as part of the PY2022 evaluation ranged from 65% to 100% and are slightly lower than those embedded within ex ante per-unit savings. The impact of this discrepancy is a 10% reduction in energy savings and a 7% reduction in demand savings across all Tier 1 measures.

The implementation contractor did not track the water heating fuel type for 99% of the projects with faucet aerator and water heater pipe wrap measures. As a result, the evaluation team applied the Ameren Missouri TRM-deemed assumption for unknown water heating fuel of 42% electric. In contrast, the implementation team used deemed per-unit savings from Appendix F of the Ameren Missouri TRM that reflect 100% electric water heating for ex post calculations. This difference led to low realization rates for faucet aerators and water heater pipe measures, and resulted in a 12% reduction in energy savings and an 8% reduction in demand savings for the PAYS Program.

TIER 4 RETROFIT MEASURES

Two key factors drove the differences between Tier 4 ex ante and ex post savings: (1) as part of the desk reviews, the evaluation team applied the Energy Independence and Security (EISA) baseline lamp efficacies (45 lumens/watt) for lamps installed on or after August 1, 2023; and (2) the evaluation team reviewed and updated energy models for a sample of projects to correct for inconsistencies between original energy models and available project documentation. We provide more detailed explanations of these differences below:

- For 5 of 20 projects sampled for desk reviews, the installation date of Tier 4 measures was after August 1, 2023. As a result, we adjusted the baseline wattages for lighting measures installed in these projects to be compliant with EISA baseline wattages of 45 lumens/watt. These five projects had a large share of savings coming from lighting measures (44%) and therefore substantially affected realization rates for several projects (see Appendix C for individual project realization rate for the 20 sampled Tier 4 projects).
- The evaluation team revised energy models following verification of project scopes, equipment specifications, TMY3 weather stations, and existing building conditions, such as conditioned floor area, insulation levels, and air infiltration rates. The resulting impact on the Tier 4 channel was an increase of 4.5% in energy savings. Two projects represented the majority of that impact resulting from changes to conditioned floor areas and weather stations.

6.3.2 PROCESS RESULTS

This section summarizes the results of the limited PY2023 process evaluation for the PAYS Program. In the remainder of this section, we discuss changes in program design and implementation from PY2022 present out analysis of participant attrition rates throughout the participation process as well and factors (such as high copays and timing of Easy Plan delivery) that may lead some participants to pause their participation prior to installing Tier 4 measures. We also provide responses to Missouri's CSR process questions.

The evaluation team conducted a review of program materials and completed an in-depth interview with program implementer staff. There were no substantial changes in program design or delivery from PY2022 to PY2023. However, the implementation team did highlight some improvements to the Easy Plan delivery and scheduling process. The program implementer has also begun using Calendly to schedule Easy Plan appointments, which helps streamline the outreach process.

There are two key challenges to delivering the PAYS Program in PY2023 highlighted by implementation staff.

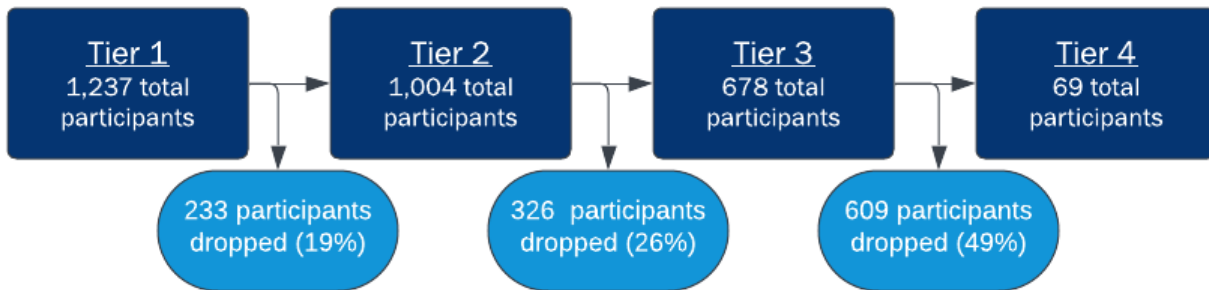
- **Difficulty reaching program goals:** The program implementer staff mentioned that they needed 372 projects per month to meet the spending goals set for the implementer by the utility. The program achieved that goal in only two months (January and September). These goals appear to be difficult to reach.
- **Contractor shortage for HVAC projects:** Program implementer staff said they were experiencing a contractor shortage for HVAC projects. In response, the implementer staff mentioned holding enrollment orientations in the coming weeks after the interview (September 8, 2023) to onboard more contractors. The implementer staff expressed confidence in filling these gaps in the latter months of PY2023.

PROGRAM TIER PROGRESSION AND ATTRITION

Enrollees in the PAYS Program progress through four tiers of program participation. In Tier 1, a contractor visits a participant’s home, conducts an initial safety screening, and installs Tier 1 measures directly. If customers pass the initial screening, they move to Tier 2, where contractors conduct a more thorough home assessment. Tier 1 measures can also be installed during Tier 2. Information collected during the assessment is then used by the implementation team to create a customer-specific retrofit plan (i.e., an Easy Plan). Customers reach Tier 3 when they receive their Easy Plan detailing proposed measures, benefits, costs, and copay amounts from the implementer. Once participants decide to move forward with installing measures outlined in their Easy Plan, they reach Tier 4.

We reviewed PAYS participants’ journeys for customers who enrolled beginning in 2023 to analyze which tiers had the highest attrition rates. Figure 1 visualizes the progression of participants through the program tiers in 2023, and the number of participants (and share of total participants) that elected to not move forward at each stage. The largest drop in participation among projects marked “completed” occurred between Tier 3 and Tier 4. While more than half of participating customers who initially enrolled in the program reached Tier 3 (i.e., received an Easy Plan), only 10% of those participants went on to install Tier 4 measures.

Figure 1. PY2023 PAYS Program Attrition by Tier



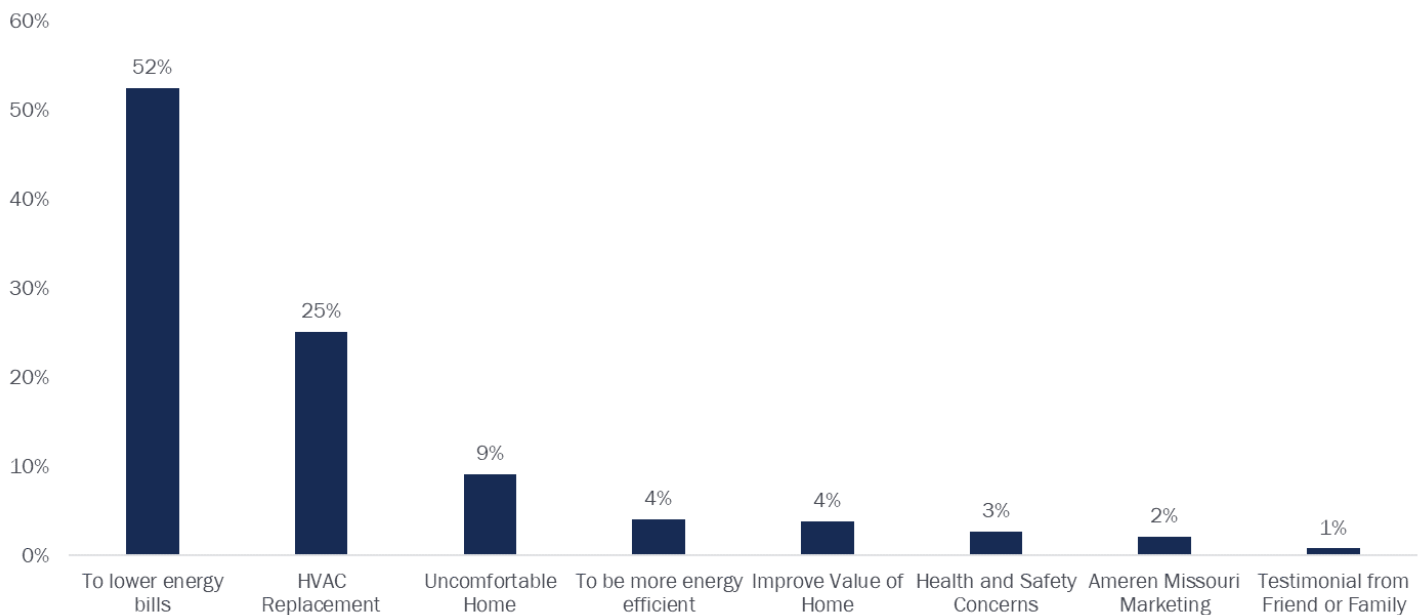
Note: This figure only includes projects listed as “Closed” or “Paused” in the PY2023 program-tracking data. There were 12 Tier 1 projects, 43 Tier 2 projects, and 200 Tier 3 projects listed as “Active” and excluded from the figure so that active projects did not misconstrue attrition rates.

Based on our review of the Enrollment Data Report from PY2023, we understand that participants who elected not to move from one Tier to the next did so for several different reasons. Of the 233 participants who did not move forward beyond Tier 1 of the program, 84% (196 participants) paused their projects to make further improvements to their homes before continuing to the Tier 2 assessment phase. Almost all participants who dropped off between Tiers 2 and 3 (99%) were unresponsive to further communications from the PAYS Program implementation team. Finally, most participants (54%) who dropped out of the program after Tier 3 declined the copay offer included with their Easy Plan (328 participants).

MOTIVATIONS FOR PARTICIPATING

At the time that of program enrollment, the implementation team asks participants about their primary motivations for enrolling. Figure 2 shows that more than half (52%) of PAYS participants are motivated by financial interests. Another 25% of participants reported that they were primarily motivated by an HVAC replacement. These findings underscore the importance of providing participants with a financially attractive path to participation and help explain the high rate of drop-outs between Tiers 3 and 4, which are at least partially associated with high levels of copay (as discussed in the next subsection).

Figure 2. Participant Motivations to Enroll in PAYS Program (n=526)



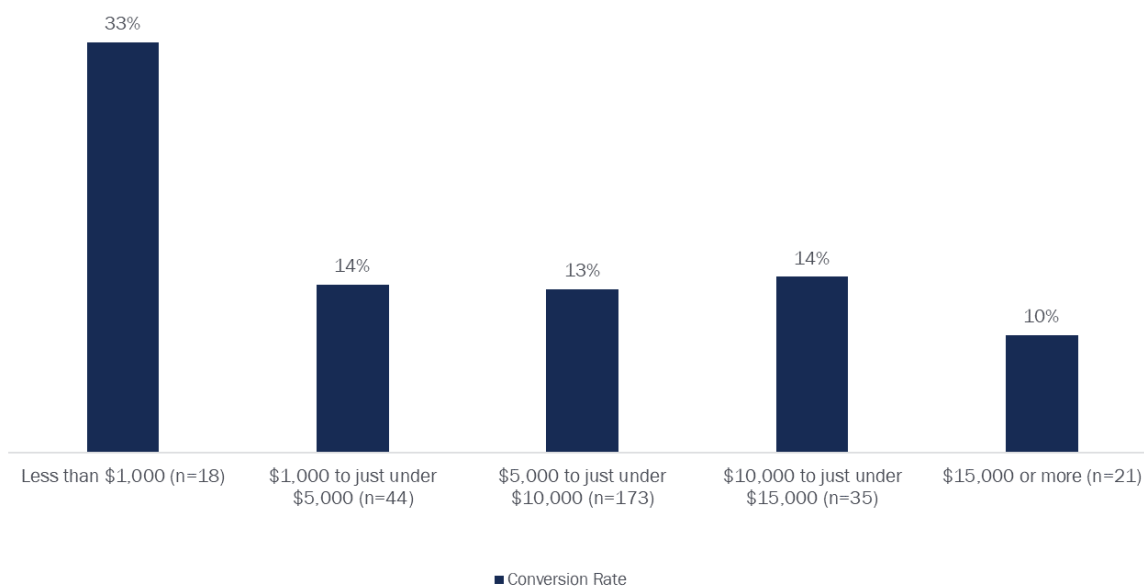
COPAY ANALYSIS

The evaluation team used data from the Enrollment Data Report and the Process Data Report to characterize copay amounts and explore any differences in the amounts quoted to those who moved forward with Tier 4 retrofits compared with those who did not. Among projects considered closed or paused by the implementation team, the median total copay amount for PY2023 was higher for those who received an Easy Plan and elected not to move forward with a Tier 4 project (\$7,905) when compared to those who did complete a Tier 4 project (\$6,981).¹⁹

We ran further analysis to compare copay amounts with conversion rates from Tier 3 to Tier 4. As seen in Figure 3, participants were far more likely to complete Tier 4 retrofits if their copay was under \$1,000. Thirty-three percent of the participants accepted the Easy Plan when the copay was less than \$1,000. At higher copay values, the conversion rate drops to 10%–14%.

