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Ameren Missouri Program Year 2020 Annual EM&V Report

Volume 2: Residential Portfolio Report

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Opinion Dynamics

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1. Executive Summary

This volume of the PY2020 Annual Report presents evaluation results from the Ameren Missouri PY2020 portfolio of residential energy efficiency programs as described in Ameren Missouri's 2019–21 Missouri Energy Efficiency Investment Act (MEEIA) Energy Efficiency Plan. In this document, the evaluation team provides portfolio-level results for PY2020, as well as detailed findings for each program. Results for the business and demand response portfolios are provided in separate volumes.

During PY2020, Ameren Missouri offered seven programs for residential customers. The portfolio of programs included:

- Residential Lighting
- Heating Ventilation and Air Conditioning (HVAC)
- Home Energy Reports (HER)
- Energy Efficient Products (EEP)
- Energy Efficient Kits (EE Kits)
- Multifamily Market Rate (MFMR)
- Appliance Recycling (ARP)

In addition to these seven programs, Ameren Missouri offered two programs targeted specifically to residential customers that meet certain income requirements. As such, this volume also covers the Single Family and Multifamily Income Eligible Programs (SFIE and MFIE, respectively). Collectively, the nine programs referenced here are referred to as the "residential programs" throughout this volume.

The following sections present key evaluation findings and recommendations for the residential portfolio. The remainder of this volume is organized as follows:

- Chapter 2 presents the general evaluation approach for the residential programs, including overarching evaluation objectives and an overview of the PY2020 evaluation activities and methodologies.
- Chapters 3–11 present evaluation results for the nine residential programs.

1.1 Portfolio Impact Results

At the portfolio level, the PY2020 Ameren Missouri residential programs exceeded their first year energy savings goal but fell just short of their first year demand savings goal, achieving 154,696 MWh and 48.26 MW respectively (Table 1). Performance related to last year demand savings was mixed with the portfolio exceeding the target for less than 10 and 10–14 and EUL targets, but not meeting the 15+ EUL target.[1]

[1] Throughout this volume, we refer to "goals" and "targets." Ameren Missouri's 2019–21 MEEIA Energy Efficiency Plan sets annual first year energy and demand savings goals. In addition, Ameren Missouri developed impact targets that are used to determine Earnings Opportunities.

Table 1. PY2020 Residential Portfolio Impact Summary

	Ex Ante Gross	Gross RR	Ex Post Gross	NTGR	Ex Post Net	Goal/Target Net	% of Goal/Target
First Year Savings							
Energy Savings (MWh)	187,914	109%	205,498	75%	153,497	118,389	130%
Demand Savings (MW)	56.54	110%	62.4	77%	48.26	48.90	99%
Last Year Demand Savings							
< 10 EUL (MW)	0.12	3,193%	3.72	73%	2.72	0.56	484%
10–14 EUL *(MW)*	5.12	83%	4.27	100%	4.29	3.38	127%
15+ EUL *(MW)*	23.81	91%	21.60	68%	14.59	19.01	77%

Portfolio performance was largely driven by the Residential Lighting, HVAC and HER programs, which collectively contribute approximately 90% of Ameren Missouri's first year residential savings. As shown in Table 2, the Lighting and HER programs exceeded first year energy and demand savings goals, while the HVAC Program did not. Table 3 shows last year demand savings across the portfolio for all measures with an EUL of less than 10 years, between 11 and 14 years, and 15 or more years. Notably, the Lighting Program drove the high realization rate (3,193%) and strong performance against net savings goals (484%) across the portfolio for the less than 10 EUL class. This was due to the fact that a small portion of LEDs sold through the Upstream channel (i.e., sold through brick and mortar retailers) were installed in business applications with an assumed EUL (six years) that is lower when compared to the assumed EUL for similar LEDs installed in residential spaces (19 years). See Section 3.3.1 for additional details.