¹⁹ The evaluation team used median values as the means are heavily influenced by the presence of strong outliers.

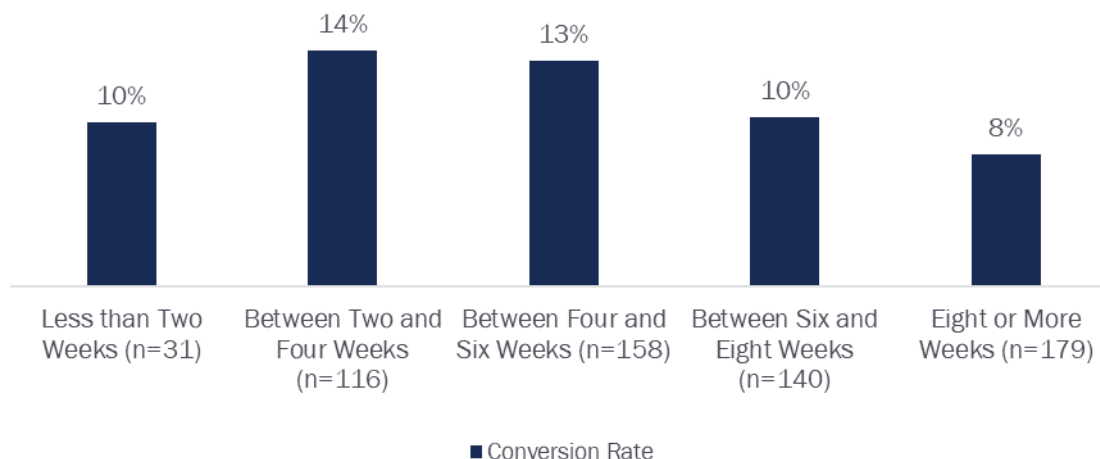
Figure 3. Distribution of Copay Amounts by Conversion Rate



EASY PLAN DELIVERY TIMELINE AND TIER 3 ATTRITION

We compared Tier 3 to Tier 4 conversion rates and the time between assessment and Easy Plan delivery but did not find a strong correlation between the period of time between assessments and Easy Plan delivery and the conversion rate to Tier 4 (see Figure 4Figure 3). Easy Plans delivered to participants two to six weeks after their assessment dates had a 13% to 14% chance of acceptance (i.e., converting to a Tier 4 project), whereas those delivered either less than two weeks or more than six weeks later were accepted 8% to 10% of the time.

Figure 4. Tier 3 to Tier 4 Conversion Rates and Time Between Assessment and Easy Plan Delivery (Weeks)



RESPONSES TO THE REQUIRED PROCESS EVALUATION QUESTIONS

To meet the requirements of the Missouri CSR for demand-side process evaluations, we provide responses to the five required process evaluation questions in Table 31.²⁰

Table 31. CSR-Required Process Evaluation Questions for PY2023

CSR-Required Process Evaluation Questions	Findings
What are the primary market imperfections that are common to the target market segment?	<p>At a high level, the primary market imperfection that the program addresses is the high upfront cost of energy efficiency home upgrades. Financing plays an important role in addressing this market imperfection by offsetting the upfront cost and ensuring manageable payments over time.</p> <p>Another market imperfection the program seeks to alleviate is split incentives. By tying the program cost to the premises rather than the participant, the program is designed to include renters who may not have been willing to invest in a temporary home previously. It also entices landlords who may have been unwilling to incur the cost of equipment upgrades that would provide cost savings for their tenants.</p>
Is the target market segment appropriately defined, or should it be further subdivided or merged with other market segments?	<p>The PAYS Program’s algorithms used for targeting are proprietary; however, the target market segment includes customers with single-family and multifamily residential homes with higher usage than the housing characteristics suggest. Only homes expected to have the required savings potential receive targeted marketing materials.</p> <p>There is no income requirement for the target market segment. As the program is intended to have no up-front cost, it is well-positioned to serve moderate-income customers who do not qualify for low-income incentives but cannot afford the up-front costs of weatherization and HVAC upgrades. That said, we note that most projects do have upfront costs in the form of a copay.</p>
Does the mix of enduse measures included in the program appropriately reflect the diversity of enduse energy service needs and existing enduse technologies within the target market segment?	<p>The PAYS Program includes a mix of enduse measures customized based on each home’s needs. Upgrades include LED lighting, domestic hot water, insulation, HVAC, and air sealing measures, among others.</p> <p>The addition of natural gas-derived technologies for PY2022 reflects an improvement from PY2021 to better reflect the diversity of the energy needs within the target market segment and to help make the program accessible for customers with natural gas heat.</p>
Are the communication channels and delivery mechanisms appropriate for the target market segment?	<p>The program uses a targeted marketing approach with “good fit” customers based on high energy usage and property characteristics. Targeted customers receive a home energy report as the primary marketing approach.</p> <p>Customers most often learned of the program via the Ameren Missouri website, but the vast majority suggested receiving program information and communications via email.</p>
What can be done to more effectively overcome the identified market imperfections and to increase the rate of customer acceptance and implementation for select enduses/measure groups included in the Program?	<p>Based on our PY2023 process analysis and the results from the PY2022 participant survey, higher copay amounts are correlated with a higher rate of drop-out before reaching Tier 4 and are a key barrier to retrofitting, which accounts for most of the energy savings. Moreover, higher copay amounts partially negate the program’s ability to address the market imperfection resulting from high up-front costs.</p>

²⁰ The Missouri Code of State Regulations (20 CSR 4240.22.070(A)) requires that demand-side programs operating as part of a utility’s preferred resource plan are subject to ongoing process and impact evaluations that meet certain criteria, including the process evaluation questions presented in this section. Please note, the reference for this CSR was previously 4 CSR 240-22.070(8).

6.4 CONCLUSIONS AND RECOMMENDATIONS

Based on the results of this evaluation, the evaluation team offers the following conclusions and recommendations for the PAYS Program moving forward:

- **Conclusion #1:** The program tracking data does not include existing domestic hot water heating fuel type for most Tier 1 projects. As a result, the evaluation team applied an unknown fuel mix of 42% electric and 56% natural gas to water heating end-use measures. The implementation team applied deemed savings values that embedded 100% electric water heating, thus overstating electric savings for these measures. Ameren Missouri-TRM Appendix F version 7.0 includes a PAYS Program deemed table where the appropriate hot water heating fuel assumptions are applied.
- **Recommendation:** We recommend that the implementation team track the domestic hot water heating fuel at each household to develop more accurate ex ante savings values. Alternatively, we recommend adopting the mix of water heating fuel types included in Appendix F version 7.0 deemed tables to ensure consistency between ex ante and ex post assumptions.
- **Conclusion #2:** Available data suggests that higher copay amounts can deter Tier 4 retrofit participation. In particular, participants who received an Easy Plan and a copay of \$1,000 or less were far more likely to elect to install Tier 4 measures when compared with those that have higher copay offers. This is consistent with participant research conducted in PY2022 that suggested that high upfront costs presented barriers to increasing PAYS participation.

7. COMMUNITY LIGHTING

This chapter summarizes the PY2023 evaluation methodology and results for the Community Lighting Program. The PY2023 evaluation of the Community Lighting Program consisted of a data review, interviews with program and implementation staff, and an engineering analysis to develop gross and net energy and demand savings estimates.

The Community Lighting Program aims to provide deeply discounted or free LEDs through two separate channels. The Upstream Channel offers point-of-purchase discounts on select standard and specialty LEDs sold at participating discount retail locations within Ameren Missouri service territory. The Food Bank Channel distributes four packs of standard LEDs and nightlights to partnering food pantry locations throughout Ameren Missouri service territory. The food pantries then distribute the packs and nightlights at no cost to their clientele.

7.1 PARTICIPATION SUMMARY

In PY2023, the Community Lighting Program distributed 1,230,594 LED bulbs, claiming 9,843 MWh and 1.51 MW in ex ante energy and demand savings, respectively. The Upstream Channel incented 292,554 bulbs sold at 49 participating discount retailer locations, while the Food Bank Channel distributed 938,040 bulbs across 93 participating food pantry locations. The Upstream Channel accounted for 24% of units sold and 17% of ex ante gross MWh and MW savings, while the Food Bank Channel accounted for the remaining 76% of units and 83% of ex ante savings. Standard LEDs accounted for the vast majority of units distributed through the Community Lighting Program, comprising 71% of Upstream Channel sales and 80% of Food Bank Channel. Table 32 summarizes participation and ex ante savings by channel and bulb type.

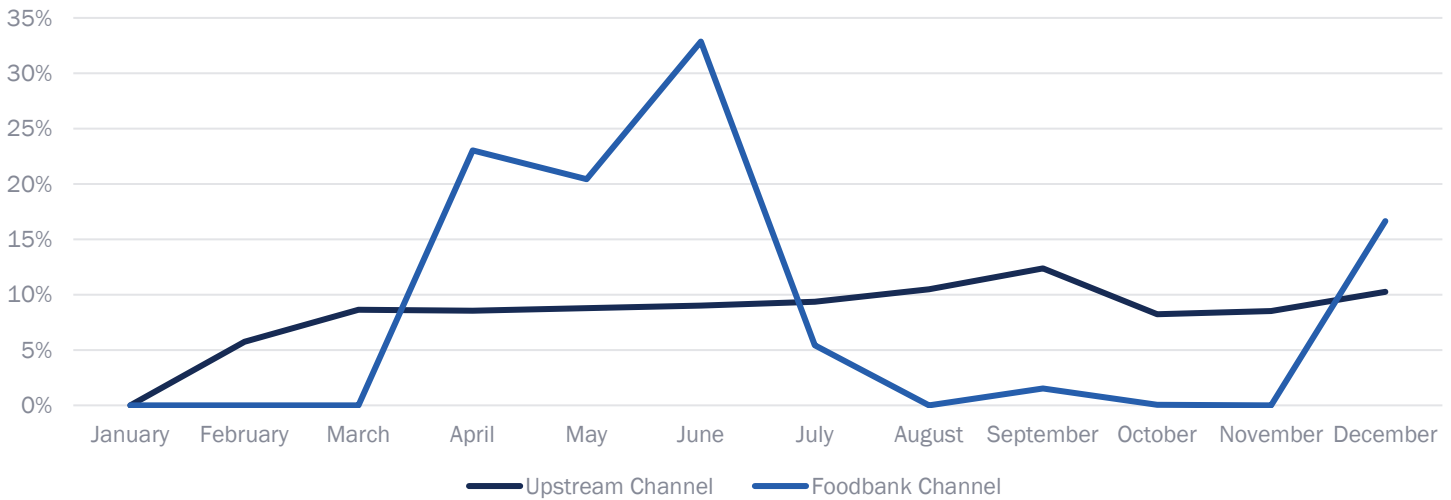
Table 32. PY2023 Lighting Program Detailed Participation Summary by Channel and Bulb Type

Bulb Type	Store/Food Bank Locations		Bulbs		Ex Ante Gross Savings			
	Number	%	Number	%	MWh	%	MW	%
Upstream Channel								
Standard	49	35%	206,386	17%	1,038	11%	0.16	11%
Reflector	15	11%	43,080	4%	417	4%	0.06	4%
Specialty	15	11%	43,088	4%	203	2%	0.03	2%
<i>Subtotal</i>	49	35%	292,554	24%	1,658	17%	0.26	17%
Food Bank Channel								
Standard	93	65%	750,432	61%	3,527	36%	0.55	36%
Nightlights	93	65%	187,608	15%	4,658	47%	0.70	47%
<i>Subtotal</i>	93	65%	938,040	76%	8,185	83%	1.25	83%
Total	142	100%	1,230,594	100%	9,843	100%	1.51	100%

The distribution of Community Lighting Program bulb sales across the year differed by channel. The Upstream Channel took a few months to build its distribution pipeline. Once established, there was a steady increase in bulb distribution throughout the year, with a slight increase in September. Conversely, the Food Bank Channel exhibited more variability in its distribution pattern. Most bulb distribution through this channel occurred during the summer months, with a slight uptick observed towards the end of the year. Implementation staff noted that tracking distribution through the Food Bank Channel is slightly more varied since bulbs are distributed to participating food bank distribution centers and then distributed across participating food bank locations. In contrast, the Upstream Channel demonstrated greater

consistency in sales and distribution of bulbs to end-users. Figure 5 shows the PY2023 distribution of bulbs by month for the Upstream and Food Bank Channels.

Figure 5. PY2023 Community Lighting Distribution Over the Calendar Year



7.2 EVALUATION METHODOLOGY

For PY2023, our team focused on gross impact evaluation efforts, supplemented by program staff interviews and program material review. Our impact evaluation included a review of the program-tracking databases and an engineering analysis to estimate ex post gross savings by applying appropriate TRM-recommended assumptions based on information available from PY2023 Community Lighting Program tracking data.

We began the PY2023 impact analysis by reviewing program-tracking data to verify that the data included the necessary level of detail and were free of any significant inconsistencies. We then calculated ex post gross savings using Ameren Missouri TRM algorithms and deemed savings assumptions. We calculated ex post net savings using a deemed NTGR of 1.0.

We conducted interviews with program administration and implementation staff in the third quarter of 2023. These interviews aimed to understand the program design, any changes that occurred throughout the year, and program staff perspectives on program implementation.

Table 33 provides an overview of the PY2023 evaluation activities for the Community Lighting Program.

Table 33. PY2023 Lighting Program Evaluation Activities

Evaluation Activity	Description
Program Manager and Implementer Interviews	Conduct interviews in Q3 of PY2023 to understand the program design, any changes that occurred throughout the year, and program staff perspectives on program implementation.
Program Material Review	Review any available program materials to inform evaluation activities.
Participant Survey	Conduct a survey with participants from Food Bank Channel to update parameters for gross impact analysis—e.g., measure in-service rates (ISRs).
Gross Impact Analysis—Database Review	Review the program database to check that program data are complete and within range and that program-incented measures meet all program requirements.

Evaluation Activity	Description
Gross Impact Analysis—Engineering Analysis	Verify that ex ante savings estimates used correct TRM algorithms and deemed savings values where applicable. Estimate overall and measure-level ex post gross impacts using TRM algorithms and deemed savings assumptions.
Net Impact Analysis	Estimate PY2023 net impacts, applying a deemed NTGR of 1.0.
Reporting	Develop the draft and final annual reports.

7.3 EVALUATION RESULTS

This section presents the PY2023 Community Lighting Program Evaluation results. Specifically, this section presents the gross impact results and the process evaluation findings, including responses to the five required evaluation questions outlined in the Missouri Code of State Regulations (CSR).

7.3.1 IMPACT RESULTS

This section summarizes impact results for the PY2023 Community Lighting Program. The Program realized ex post net energy and demand savings of 14,870 MWh and 2.28 MW, respectively. This represents 444% of ex post net energy savings targets and 455% of ex post net demand savings targets. The Community Lighting Program was the largest Residential program in the Low Income portfolio (66% of ex post energy savings and 49% of ex post demand savings). Table 34 presents overall first year ex ante and ex post gross savings and targets for PY2023.

Table 34. PY2023 Community Lighting Gross Impact Summary

Column	Ex Ante Gross	Gross Realization Rate	Ex Post Gross	NTGR	Ex Post Net	Goal/Target Net	% of Goal
Energy Savings (MWh)	9,843	162.8%	16,022	1.00	16,022	3,610	444%
Demand Savings (MW)	1.51	162.9%	2.46	1.00	2.46	0.54	455%

^a Per industry standard practice, we assume an NTGR of 100% for the Community Lighting Program.

The Community Lighting Program realized 162.8% of gross ex ante energy and 162.9% of demand savings in PY2023. Based on our engineering analysis, we attribute differences between ex ante and ex post gross savings to the following factors:

- Differences in LED wattage assumptions.** To calculate ex post gross energy and demand savings, we applied EISA-compliant baseline wattages recommended by the 2023 Ameren Missouri TRM 7.0 Appendix I. Ex ante values reflected baseline wattages embedded in deemed values from Appendix F of version 6.0 of the Ameren Missouri TRM. In contrast, the evaluation team assigned baseline wattages from Appendix I based on product-specific lumen outputs.
- This difference in baseline wattage assumptions resulted in a significant increase in ex post energy and demand savings for standard bulbs, a decrease for reflector bulbs, and a decrease for specialty bulbs relative to ex ante savings estimates. Assumptions reflecting CFL baseline wattages in Version 6.0 of the TRM (used for ex ante) were more efficient than the EISA-standard 45 lumens/watt baseline for several key standard LED categories. We adjusted the baselines for ex post calculations to be in line with the 45 lumens/watt standard, which caused the substantial increase in savings.
- Differences in ISR assumptions.** To calculate ex post gross energy and demand savings for the Upstream Channel, we applied ISRs of 88%, 90%, and 93% for standard, reflector, and specialty products, respectively, based on

Ameren Missouri TRM 7.0 recommendations. We applied an ISR of 93.1% for the Food Bank Channel based on a proxy value established as part of the current evaluation. Ex ante savings relied on deemed per-unit savings values from Appendix F of the Ameren Missouri TRM Version 6.0, which embedded a blended average ISR of 88.6% for all bulb types.

- This difference in the Upstream Channel’s ISR resulted in a decrease in ex post energy and demand savings for standard bulbs, an increase for reflector bulbs, and an increase for specialty bulbs relative to ex ante savings estimates.
- The difference in the Food Bank Channel’s ISR resulted in an increase in ex post energy and demand savings for both standard bulbs and nightlights relative to ex ante savings estimates.

Table 35 presents ex post gross energy and demand savings by channel and bulb type.

Table 35. PY2022 Community Lighting Gross Impacts by Channel and Bulb Type

Channel	Bulb Type	Ex Ante		Ex Post		Gross RR	
		kWh	kW	kWh	kW	kWh	kW
Upstream	Standard	1,038,473	161	2,484,209	385	239.2%	239.2%
	Reflector	417,014	65	287,839	45	69.0%	69.0%
	Specialty	202,514	31	233,001	36	115.1%	115.1%
Food Bank	Standard	3,527,030	547	8,150,567	1264	231.1%	231.1%
Food Bank	Nightlight	4,658,307	704	4,866,196	726	104.5%	103.2%
Total		9,843,338	1,508	16,021,813	2,457	162.8%	162.9%

Note: Savings values may not sum exactly due to rounding, and gross realization rate values shown are based on unrounded savings values.

7.3.2 PROCESS RESULTS

PROGRAM STAFF INTERVIEWS

Overall, there were only a few changes to the program design in PY2023, as noted below:

- The Program increased the budget and the total number of bulbs distributed through the Program due to high demand.
- The Program increased the number of participating locations in the Food Bank Channel to serve more low-income areas, particularly in rural areas.

Outside of these program changes, the Community Lighting Program encountered several implementation hurdles while experiencing notable success and positive reception of the two channels within the communities where they were implemented. One challenge faced by the program team involved preventing non-targeted customer segments from participating in the Program and diverting resources intended for income-qualified customers. To address this issue, the program team deliberately limited marketing efforts to avoid attracting non-targeted customers. Additionally, the team encountered difficulty in extending the budget to cover the entire program year while maximizing outreach to customers consistently throughout the year. To manage this challenge, the program team intentionally slowed down distribution to thrift locations to stretch the budget and ensure it lasted for the entirety of the program year.

FOOD BANK PARTICIPANT SURVEY

The evaluation team attempted to survey participants from the Food Bank Channel to update parameters related to gross impact analysis by measuring ISRs.²¹ The survey was deployed to 25 food bank locations using slips included in the distributed packs of bulbs. The evaluation team only received two responses to the survey, which proved insufficient to calculate the ISRs.

Due to insufficient data to calculate the ISR for the Food Bank Channel, the evaluation team explored other programs of similar scale and distribution to apply a proxy ISR value. The evaluation team reviewed several similar programs and deemed the ComEd CY2018 Food Bank LED Distribution Program to be the most similar in program design and bulb distribution.²²

DEMAND-SIDE PROCESS EVALUATION

Complementing the program team’s observations about PY2023, the evaluation team offers responses to the five process evaluation questions required by the Missouri Code of State Regulations (CSR) for demand-side process evaluations in Table 36. Given that the PY2023 evaluation focused on gross impacts, the findings here are based largely on impact-related research activities.

Table 36. Summary of Responses to CSR Process Evaluation Requirements

CSR Required Process Evaluation Questions	Findings
What are the primary market imperfections that are common to the target market segment?	Past evaluations and market research have found that the usage of energy-efficient bulbs varies considerably based on household income levels and specific lighting needs (e.g., socket types). Lower-income households exhibit lower levels of LED penetration and overall adoption of energy-efficient bulbs compared to higher-income counterparts. Previously, a common criticism of LEDs was their higher upfront cost; however, prices for LED bulbs have plummeted rapidly, reaching near parity with incandescent bulbs. This cost reduction could prove particularly beneficial to lower-income households, which typically allocate a larger portion of their income toward utility bills. Within the Community Lighting Program, an opportunity exists to enhance LED adoption among lower-income households by offering low or no-cost LED options. Nonetheless, it’s still essential to emphasize education regarding replacing incandescent bulbs.
Is the target market segment appropriately defined, or should it be further subdivided or merged with other market segments?	The defined target market encompasses individuals who qualify based on income criteria and reside in communities where a substantial portion of residents are eligible for income-based assistance within the service area of Ameren Missouri. This initiative caters to various income brackets by engaging through both Program channels.
Does the mix of enduse measures included in the program appropriately reflect the diversity of enduse energy service needs and existing enduse technologies within the target market segment?	Retailers in economically disadvantaged neighborhoods have been slower to transition away from energy-intensive bulbs, underscoring the importance of addressing market disparities in energy-efficient lighting adoption through programs such as the Food Bank Channel. As noted previously, we understand that adopting standard LED bulbs is less prevalent among low-income populations. As such, the mix of standard, reflector, and specialty bulb types still makes sense to offer to this population of Ameren Missouri residential customers.

²¹ The survey was deployed using slips included in the packs of bulbs distributed at food banks. In September 2023, 3,000 packs with survey slips were sent to roughly 25 food bank locations. Program staff reported that by November 1, 2023, all packs with slips had been distributed to food bank clients.