Table 2. PY2020 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)							
Lighting	105,291	110%	115,409	65%	74,812	13,203	567%
HVAC	38,830	95%	36,908	77%	28,245	47,594	59%
HER[2]	24,693		36,002		36,002	35,250	102%
REP	9,823	91%	8,981	86%	7,705	9,188	84%
EE Kits	5,429	105%	4,346	78%	3,410	6,551	52%
MFMR	3,022	98%	2,964	94%	2,786	3,270	85%
RAR	826	108%	888	60%	537	3,333	16%
Total Residential	**187,914**	**109%**	**205,498**	**75%**	**153,497**	**118,839**	**130%**
First Year Demand Savings (MW)							
Lighting	15.85	113%	17.90	65%	11.60	1.97	588%
HVAC	23.98	97%	23.24	70%	16.24	25.40	64%
HER	11.51		16.78		16.78	16.43	102%
REP	3.42	84%	2.88	80%	2.31	2.43	95%
EE Kits	0.98	83%	0.81	79%	0.65	1.16	56%
MFMR	0.67	99%	0.67	94%	0.63	1.04	60%

[2] The 2019-21 MEEIA Energy Efficiency Plan does not include incremental MWh or MW goals for the PY2020 HER Program, but we include goals here based on PY2019 for purposes of comparison.

	Ex Ante Gross	Gross RR	Ex Post Gross	NTGR	Ex Post Net	Goal Net	% of Goal
RAR	0.13	99%	0.13	55%	0.07	0.47	15%
Total Residential	**56.54**	**110%**	**62.40**	**77%**	**48.26**	**48.80**	**99%**

Table 3. PY2020 Residential Portfolio Last Year Demand Impact Summary

	Ex Ante Gross	Gross RR	Ex Post Gross	NTGR	Ex Post Net	Target Net	% of Target
< 10 EUL							
Lighting	0.00		3.11	65%	2.02	0.00	0%
HVAC	0.00		0.47		0.58	0.00	
HER							
REP	0.00		0.00		0.03	0.03	
EE Kits	0.00		0.00		0.01		
MFMR	0.04	1.00	0.04	94%	0.03	0.19	18%
RAR	0.08	1.29	0.10	44%	0.05	0.34	13%
Total Residential	**0.12**	**3,193%**	**3.72**	**73%**	**2.72**	**0.56**	**484%**
10–14 EUL							
Lighting	0.00	0%	0.00		0.00	0.00	0%
HVAC	0.74	79%	0.58	229%	1.34	0.00	
HER							
REP	3.42	84%	2.88	77%	2.20	2.39	92%
EE Kits	0.71	84%	0.59	90%	0.53	0.76	70%
MFMR	0.22	98%	0.21	94%	0.20	0.22	91%
RAR	0.03	27%	0.01	135%	0.01	0.00	
Total Residential	**5.12**	**83%**	**4.27**	**100%**	**4.29**	**3.38**	**127%**
15+ EUL							
Lighting	15.85	93%	14.78	65%	9.58	1.97	486%
HVAC	7.25	85%	6.17	72%	4.43	16.17	27%
HER							
REP	0.00		0.00		0.08	0.00	
EE Kits	0.28	80%	0.22	46%	0.10	0.40	26%
MFMR	0.42	99%	0.42	94%	0.39	0.47	84%
RAR	0.01	107%	0.01	84%	0.01	0.00	
Total Residential	**23.81**	**91%**	**21.60**	**68%**	**14.59**	**19.01**	**77%**

Among the residential programs in the Low-Income Portfolio, performance against savings goals was also mixed. While the Multifamily Income Eligible (MFIE) Program exceeded its first year energy savings goals, the Single Family Income Eligible (SFIE) Program did not. Alternatively, the SFIE Program met its first year demand savings goal while the MFIE Program did not (Table 4 and Table 5, respectively). That said, both programs performed well against the average percent of energy savings per property metric established for this MEEIA

cycle (i.e., achieving at least 10% savings per property for SFIE and 15% per property for MF). In particular, the SFIE Program achieved an average of 16% savings per property while the MFIE Program achieved an average of 30% savings per property.