²² Commonwealth Edison (ComEd). *ComEd Food Bank LED Distribution Impact Evaluation Report*. Prepared by Naviant. April 8, 2019.

https://www.ilsag.info/wp-content/uploads/SAG_files/Evaluation_Documents/ComEd/ComEd_CY2018_Evaluation_Reports_Final/

[ComEd LED Food Bank CY2018 Impact Evaluation Report 2019-04-08 Final.pdf](#)

CSR Required Process Evaluation Questions	Findings
Are the communication channels and delivery mechanisms appropriate for the target market segment?	The communication channels and delivery mechanisms utilized by the Community Lighting Program demonstrate a tailored approach to reach the target market segment effectively. By leveraging customer-facing marketing initiatives and establishing strong partnerships with local stores, the program ensures that outreach efforts are well-informed and responsive to the needs of the community. This includes ongoing sales performance assessments and proactive measures to address gaps or requirements for additional support. Moreover, the program’s commitment to expanding its reach beyond St. Louis underscores a dedication to achieving equitable distribution, particularly in rural areas where access to energy-efficient resources may be more limited.
What can be done to more effectively overcome the identified market imperfections and to increase the rate of customer acceptance and implementation for select enduses/measure groups included in the Program?	In PY2023, the program increased the number of partnerships with participating food banks, which led to an increase in distributed bulbs and low-income customers served through the Food Bank Channel of the Community Lighting Program. The Channel should continue increasing marketing of its offerings to Food Banks within the Ameren Missouri Service territory while ensuring that the Program does not oversaturate participating locations with bulbs. The Program might consider including more education for bulb recipients about replacing incandescent bulbs to increase energy savings and decrease the energy burden among income-qualified customers.

7.4 CONCLUSIONS AND RECOMMENDATIONS

The evaluation team offers the following conclusions and recommendations for the Community Lighting Program:

- **Conclusion #1:** The Community Lighting Program maintained the Upstream channel of the program and extended the channel’s limited budget throughout the program year while drastically increasing participation in the Food Bank Channel, which was a main contributor to exceeding savings targets set for PY2023.
- **Conclusion #2:** The evaluation team applied EISA-compliant baseline wattages and bulb type-specific ISRs from the Ameren Missouri TRM Version 7.0 to calculate ex post energy and demand savings, whereas program-tracked ex ante savings relied on a blended average LED wattage and ISR assumptions embedded within per-unit savings provided by Appendix F of the Ameren Missouri TRM Version 6.0.
- **Recommendation:** To improve the accuracy of ex ante savings and align with Appendix I of the Ameren Missouri TRM version 7.0 recommendations, the implementation team should consider using the updated baseline wattages and bulb type-specific ISRs based on lumen categories to calculate ex ante savings.

8. MULTIFAMILY INCOME ELIGIBLE (MFIE)

This chapter presents the PY2023 evaluation methodology and results for the Multifamily Income Eligible (MFIE) Program. We present additional details on the methodology in Appendix A.

The MFIE Program, known to customers as the CommunitySavers® Multifamily Program, aims to deliver long-term energy savings and bill-reduction opportunities to income eligible Ameren Missouri customers living in multifamily properties. The program, which targets income eligible multifamily property managers and owners, provides a one-stop-shop approach to assist these customers in overcoming barriers to completing comprehensive retrofits. Eligible measures include lighting, advanced thermostats, advanced power strips, domestic hot water, building shell, and HVAC upgrades.

The target market for the MFIE Program includes multifamily properties with three or more units and high proportions of low-income residents. Approved participants must meet one of the following income requirements:

- They reside in a federal, state, or local subsidized housing property and fall within that program's income guidelines.
- They reside in nonsubsidized housing and provide proof of income levels at or below 80% of the area median income (AMI).
- They reside in a census tract where at least 85% of customers are at or below 80% of AMI.

Properties with a mix of qualifying and nonqualifying tenants can qualify the entire property if at least 50% of the tenants meet the income eligibility requirements.

Resource Innovations (RI) became the primary implementer of the MFIE Program in PY2022, taking over implementation from the International Center for Appropriate and Sustainable Technology (ICAST). As with the MFMR Program, the MFIE Program uses a one-stop-shop delivery model in which RI offers a suite of concierge-style services to assist participants in identifying and executing energy efficiency projects. RI spearheads customer recruitment, assists with the application process, and oversees participating Service Providers, who conduct energy use assessments to identify potential energy efficiency improvements and ultimately install the agreed-upon measures. RI staff also conduct post-installation QA/QC activities, submit final project data to Franklin Energy for invoicing, and provide customers with their rebates at the conclusion of the project.

Franklin Energy serves as the overall administrator of the program. They lead the development of marketing collateral (in collaboration with Ameren Missouri and RI), provide engineering oversight, and process incentive payments. Franklin Energy also facilitates communication between Ameren Missouri and the program implementation teams.

8.1 PARTICIPATION SUMMARY

In PY2023, the program treated 40 accounts across 80 projects.²³ The implementation of these projects led to the installation of 23,372 energy-efficient measures, as shown in Table 37.

Table 37. PY2023 Multifamily Income Eligible Participation Summary

Participation Metrics	Unique Accounts	Unique Projects	Measure Count
MFIE Program	40	80	23,372

²³ For projects that were completed in multiple phases, each phase is listed as a unique project in the program-tracking data. As a result, multiple projects can be associated with the same account.

Table 38 provides the quantity of each measure category delivered to participating customers through the MFIE Program. Residential HVAC systems (HVAC RES), common area lighting, and advanced thermostats contributed the most to ex ante energy savings, with 86% of total ex ante savings.

Table 38. PY2023 Multifamily Income Eligible Program Participation Summary by Measure Category

Measure Category	Number	Ex Ante Gross Savings	
		MWh	%
HVAC RES	913	4,669	63%
Common Area and Exterior Lighting	3,213	1,046	14%
Advanced Thermostat	1,626	632	9%
Electronically Commutated Motor (ECM)	556	324	4%
Filter Alarm	1,289	153	2%
Central Air Conditioner (CAC)	84	128	2%
In-Unit Lighting	14,324	126	2%
Showerhead	360	84	1%
HVAC BUS	2	74	1%
Faucet Aerator	775	47	1%
Ceiling Insulation	14	32	>1%
Advanced Power Strips Tier 2	199	30	>1%
Heat Pump Water Heater	1	21	>1%
Programmable Thermostat	16	4	>1%
Total	23,372	7,371	100%

Note: Values may not sum to the total presented due to rounding.

8.2 EVALUATION METHODOLOGY

The PY2023 evaluation focused on estimating energy and demand savings impacts to assess the performance of the MFIE Program. Table 39 provides an overview of the MFIE Program evaluation activities.

Table 39. PY2023 Evaluation Activities for the Multifamily Income Eligible Program

Evaluation Activity	Description
Program Manager and Implementer Interviews	<ul style="list-style-type: none"> Conducted interviews in Q3 of PY2023 to understand program design changes and program staff perspectives on program implementation.
Program Material Review	<ul style="list-style-type: none"> Reviewed any new program materials to inform evaluation activities.
Gross Impact Analysis—Database Review	<ul style="list-style-type: none"> Reviewed program database to check that program data are complete and within range and that program-incented measures meet all program requirements.
Gross Impact Analysis—Engineering Analysis	<ul style="list-style-type: none"> Verified that ex ante savings estimates used correct TRM algorithms and deemed savings values where applicable. Estimated overall and measure-level ex post gross impacts using TRM algorithms, deemed savings assumptions, and site-specific parameters for custom analyses. Developed average % energy savings per participating property.
Net Impact Analysis	<ul style="list-style-type: none"> Estimated PY2023 net impacts, applying a deemed NTGR of 1.0.
Reporting	<ul style="list-style-type: none"> Developed the draft and final annual reports.

8.2.1 IMPACT ANALYSIS

The PY2023 program-tracking database included two types of measures: (1) prescriptive measures identified with specific TRM IDs and (2) “custom” measures identified only in terms of their enduse but without any additional measure-specific information. For prescriptive measures, the engineering analysis included a review of ex ante values and the development of ex post values using TRM algorithms, deemed savings assumptions, and site-specific parameters available in the program-tracking data. For custom measures, the program-tracking database did not contain information sufficient to verify ex ante savings; this information was only available in project-specific custom workbooks. Given the large number of custom projects in PY2023, we took a sample-based approach, as described below.

ANALYSIS OF CUSTOM PROJECTS

The PY2023 program-tracking database included 66 MFIE custom projects with electric measures. We reviewed a random sample, stratified by enduse, of 20 custom projects. We selected the sampling approach and sample sizes based on the number, type, and size of custom projects, targeting 10% relative precision at the 90% confidence level (90/10), where possible. Table 40 summarizes the sample for the custom reviews.

Table 40. Multifamily Income Eligible Program Custom Project Sampling Summary

Enduse	Total Ex Ante Custom Energy Savings (MWh)	Number of Custom Projects	
		Population	Project Reviews
Residential HVAC	4,669	41	10
Business Lighting	1,046	10	5
Residential Lighting	126	14	4
Business HVAC	74	1	1
Total	5,916	66	20

Note: Values may not sum to the total presented due to rounding.

The custom reviews consisted of a desk review of the workbooks provided by the program implementer. The main purpose of the reviews was to verify that the ex ante analysis correctly reflected the installed measures, including equipment types and quantities, efficiencies, baseline assumptions, and other information needed to estimate gross energy and demand savings. Based on the information provided in the workbooks, we developed project-level ex post savings estimates. We aggregated the project-level results to the enduse level by applying weights that reflect (1) the relative size of each project within the sample and (2) the probability of each project being sampled. We then used the enduse-level realization rates to adjust the ex ante savings for the population of custom projects.

8.2.2 AVERAGE PERCENT ENERGY SAVINGS METRIC

The evaluation team provides the two key inputs to calculating the average percent of energy savings for the MFIE Program, including evaluated energy savings and total billed energy consumption for the 12 months prior to participation (pre-period consumption). These items enable the calculation of the average percent energy savings per property metric by dividing the program’s total ex post energy savings by the total pre-period consumption for all the properties served during the program year. The metric estimates the first year energy savings as a share of pre-period energy consumption for all participant properties (i.e., including energy consumption from non-participating units within a participating building).

We used information collected from Ameren Missouri’s customer billing data, Resource Innovations’ premise data, and PY2023 program-tracking data to calculate pre-period consumption. The evaluation team reviewed all datasets for accuracy and completeness. The data sources included the following:

- **Program-Tracking Data:** Franklin Energy provided the evaluation team with participant tracking files for the MFIE Program, including all PY2023 program participants through December 2023. These files contained unique customer identifiers, contact information, participation date, measures installed, and ex ante savings.
- **Premise Data:** Resource Innovations provided data with unique premise identifiers for the MFIE Program. The data included unique premise identifiers, project names, project start dates, and the annual usage data for each premise. These data included participating and non-participating premises in treated buildings.
- **Customer Billing Data:** Ameren Missouri provided historic electric billing data for all electric customers through December 2023. The billing data included premise number, street address, city, and monthly kWh usage for each premise from the year before the project start date.

As the first analysis step, we created a variable for the start date of the usage period for each premise by subtracting one year from the start date of the project provided by Resource Innovations. The evaluation team dropped any premises associated with projects initiated in PY2022 and kept only premises associated with projects initiated and completed in PY2023, as the metric only includes projects initiated and completed within the program year. We then requested total electric consumption data from Ameren Missouri for each premise between the start date and end date provided in the dataset.

8.3 EVALUATION RESULTS

8.3.1 IMPACT RESULTS

This section summarizes impact results for the PY2023 MFIE Program. The MFIE was the second-largest residential program in the Low Income Portfolio in terms of ex post net energy and demand savings (29% of energy and 40% of demand). Table 41 compares first year ex ante and ex post gross savings at the program level. The ex post savings are 96% and 90% of the ex ante savings for energy and peak demand, respectively, and achieved 7,055 kWh and 2.03 kW of net energy and demand savings. The program achieved 121% of Ameren Missouri’s first year gross energy savings goal and 127% of the first year demand savings goal.

Table 41. PY2023 Multifamily Income Eligible Gross Impact Summary

	Ex Ante Gross	Gross Realization Rate	Ex Post Gross	NTGR ^a	Ex Post Net	Goal/Target Net	% of Goal
Energy Savings (MWh)	7,371	95.7%	7,055	1.000	7,055	5,853	121%
Demand Savings (MW)	2.26	89.5%	2.03	1.000	2.03	1.60	127%

^a Per industry standard practice, we assume an NTGR of 100% for the Multifamily Income Eligible Program.

The evaluation team completed analyses of savings associated with the following measure categories: dirty filter alarms, electrically commutated motors, residential and common area HVAC (HVAC RES, HVAC BUS); in-unit, common area, and exterior lighting (Lighting RES, Lighting BUS); advanced and programmable thermostats (HeatCool); central air conditioning replacements (Cooling RES); showerheads and faucet aerators (Water heating RES); ceiling insulation improvements (Building Shell RES); miscellaneous efficient equipment like advanced power strips (Miscellaneous RES); and common area heat pump water heaters (Water Heating BUS).

Table 42 summarizes the total PY2023 MFIE Program ex ante and ex post energy and demand savings and realization rates by enduse. The Program has realization rates of 96% and 90% for energy and demand savings, respectively. The top three enduses contributing to the realization rates are HVAC RES, Lighting BUS, and HeatCool. HVAC RES, constituting 71% (4,990 MWh) of ex post energy savings, achieved realization rates of 97% and 92% for energy and demand savings, respectively. Lighting BUS, which contributed 13% (947 MWh) to ex post energy savings, demonstrated a realization rate of 91% for both energy and demand savings. HeatCool represents 8% (585 MWh) of ex post energy savings and achieved a 92% realization rate for energy savings but a lower rate of 76% for demand savings. Other enduses individually account for less than 5% of ex post energy savings and collectively represent approximately 8% of the program-wide ex post demand savings.

Table 42. PY2023 Multifamily Income Eligible Program Gross Savings by Enduse

Enduse	Energy Savings			Demand Savings		
	Ex Ante (MWh)	Realization Rate	Ex Post (MWh)	Ex Ante (MW)	Realization Rate	Ex Post (MW)
HVAC RES	5,146	97.0%	4,990	1.58	92.3%	1.46
Lighting BUS	1,046	90.5%	947	0.20	90.5%	0.18
HeatCool	636	91.9%	585	0.30	76.1%	0.23
Water Heating RES	130	125.6%	164	0.01	125.6%	0.01
Cooling RES	128	77.6%	99	0.12	77.6%	0.09
Lighting RES	126	100.0%	126	0.02	102.0%	0.02
HVAC BUS	74	100.0%	74	0.01	100.0%	0.01
Building Shell RES	32	108.7%	35	0.02	108.9%	0.02
Water Heating BUS	30	101.3%	31	<0.01	101.3%	<0.01
Lighting BUS	21	16.9%	4	<0.01	16.9%	<0.01
Total	7,371	95.7%	7,055	2.26	89.5%	2.03

Note: Values may not sum to the total presented due to rounding.

Table 43 summarizes the MFIE Program's total PY2023 first year ex ante and ex post electric energy and demand savings and realization rates by measure category.

Table 43. PY2023 Multifamily Income Eligible Program Gross Savings by Measure Category

Measure Category	Energy Savings			Demand Savings		
	Ex Ante (MWh)	Realization Rate	Ex Post (MWh)	Ex Ante (MW)	Realization Rate	Ex Post (MW)
HVAC RES	4,669	99.1%	4,625	1.36	94.9%	1.29
Common Area and Exterior Lighting	1,046	90.5%	947	0.20	90.5%	0.18
Advanced Thermostat	632	92.0%	581	0.30	76.0%	0.22
Electronically Commutated Motor (ECM)	324	65.5%	212	0.15	65.5%	0.10
Filter Alarm	153	100%	153	0.07	100.0%	0.07
Central Air Conditioner (CAC)	128	77.6%	99	0.12	77.6%	0.09
In-Unit Lighting	126	100.0%	126	0.02	102.0%	0.02
Showerhead	84	100.0%	84	0.01	100.0%	0.01
HVAC BUS	74	100.0%	74	0.01	100.0%	0.01
Faucet Aerator	47	171.4%	80	<0.01	171.4%	0.01
Ceiling Insulation	32	108.7%	35	0.02	108.9%	0.02
Advanced Power Strips Tier 2	30	101.3%	31	<0.01	101.3%	<0.01

Measure Category	Energy Savings			Demand Savings		
	Ex Ante (MWh)	Realization Rate	Ex Post (MWh)	Ex Ante (MW)	Realization Rate	Ex Post (MW)
Heat Pump Water Heater	21	16.9%	4	<0.01	16.9%	<0.01
Programmable Thermostat	4	88.5%	4	<0.01	85.0%	<0.01
Total	7,371	95.7%	7,055	2.26	89.5%	2.03

Note: Values may not sum to the total presented due to rounding.

CUSTOM ANALYSIS RESULTS

While the tables in the previous section include the results from all projects, Table 44 presents the results of the gross savings analysis for the 20 sampled custom projects, organized by measure category. Of all sampled custom projects, the ex post savings for Lighting BUS measures deviated most from ex ante estimates, with realization rates of 90.5% for both energy and demand savings. Additionally, ex post demand savings for custom HVAC RES projects deviated slightly from ex ante estimates, with a realization rate of 94.9%.

Table 44. PY2023 Multifamily Income Eligible Program Custom Gross Savings by Measure Category

Measure Category	Energy Savings			Demand Savings		
	Ex Ante (MWh)	Realization Rate	Ex Post (MWh)	Ex Ante (MW)	Realization Rate	Ex Post (MW)
HVAC RES	1,310	99.1%	1,297	0.21	94.9%	0.20
Lighting BUS	624	90.5%	564	0.12	90.5%	0.11
HVAC BUS	74	100.0%	74	0.01	100.0%	0.01
Lighting RES	54	100.0%	54	0.01	102.0%	0.01

As outlined in Section 8.2.1, we used the enduse-level realization rates to adjust the ex ante savings for the population of custom projects. We include a description of the drivers of variances between ex ante and ex post energy and demand savings in the following section.

EXPLANATION OF DISCREPANCIES

Discrepancies between ex ante savings and ex post savings stem from multiple sources. The following list highlights the largest contributors to differences between ex ante and ex post savings:

- HVAC RES (66% of ex post energy savings and 64% of ex post demand savings):** The gross realization rate is 99.1% for energy savings and 94.9% for demand savings.
 - Four records included in the sample for this measure category involved an existing system over 30 years old. According to the TRM, the SEER for an existing unit should be derated by the age of the system up to a maximum of 30 years. As such, the evaluation team applied the 30-year maximum age to derate the SEER for the four records where systems were more than 30 years old. However, ex ante savings estimates did not apply to the 30-year cap when derating the SEER. This resulted in lower ex post savings for energy and demand than ex ante estimates, lowering realization rates.
 - For three records in the sample, the ex ante savings estimates were based on the CF from the business HVAC enduse in the TRM. However, the enduse of the three projects is residential HVAC. Using the residential HVAC CF increased demand savings for the measure.
- Lighting BUS (13% of ex post energy savings and 9% of ex post demand savings):** The gross realization rate is 90.5% for both energy and demand savings.

- For one record, the ex ante estimate was based on an incandescent baseline. The evaluation team used the EISA standard baseline (45 Lumens/Watt) for ex post calculations because these records had installation dates after August 1, 2023. Using the EISA standard baseline decreased ex post savings for these records.
- The ex ante savings estimates for three records were based on rounded values. The evaluation team did not round values in calculating ex post savings. This increased the realization rate for demand savings.
- **Advanced Thermostats (8% of the ex post energy savings and 11% of ex post demand savings):** The gross realization rate is 92% for energy savings and 76% for demand savings.
 - Savings estimates for advanced thermostat projects involve inputs from the type of system the thermostat controls. Ex ante savings estimates were based on default assumptions for the existing HVAC equipment from Missouri TRM Appendix F, Version 6.0, while the evaluation team used key inputs for the controlled equipment from the program-tracking data for ex post savings calculations.
 - For eight projects, key inputs from the program-tracking data (e.g., Base Heating/Cooling and SEER) differed from the parameters applied in the ex ante savings estimates. This lowered the realization rates for both energy and demand savings.
 - The evaluation team also found that 18 advanced thermostat projects co-occurred with a custom HVAC project. For these cases, the evaluation team used the inputs from the corresponding custom measures (e.g., Heating Equipment, Cooling Equipment, and Efficient SEER); however, the ex ante estimates were based on the parameters of the replaced equipment. This decreased the realization rates for energy and demand savings for these projects.

AVERAGE PERCENT SAVINGS METRIC

The primary performance metric for the MFIE Program is the average percent energy savings per participating property. This performance metric is meant to encourage the pursuit of deeper savings per property and provide a holistic assessment of the program’s impact. The program team aims to achieve an average of 15% of energy savings per property across the channel.

Table 45 summarizes the key inputs for calculating the average percent energy savings according to the 2019–21 MEEIA Energy Efficiency Plan guidance. We calculated the average percent energy savings per property as total ex post energy savings divided by the total billed energy consumption at participating properties for the twelve months prior to program participation. Additionally, only projects that started and ended within the program year are included in this calculation. Ex post savings—based on engineering approaches using the Ameren Missouri TRM and desk reviews—equate to 31% of the recorded baseline energy use. These results are largely attributable to the high incidence of HVAC measures and indicate that the program team successfully delivered comprehensive projects to participants.

Table 45. PY2023 Multifamily Income Eligible Program Average Energy Savings Per Property

Metric	Value
Ex post gross energy savings (kWh) [A]	3,754,836
Total billed pre-participation energy consumption (kWh) [B]	12,251,517
Average percent energy savings per property [A/B]	31%

8.3.2 PROCESS RESULTS

The MFIE Program aims to provide one-stop-shop services to assist owners and managers of income eligible multifamily properties with identifying and implementing comprehensive energy efficiency projects that result in deep savings and bill reductions for Ameren Missouri customers.

Throughout PY2023, the program team worked to improve upon the processes it established during its first year of implementation in PY2022. The program team maintained its network of preferred contractors, to whom the program team can refer projects as they come in from customer inquiries. The team also worked to enroll new contractors as Trade Allies. Newly enrolled contractors complete an hour-long onboarding that provides an orientation to the program workflow and contractor responsibilities and goals for each project stage.

There were no changes to program design between PY2022 and PY2023. However, the implementation team made one notable change to their implementation process. Beginning in PY2023, the MFIE program team began providing additional support to contractors when completing data entry for their projects. Whereas the PY2022 program guidelines involved contractors being primarily responsible for data entry, in PY2023, the program team worked with contractors to co-enter and check project information entered in PowerPath, the MFIE program-tracking database. The program implementation team noted that, even with this additional support, contractors did not always provide sufficient detail in PowerPath, which lengthened the process of confirming project information. Specifically, the implementation team found that in several cases, information entered into PowerPath as seen on contractor work orders, did not match as-built conditions at participating sites.

Complementing the program team’s observations about PY2023, the evaluation team offers responses to the five process evaluation questions required by the Missouri Code of State Regulations (CSR) for demand-side process evaluations in Table 46. Given that the PY2023 evaluation did not include process evaluation activities, the findings here are based largely on process evaluation activities conducted in PY2020.

Table 46. Summary of Responses to CSR Process Evaluation Requirements

CSR Required Process Evaluation Questions	Findings
What are the primary market imperfections that are common to the target market segment?	Market imperfections specific to the multifamily sector include (1) the split incentive for in-unit measures between property owners, managers, and residents; ^a (2) a lack of awareness about the potential for saving money and energy through energy efficiency upgrades; (3) costs associated with energy efficiency upgrades; (4) knowledgeable staff available to install energy-efficient upgrades; and (5) the time investment to plan, budget, and implement energy efficiency upgrades.
Is the target market segment appropriately defined, or should it be further subdivided or merged with other market segments?	Yes, the target market is appropriately defined as a building including three or more units with Ameren Missouri electric service and located in an area where most residents have an annual income at or below 80% of AMI. This program also addresses multifamily property needs for both common area and in-unit upgrades.
Does the mix of enduse measures included in the program appropriately reflect the diversity of enduse energy service needs and existing enduse technologies within the target market segment?	Yes, the program offers measures that cover all major multifamily common area and in-unit enduse needs, including lighting, appliances, space cooling, space heating, building shell (e.g., insulation and windows), and water heating. The program team can continue increasing the comprehensiveness of solutions offered to the target market segment by encouraging participation in the one-stop-shop channel.
Are the communication channels and delivery mechanisms appropriate for the target market segment?	The primary recruitment channel is RI’s network of relationships with local contractors and larger property management companies. The program also leverages relationships with community-based organizations and trade organizations. This varied approach generates participation from varying customer types in the target market segment.

CSR Required Process Evaluation Questions	Findings
What can be done to more effectively overcome the identified market imperfections and to increase the rate of customer acceptance and implementation for select enduses/measure groups included in the Program?	<p>One potential strategy to overcome split incentive issues is the promotion of Green Leases.^b Green Leases are contracts between landlords and a tenant or tenants that negotiate the mutual benefit of installing energy-efficient or green measures in shared buildings. Owners are burdened with green upgrade costs for shared buildings, while tenants benefit from lower operating costs. Without green leases, there is little incentive for owners to make green upgrades to tenant units. Green leases allow both parties financial benefits and incentives, and multifamily building types are ideal buildings for their use.</p> <p>The other market imperfections outlined above are largely targeted by the program’s one-stop-shop model. As such, increasing participation and the share of projects in the program utilizing those services should help to overcome imperfections, such as lack of awareness and information, project costs, limited staff knowledge, and the time needed to plan efficiency projects more effectively.</p>

^a The split incentive occurs when the tenant pays the cost of the electricity use, but the owner is responsible for choices that affect building and equipment efficiency.

^b Consortium for Building Energy Innovation (CBEI). “Creating an Energy Savings Win-Win for Owners and Tenants.” *Split Incentives and Green Leases*. Last modified July 27, 2020. <http://www.cbei.psu.edu/split-incentives-and-green-leases/index.html>.

8.4 CONCLUSIONS AND RECOMMENDATIONS

Based on the results of this evaluation, the evaluation team offers key conclusions and recommendations for the MFIE Program moving forward:

- **Conclusion #1:** The overall program realization rate is 96% for energy and 90% for demand and is largely driven by three factors. The first factor involves custom projects in the HVAC enduse. According to the TRM, the SEER values of units replaced through the program (i.e., SEERexist) for ASHPs and similar measures should be derated by the age of the existing equipment up to a maximum of 30 years. However, measures with ages that exceeded 30 years were used. Second, in some cases in the custom analysis, the EISA standard baseline was not used for common area LEDs installed after August 1, 2023. Finally, the advanced thermostats installed with new efficient HVAC equipment used the original baseline for the controlled equipment when deriving savings instead of the newly installed equipment.

 - **Recommendation:** The TRM allows up to and including an age of 30 when derating the SEER of existing equipment. We recommend applying this age cap to ensure better alignment with the TRM when working with custom measures. Additionally, ensure that projects involving the installation of an advanced thermostat and new HVAC equipment use efficient equipment to determine the proper deemed savings for the installation.
- **Conclusion #2:** The only source of the discrepancy for ECMs between ex post and ex ante is the condition in which savings can be claimed. According to the CFR (430.32(y)), ECMs are part of the baseline for new construction, replace-on-fail, time-of-sale, and early replacement scenarios. Because of this, ECM savings can only be claimed when a ducted system exists for the project.

 - **Recommendation:** We recommend ensuring that ECM savings are only claimed when baseline equipment is centrally ducted, not when baseline equipment is a baseboard heating or room air conditioning unit.
- **Conclusion #3:** In the heat pump water heater (HPWH) prescriptive analysis, the deemed savings from Version 6.0 of the TRM used in ex ante calculations did not characterize the measure correctly due to a difference in inputs that determine the deemed savings. The TRM deemed savings calculation for HPWH used a capacity that does not apply to multifamily buildings. The capacity used to determine the deemed savings value differed greatly from the value used in the program tracking data.

- **Recommendation:** We suggest updating the TRM and Appendix F to have a version closer to the expectations of a multifamily building in the income eligible section. The program team could also expand the business section to include multifamily capacities and inputs to address this discrepancy.
- **Conclusion #4:** Consistent with PY2022, the current program-tracking database lacks key inputs for calculating ex ante energy and demand savings and verifying ex post savings. The missing inputs and supporting information are often only available in external documents such as the project-specific or custom workbooks provided by the implementation team.
- **Recommendation:** For projects using site-specific, “custom” parameters, project workbooks include detailed documentation of the development of ex ante estimates. We recommend that the implementation team incorporate more of the key parameters from these workbooks into the program-tracking database, given their use in prescriptive algorithms (e.g., cooling capacity, heating capacity, and baseline conditions, which were all provided but not for every record in the database). We also recommend that all custom workbooks in future program years include project summaries and information on the sources of energy savings. Incorporating these inputs into the tracking database will improve the efficiency of program quality control measures and may also positively impact gross realization rates.

9. SINGLE FAMILY INCOME ELIGIBLE (SFIE)

This chapter summarizes the PY2023 evaluation methodology and results for the Residential Single Family Income Eligible (SFIE) Program. We present additional details on the methodology in Appendix A.

The Single Family Income Eligible (SFIE) Program, known to customers as the CommunitySavers® Single Family Program, aims to provide whole-home energy efficiency upgrades to income eligible Ameren Missouri customers living in single family properties, including duplexes, triplexes, and fourplexes. The Program focuses on providing income eligible customers with a free walkthrough home energy assessment, direct installation of low-cost energy efficiency measures, and installation of home weatherization measures (including minor repairs needed to install these measures), along with information about behavioral improvements and other Ameren Missouri programs. The implementation team primarily recruits participants through partnerships with large housing organizations and trusted community groups. Additionally, in PY2023, Ameren Missouri provided room air conditioners to customers through the Grant channel by partnering with Cool Down St. Louis.

From a program implementation perspective, the roles and responsibilities of Franklin Energy and Resource Innovations (RI) largely remained the same as in PY2022. RI serves as the program implementer, leading customer recruitment efforts, managing sub-contractors, collecting program-tracking data, and transferring data to Franklin Energy. Franklin Energy is the program administrator, reviewing the data submissions and savings calculations, batching invoices, and processing incentives. Franklin Energy also aggregates program-tracking data and provides regular reports on program activity to Ameren Missouri. For grant funding activities, Franklin Energy works closely with Ameren Missouri to administer and implement the offerings.

9.1 PARTICIPATION SUMMARY

The SFIE Program comprises two channels: the Single Family Channel and the Grant Channel. The program team treated 456 participants through the Single Family Channel in PY2023, which accounted for 94% of program ex ante savings. The Grant Channel accounted for 6% of program ex ante savings. Across both channels, the program team distributed 5,252 measures. Table 47 presents participation in the SFIE Program during PY2023 by channel.

Table 47. PY2023 Single Family Income Eligible Program Participation Summary

Program Component	Participants		Measures		Ex Ante Gross Savings	
	Number	%	Number	%	MWh	%
Single Family	456	100%	4,402	84%	1,080	94%
Grant			850	16%	63.8	6%
Total	456	100%	5,252	100%	1,144	100%

9.2 EVALUATION METHODOLOGY

The evaluation team focused on impact evaluation activities in PY2023 to assess the performance of the SFIE Program. Table 48 provides an overview of the SFIE evaluation activities.

Table 48. PY2023 Single Family Income Eligible Program Evaluation Activities

Evaluation Activity	Description
Program Manager and Implementer Interviews	<ul style="list-style-type: none"> Conducted interviews in Q3 of PY2023 to understand program design changes and program staff perspectives on program implementation.
Program Material Review	<ul style="list-style-type: none"> Reviewed any new program materials to inform evaluation activities.
Gross Impact Analysis—Database Review	<ul style="list-style-type: none"> Reviewed the program database to check that program data are complete and within range and that program-installed measures meet all program requirements.
Gross Impact Analysis—Engineering Analysis	<ul style="list-style-type: none"> Verified that ex ante savings used the correct TRM-deemed savings values. Estimated overall and measure-level ex post gross impacts using TRM algorithms, deemed savings assumptions, and parameters estimated from previous evaluations.
Net Impact Analysis	<ul style="list-style-type: none"> Estimated PY2023 net impacts, applying a deemed NTGR of 1.0.
Reporting	<ul style="list-style-type: none"> Developed the draft and final annual reports.

9.3 EVALUATION RESULTS

9.3.1 IMPACT RESULTS

This section summarizes impact results for the PY2023 SFIE Program. Overall, the SFIE Program was the smallest residential program in the PY2023 Low Income Portfolio, accounting for 5% of ex post Low Income Portfolio energy savings and 11% of ex post Low Income Portfolio demand savings.

As presented in Table 49, the PY2023 SFIE Program achieved 1,122 MWh and 0.56 MW in ex post gross first year savings, resulting in 88% and 90% realization rates, respectively, which achieved 103% of Ameren Missouri’s net energy savings goal and 123% of the net demand savings goal.

Table 49. PY2023 Single Family Income Eligible Gross Impact Summary

	Ex Ante Gross	Realization Rate	Ex Post Gross	NTGR ^a	Ex Post Net	Goal/Target Net	% of Goal
Energy Savings (MWh)	1,270	88.4%	1,122	100%	1,122	1,087	103%
Demand Savings (MW)	0.63	89.6%	0.56	100%	0.56	0.46	123%

^a Per industry standard practice, we assume an NTGR of 100% for the Single Family Income Eligible Program.

Table 50 shows the ex ante and ex post gross first year energy and demand savings and the associated realization rates by measure. While realization rates for most measure categories are close to 100%, lower realization rates for two key measures (Air Source Heat Pumps and Central Air Conditioners) drove the overall program realization rates to 88% and 90% for energy and demand savings, respectively. ASHP measures account for the largest portion of ex post energy savings (393 MWh, 35%) and have realization rates of about 81% and 82% for energy and demand savings, respectively. Central Air Conditioner measures account for the next largest share of ex post savings (285 MWh, 25%) and have an 83% realization rate for energy and demand savings. Additionally, ECM auto fans and learning thermostats accounted for the third and fourth highest share of program savings (143 MWh and 13% for ECMs and 84 MWh and 8% for learning thermostats). All other measures account for no more than 6% of program savings individually and only about 19% of ex ante program energy savings combined.

Table 50. PY2023 Single Family Income Eligible Program Gross Savings by Measure

Measure Category	Energy Savings			Demand Savings		
	Ex Ante (MWh)	Realization Rate	Ex Post (MWh)	Ex Ante (MW)	Realization Rate	Ex Post (MW)
Air Source Heat Pump	483	81.4%	393	0.089	82.4%	0.074
Central Air Conditioner	342	83.4%	285	0.324	83.4%	0.270
ECM Auto Fan	126	113.3%	143	0.059	113.2%	0.067
Learning Thermostat	104	80.9%	84	0.049	98.8%	0.049
Room Air Conditioner	68	99.1%	67	0.064	99.1%	0.064
Refrigerator	51	100.0%	51	0.007	100.0%	0.007
Ceiling Insulation	28	105.3%	29	0.013	102.4%	0.013
Filter Alarm	15	100.0%	15	0.007	100.0%	0.007
Advanced Power Strips	13	100.0%	13	0.002	100.0%	0.002
Lighting	11	102.1%	11	0.002	102.1%	0.002
Air Sealing	8	102.5%	8	0.004	93.4%	0.003
Low Flow Faucet Aerator	6	111.1%	7	0.001	111.1%	0.001
Programmable Thermostat	5	45.4%	2	0.005	45.5%	0.002
Tune-Up	4	82.8%	4	0.004	82.8%	0.003
Low Flow Showerhead	4	184.7%	8	<0.001	184.7%	0.001
Duct Repair	0.1	100.2%	0.1	<0.001	100.2%	<0.001
Total	1,270	88.4%	1,122	0.629	89.6%	0.564

Note: Values may not sum to the total presented due to rounding.

REASONS FOR DISCREPANCIES

Discrepancies between ex ante savings calculated by the program team and ex post savings calculated by the evaluation team are primarily driven by the evaluation team's use of participant-specific information from the program-tracking data when available instead of default values from Version 6.0 of the TRM .

Below, we describe the key drivers of differences between ex ante and ex post savings for individual measures.

- Air Source Heat Pump (35% of ex post energy savings and 13% of ex post demand savings):** The gross realization rate for ASHPs is 81% for energy savings and 82% for demand savings. The discrepancies and the ex post adjustments include:
 - Ex ante savings estimates were based on an average default TRM savings value; however, the evaluation team used the installed and cooling/heating capacity values from the program-tracking data for ex post calculations. This lowered energy and demand savings, driving down the realization rate for this measure.
 - Ex ante savings estimates used energy savings for single family measures as a default for multifamily residences. For ex post calculations, the evaluation team relied on program-tracking data, which included information on building type. According to program-tracking data, about 20% of all ASHP records were installed in multifamily residences. In our ex post analysis, we updated measure codes and savings for these multifamily installations, which decreased savings for these records.
 - All ASHP installations were claimed as early replacement (ER). The estimation of ER savings requires a baseline SEER value that is derated based on the age of the existing equipment, capped at 30 years. For ex ante savings calculations, the existing equipment age was derated but not capped at 30 years; however, the evaluation team

capped the equipment age at 30 years for ex post savings calculations. When the equipment age value was missing, we used a default age of 12 years, as specified in the TRM, to derate the existing SEER, which slightly lowered energy and demand savings.

- **Central Air Conditioner (25% of ex post energy savings and 48% of ex post demand savings):** The gross realization rate for central air conditioners is 83% for both energy and demand savings. The discrepancies and the ex post adjustments include:
 - Ex ante savings estimates were based on average default TRM savings values. For the ex post analysis, we applied the installed SEER and cooling capacity values from the program-tracking data, which lowered energy and demand savings.
 - Program-tracking data included information on building type, but ex ante savings estimates incorrectly used energy savings for single family measures as a default for multifamily residences. About 12.5% of all central air conditioner records indicate they were installed in multifamily residences. The ex post analysis updated measure codes and savings for multifamily installations, which decreased savings for these records.
 - All the central air conditioner installations were claimed as early replacement (ER). The estimation of ER savings requires a baseline SEER value that is derated based on the actual age of the existing equipment, capped at 30 years. For ex ante savings calculations, the existing equipment age was derated but was not capped at 30 years. For ex post savings calculations, equipment age was capped at 30 years. When the equipment age value was missing, we used a default age of 12 years, as specified in the TRM, to derate the existing SEER. This resulted in slightly lower energy and demand savings.
- **ECM Auto Fan (13% of ex post energy savings and 12% of ex post demand savings):** The gross realization rate for ECMs is 113% for energy and demand savings. The efficiency boost caused by the ECM is already included in the efficiency of a new heat pump or central air conditioner, so participants receiving new equipment do not claim cooling savings for the ECM. To account for these participants the generalized calculation used to estimate ex ante savings applied a percentage reduction to the energy savings. The evaluator used information from the program tracking data to determine if each participant received a new central air conditioning unit or a new air source heat pump and applied the algorithm without the reduction factor as appropriate (i.e., where the participant did not receive a new cooling system). This led to an overall increase in energy savings compared to the ex ante value.
- **Learning Thermostats (8% of ex post energy savings and 9% of ex post demand savings):** The gross realization rate for learning thermostats is 81% for energy savings and 99% for demand savings. The discrepancies and the ex post adjustments include:
 - Ex ante savings estimates were based on average default TRM savings values. However, for the ex post analysis, we applied the installed efficiencies and cooling/heating capacity values as provided in the program-tracking data, including updating values to reflect the installation of new heating/cooling equipment through the SFIE program. This resulted in lower energy and demand savings.
 - Ex ante savings estimates used energy savings for single family measures as a default for multifamily residences. For ex post calculations, the evaluation team relied on program-tracking data, which included information on building type. The evaluation team identified that about 20% of learning thermostat records were installed in multifamily residences. The ex post analysis updated measure codes and savings for multifamily installations, decreasing energy savings for these records.

9.3.2 PROCESS RESULTS

Overall, the design and implementation of the SFIE Program remained consistent with PY2022 in terms of implementation team roles and responsibilities and the implementation model.

A key success during PY2023 was the strength of its customer recruitment and project pipeline. The program staff attributed successful customer recruitment to effective communication channels and word-of-mouth endorsements. Outside of utilizing existing communication networks, program staff focused on building new pathways and working with local organizations to administer the program to a wider range of customers. Furthermore, the SFIE Program started PY2023 with a pipeline of projects from PY2022 that jumpstarted the new program year. As the program team approached the end of PY2022, they identified projects to pursue early in PY2023. Program staff also found this was particularly beneficial to participating contractors who experience decreased HVAC work in the winter months.

The SFIE Program’s robust project pipeline led to a waitlist of interested customers. Some customers on the waitlist sought alternative programs with more near-term availability, while others did not qualify for the SFIE Program or sought assistance with measures not offered through the SFIE Program. The implementation team reported uncertainty about which programs were best suited to serve each type of customer.

The program team experienced another challenge related to referring customers to other programs. Some customers needed measures that were not included in the SFIE Program. While the team searched for suitable programs, they found the process could be more efficient. Namely, the program team would benefit from a more expansive list of other programs that includes pertinent information about each program’s specific measure offerings.

Complementing the program team’s observations about PY2023, the evaluation team offers responses to the five process evaluation questions required by the Missouri Code of State Regulations (CSR) for demand-side process evaluations in Table 51.²⁴ The findings summarized here are based largely on process evaluation activities conducted in PY2020.

Table 51. Summary of Responses to CSR Process Evaluation Requirements

CSR Required Process Evaluations Questions	Findings
What are the primary market imperfections that are common to the target market segment?	Income eligible households face multiple barriers to investing in energy efficiency through Ameren Missouri programs or outside of them. Market imperfections include: <ul style="list-style-type: none"> ▪ the high upfront cost of energy-efficient products relative to household capital and available credit, even when considering traditional utility program incentives, ▪ lack of access to traditional forms of information about energy efficiency programs, ▪ housing stock that may need health and safety improvements, which can preclude efficiency upgrades unless these issues are addressed first, and ▪ split incentives between property owners and renters, for those who rent their home.
Is the target market segment appropriately defined, or should it be further subdivided or merged with other market segments?	Ameren Missouri has defined the target customer market as single-family housing occupants living in areas where most residents have an annual income at or below 80% of AMI. This criterion is aligned with income eligible program eligibility requirements in other states and should not be merged with any other income-based market segments. <p>Additionally, the program targets specific housing stock subsegments (e.g., single family and mobile homes). This helps to target the community and measure selection, as well as audits and measure installation assumptions; however, the program team should consider that the program is designed to serve one type of housing at a time.</p>
Does the mix of enduses and measures included in the program appropriately reflect the diversity of enduses energy service needs and existing enduses technologies within the target market segment?	The baseline study of residential Ameren Missouri customers completed in PY2019 shows that income eligible households tend to have lower-efficiency products in their homes than their non-income eligible counterparts, including lighting. These results are consistent with findings from around the United States. The program’s mix of enduses and measures appropriately reflects these needs.

²⁴ The Missouri Code of State Regulations (20 CSR 4240.22.070(A)) requires that demand-side programs operating as part of a utility’s preferred resource plan are subject to ongoing process and impact evaluations that meet certain criteria, including the process evaluation questions presented in this section. Please note, the reference for this CSR was previously 4 CSR 240-22.070(8). As of September 2019, the CSR was moved to the location cited above.

CSR Required Process Evaluations Questions	Findings
	The program offers measures that cover major single family and mobile home energy-saving needs, including building envelope, HVAC and thermostats, refrigeration, lighting, domestic hot water, and plug load measures. The program also cross-promotes additional savings opportunities through other Ameren Missouri programs.
Are the communication channels and delivery mechanisms appropriate for the target market segment?	The program team’s communication and delivery channels are appropriate for the target market segment. Staff use a variety of community-centric approaches to promote the program, including through housing organizations with large property portfolios, community groups, and mobile home park owners; holding meet-and-greet events with community leaders in popular community gathering places like restaurants; and working with Ameren Missouri to identify community non-profit organizations serving income-eligible areas that could distribute efficient products to their constituents. These approaches are appropriate for the target market segment because they work around traditional time, geographic, and other barriers to learning about energy efficiency and the availability of utility-sponsored programs.
What can be done to more effectively overcome the identified market imperfections and to increase the rate of customer acceptance and implementation for select enduses/measure groups included in the Program?	The program team can increase the rate of customer acceptance by continuing to expand the network of participating CBOs. This collaborative work with community partners offers the opportunity to engage with many Ameren Missouri customers across the service territory. The distribution and installation arms offer opportunities for participants to install measures across a range of enduses.

9.4 CONCLUSIONS AND RECOMMENDATIONS

Based on the results of this evaluation, the evaluation team offers the following conclusions and recommendations for the SFIE Program moving forward:

- **Conclusion #1:** The project tracking data indicates that measures are installed in multifamily and single family residences, but the ex ante calculations treat all measures as though they are installed in single family homes.
 - **Recommendation:** Distinguish between projects installed in single family homes versus multifamily residences and apply the correct TRM values accordingly.
- **Conclusion #2:** Many customers who participated in the SFIE program received new thermostats and HVAC equipment. The thermostats will control the new HVAC equipment, and the thermostat savings should be calculated using the equipment parameters of the new equipment.
 - **Recommendation:** When HVAC equipment and learning thermostats are implemented concurrently, calculate the savings associated with the thermostats based on the newly installed HVAC equipment, not existing equipment.
- **Conclusion #3:** The program team faced challenges referring interested customers to other programs when the SFIE Program was full or when a customer needed measures that the SFIE Program would not incent.
 - **Recommendation:** Share more detailed information about alternative programs to strengthen cross-promotion between programs and meet customer needs. Specifically, we recommend sharing a list of specific measures alternative programs provide. Additionally, it would be beneficial to share information regarding capacity across programs so program teams can understand how immediately another program would be able to meet a customer’s needs.

10. INCOME ELIGIBLE PROGRAM PARTICIPANT BILL PAYMENT ANALYSIS

In compliance with Missouri 20 CSR 4240-20.094, subsection (4)(J),²⁵ the evaluation team performed an analysis of the effects of participation in Ameren Missouri’s income eligible programs on customers’ ability to pay their electricity bills. The analysis includes participants in the Multifamily Income Eligible (MFIE) and Single Family Income Eligible (SFIE) Programs, collectively referred to as the IE Programs in the remainder of this chapter,²⁶ during the MEEIA III Cycle (PY2019–PY2023).

This chapter presents a brief participation summary, the evaluation methodology, evaluation results, and conclusions from the analysis. We present additional details on the methodology in Appendix A. Chapters 6 and 9 provide additional information on the two programs, including their goals, design, implementation strategy, and savings realized in PY2023.

10.1 PARTICIPATION SUMMARY

Between PY2019 and PY2023, the IE Programs treated 6,886 accounts, 43% under the SFIE Program and 57% under the MFIE Program. The number of participants varied by year, with participation at its highest in 2021 (Table 52).

Table 52. PY2019–PY2023 Income Eligible Program Participation Summary

Program	2019	2020	2021	2022	2023	Total Count	Total Percent
MFIE ^a	728	860	2,231	51	39	3,909	57%
SFIE	319	927	741	534	456	2,977	43%
Total Count	1,047	1,787	2,972	585	495	6,886	
Total Percent	15%	26%	43%	8%	7%		100%

^a The MFIE Program team stopped tracking and reporting program participation by individual account number in 2022. As we define participation based on individual account number for this table, participation counts for 2022 and 2023 appear artificially low when compared to the number of participants/units served in Chapter 8.

Note: Program year assignments were made based on the final measure install date for each project and represent the distinct account numbers with projects completed in each year.

10.2 EVALUATION METHODOLOGY

The analysis focused on three metrics to assess the change in customers’ ability to pay their bills following participation in Ameren Missouri’s IE Program: changes in (1) bill amounts, (2) the incidence of disconnection notices, and (3) account balances at the time of receiving a disconnection notice. These metrics were developed in consultation with Ameren Missouri, following interviews with Ameren Missouri staff responsible for managing billing and disconnection processes and assisting customers in arrears. The purpose of these interviews was to review the data streams to be used in the analysis and to gain an understanding of key billing and arrearage processes to inform our analysis and interpretation of the data.

²⁵ “If a demand-side program is targeted to low-income customers, the electric utility must also state how the electric utility will assess the expected and actual effect of the demand-side program on the utility’s bad debt expenses, customer arrearages, and disconnections.”

²⁶ In addition to the Single Family and Multifamily Income Eligible Programs, Ameren’s Income Eligible Portfolio also includes the Community Lighting and Business Social Services Programs. The Community Lighting Program is not included in the bill payment analysis because it is an upstream program (i.e., individual customer account numbers are not tracked) and the Business Social Services Program is not included because it focuses on business account holders as opposed to residential customers.

The following subsections summarize key steps in the bill payment analysis.

DATA CLEANING AND PREPARATION

The evaluation team received several data streams from Ameren Missouri in support of this analysis:

- **Customer data**, including service address and account active and inactive dates
- **Monthly bills**, including both usage (kWh) and total bill amount (\$)
- **Disconnection records** sent due to nonpayment, including the account balance (\$) at the time of the notice

The evaluation team requested and received data for IE Program participants between PY2019 and PY2022. The data spanned the period from PY2018 through PY2023 to include one year before and one year after participation in the IE Program. PY2023 participants were not included in the analysis as one full year of post-participation data were not yet available for all PY2023 participants at the time of the analysis.²⁷ All data were reviewed for completeness and reasonableness, processed, and cleaned prior to being used in the analysis. Only participants with sufficient billing data prior to and following their participation in the IE Program were included in the modeling.

The evaluation team planned to construct a comparison group from a portion of the participants in the PY2019 to PY2022 period. We performed equivalency checks to assess the similarity of the treatment and comparison groups with respect to energy consumption, bill amounts, weather, and disconnection notice patterns to ensure the comparison group could serve as a valid baseline (see Appendix A). The equivalency analysis revealed differences in the energy consumption patterns and incidence of disconnection notices received between the proposed treatment and comparison group customers. Due to these differences, we could not use a comparison group and conducted a pre-post analysis for participants in the IE Program between PY2019 and PY2022.

BILL PAYMENT ANALYSIS

As part of this analysis, the evaluation team estimated the following metrics:

- **Change in Bill Amount (\$):** We conducted a consumption analysis using a linear fixed effects regression (LFE). Fixed effects models capture the effect of time-invariant household-specific characteristics and are the industry best practice approach to modeling program savings. We specified a variety of models ranging from simple pre-post models to more complex models incorporating a variety of terms to control for known sources of variation. Our final model specification included weather—heating degree days (HDD) and cooling degree days (CDD)—and monthly dummy variables to further control for seasonal differences in energy consumption. The final model specification also included terms to account for any changes in consumption during the COVID-19 stay-at-home orders and differences in consumption between single family and multifamily homes.

The analysis results represent the change in energy (kWh) consumption following IE Program participation. We applied the average per-kWh energy charge to the results of the consumption analysis to convert the energy impacts to bill amounts.²⁸ We conducted the analysis with energy consumption data instead of directly on bill

²⁷ Analysis results were extrapolated to PY2023 participants to capture the effects of the IE Program on the full five-year MEIA III cycle.

²⁸ Bill impacts were estimated using the current Residential Anytime Service rate, which went into effect on December 3, 2023 (<https://www.ameren.com/-/media/rates/files/missouri/uecsheet54rate1mres.ashx>). The majority (61%) of IE Program participants were on this rate at the time of their participation, while 30% were on the Electric Space Heating rate, 8% were on the Morning Evening Saver rate, and 1% were on another rate. Ameren MO confirmed that the Electric Space Heating rate has the same pricing as the Residential Anytime Service rate.

amounts to isolate the effect of the program and avoid conflating it with rate increases or decreases that occurred during the evaluation period.²⁹

- **Likelihood of Disconnection Notice:** We used logistic regression to estimate the change in odds of receiving a disconnection notice in an average month before program participation compared to an average month after program participation. A logistic regression is appropriate when estimating a binary outcome variable (e.g., receives disconnection notice/does not receive disconnection notice). We specified a variety of models ranging from simple pre-post models to more complex models incorporating a variety of terms to control for known sources of variation. Our final model specification controlled for seasonal differences in disconnect notice incidence, including weather (cooling degree days or CDD) and month dummy variables.³⁰
- **Change in Account Balance at Time of Disconnection Notice (\$):** We conducted this analysis using a LFER model. We specified a variety of models, ranging from simple pre-post models to more complex models incorporating a variety of terms to control for known sources of variation, and determined that the best specification was a simple pre-post model. Because the analysis was conducted on actual bill amounts and did not include a comparison group, it does not control for rate changes that occurred during the evaluation period.

See Appendix A for more details on the methodology.

10.3 EVALUATION RESULTS

Table 53 summarizes the first year change in bill amount, odds of disconnection notice, and account balance at the time of disconnection notice for an average IE Program participant. As shown, we estimate the IE Program achieved nearly \$575,000 in bill reductions across all participants between PY2019 and PY2023, and participants had a reduced likelihood of receiving a disconnection notice following their participation. However, among participants who did receive a disconnection notice, the average account balance (i.e., the amount in arrears) at the time of the disconnection notice was higher following program participation than before program participation. We provide further details on each of these analyses in the sections that follow.

Table 53. PY2019–PY2023 Income Eligible Participant Bill Payment Outcomes

Metric: Change In ...	Average First Year Impact Per Participant	Total First Year Impacts for PY2019–PY2023 Participants
Bill Amount (\$)	- \$83	- \$574,953
Odds of Disconnection Notice	- 0.12	
Amount Due at Time of Disconnection Notice (\$)	+\$17	

BILL AMOUNT

Participants in the IE Program experienced a reduction in their energy consumption following participation, which decreased their bills. On average, customers paid \$87 in energy charges on each monthly bill before participating in the IE Program. Following participation, their bill decreased by 8%, or \$7 on average (Table 54).

²⁹ The resulting bill amounts reflect the portion of the customer bill that fluctuates based on the amount of energy used and excludes flat fees and riders, which would not change due to changes in energy consumption.

³⁰ While we tested models that included heating degrees (HDD) we found that this was not a predictive factor and elected to only include CDD in the final model.

Table 54. Per-Participant First Year Bill Amount Impact

Metric	Value
Monthly Baseline Bill Amount (\$)	\$87
Average Monthly Bill Change (\$)	– \$7
Average Annual Bill Change (\$)	– \$83
Percent Change in Bill	– 8%

Note: Bill estimates only include energy (per kWh) charges and exclude monthly charges, riders, and other flat fees.

INCIDENCE OF DISCONNECTION NOTICES

Participants in the IE Program had a reduced likelihood of receiving a disconnection notice following their participation. On average, participants had 0.88 the odds (i.e., 0.12 less odds) of receiving a disconnection notice in a typical month in the year following their IE Program participation as compared to a typical month in the year prior to their participation.

ACCOUNT BALANCE AT TIME OF DISCONNECTION NOTICE

For those participants in the IE Program who received a disconnection notice, their total account balance (i.e., the amount in arrears) at the time of disconnection notice was, on average, \$17 higher following participation than before participation, which is equivalent to a 7% increase in the amount due (Table 55).

Table 55. Impact on Average Amount Due at Time of Disconnection Notice

Metric	Value
Average Amount Due Before Participation (\$)	\$253
Average Amount Due After Participation (\$)	\$269
Average Change in Amount Due (\$)	+ \$17
Percent Change in Amount Due	+ 7%

As discussed above, a limitation of this analysis is that it did not include a comparison group. This prevented the evaluation team from accounting for rate changes during the evaluation period and affected our ability to accurately estimate the change in account balance at the time of the disconnection notice. To provide additional context for our pre-post analysis, we requested information from Ameren Missouri on residential rate changes during the evaluation period. Ameren Missouri staff reported that there were several rate changes in the timeframe between 2018 and 2023, which equated to a 6.95% cumulative rate increase.³¹ Further, there were rate *decreases* in the first half of the cycle and rate *increases* in the second half of the cycle, which means that customers struggling to pay their bills likely faced higher arrearages later in the cycle (e.g., following their participation in the IE Program) than they did earlier in the cycle (e.g., prior to their participation in the IE Program) as a result of the rate changes. Given that the cumulative rate increase almost exactly offsets the average percent increase in the amount due at the time of the disconnect notice, the evaluation team finds it possible that, on average, there were no IE Program-induced effects on the amount IE Program participants owed when they received a disconnection notice in the PY2019 to PY2023 cycle.

³¹ Email correspondence with Ameren Missouri staff, January 26, 2024. Reported the following residential rate changes: August 1, 2018: 6.10% decrease, April 1, 2020: 1.15% decrease, February 8, 2022: 8.74% increase, July 9, 2023: 5.46% increase. 2018 rate changes are considered because these are reflected in the one year of pre-participation data included in the analysis for 2019 IE Program participants.

10.4 CONCLUSIONS

Based on the results of this evaluation, the evaluation team offers the following conclusions:

- **Conclusion #1:** Participating in the IE Program leads to a reduction in energy consumption and a corresponding decrease in energy bills observed when holding rate changes constant. The average participant between PY2019 and PY2022 experienced an 8% reduction in their bills following IE Program participation.
- **Conclusion #2:** Participants in the IE Program have a slightly reduced likelihood of receiving a disconnection notice following participation in the IE Program compared to before their participation.
- **Conclusion #3:** Among participants in the IE Program who did receive a disconnection notice following participation, the amount due increased by 7% or \$17 on average compared to before participation. However, the evaluation team could not control for cumulative rate increases of the same magnitude (6.95%) over the analysis period due to methodological limitations. Therefore, it is possible that the observed increase results from rate changes that occurred during the evaluation period.



Opinion **Dynamics**

CONTACT:

Antje Flanders
Vice President
aflanders@opiniondynamics.com



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