Table 4. PY2020 Single Family Income Eligible Impact Summary

	Ex Ante Gross	Gross RR	Ex Post Gross	NTGR	Ex Post Net	Goal/Target Net	% of Goal/Target
First Year Savings							
Energy Savings (MWh)	9,475	92%	8,748	100%	8,748	10,415	84%
Demand Savings (MW)	2.67	91%	2.43	100%	2.43	2.34	104%
Last Year Demand Savings							
< 10 EUL (MW)	0.95	102%	0.96	100%	0.96	0.57	170%
10–14 EUL(MW)	0.32	87%	0.28	100%	0.28	0.08	362%
15+ EUL(MW)	1.12	92%	1.04	100%	1.04	1.65	63%

Table 5. PY2020 Multifamily Income Eligible Impact Summary

	Ex Ante Gross	Gross RR	Ex Post Gross	NTGR	Ex Post Net	Goal/Target Net	% of Goal/Target
First Year Savings							
Energy Savings (MWh)	3,260	99%	3,243	100%	3,243	1,650	197%
Demand Savings (MW)	0.50	100%	0.49	100%	0.49	0.73	68%
Last Year Demand Savings							
< 10 EUL	0.06	100%	0.06	100%	0.06	0.00	0%
10-14 EUL	0.10	99%	0.10	100%	0.10	0.00	0%
15+ EUL	0.34	100%	0.34	100%	0.34	0.73	47%

1.2 Key Process Findings and Recommendations

In the second year of the MEEIA plan cycle, the Ameren Missouri residential portfolio performed well against the plan goals. Additionally, targeted process evaluation activities highlighted key program adaptations in the face of the COVID-19 pandemic, as well as successes and areas for improvement in program design and delivery. The evaluation team presents the following key program-specific conclusions and recommendations:

1.2.1 Residential Lighting

- **Conclusion:** For PY2020, Ameren Missouri attempted to build upon its PY2019 successes that brought several community-based, discount retailers such as St. Vincent De Paul, Salvation Army, Goodwill, and Habitat Restore into the Lighting Program.[3] By bringing discounted LEDs into these stores, the program is more likely to reach low-income customers who may not shop at other participating retailers. This focus is appropriate given that past in-home lighting audits show that low-income customers lag behind other customers in their use of efficient bulbs, and customer surveys show that free ridership (FR) is lower at the community-based stores than at large retailers. The focus on discount retailers quickly came to a halt with the arrival of the COVID-19 pandemic, however, as the majority of

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

discount retailers were closed during the stay-at-home orders and many did not recover through the remainder of the year. Nevertheless, even with the huge challenges posed by the pandemic, the discount retailers still sold 26% more bulbs in PY2020 than they did in PY2019. With renewed effort and resources focused on these retailers, this number should be expected to increase in PY2021.

- Recommendation: Ameren Missouri should continue, and if possible expand, efforts to reach low-income customers through the Lighting Program and other programs that target low-income customers.

- **Conclusion:** Even though sales through the Online Store grew by 311% in PY2020, the channel still represents only a small proportion of total program ex post gross savings. There is a clear opportunity for continued growth in this area, which would be beneficial for a number of reasons. With the growing customer reliance on online shopping more generally, the Online Store has unrealized potential. The channel is particularly useful for targeted marketing to underserved customers, which is more difficult to do through the mass market Upstream Channel.

  - Recommendation: Online stores are only limited by the amount of traffic hitting the site. In PY2019, we found that Online Store participants were more likely to learn about the store through direct communication from Ameren Missouri, as opposed to the mass media marketing activities the program used. As such, Ameren Missouri should consider increasing their own direct-to-customer marketing efforts to continue to drive general participation through this channel but also consider expanding mass media promotions due to their wider reach.

1.2.2 HVAC

- **Conclusion**: Ameren Missouri's decision to implement the Midstream Channel has already resulted in positive market impacts on distributors' sales, stocking, and business practices. Their optimism also suggests this is likely to continue and grow in the future. Overall, intervening in the supply chain seems to be stimulating supply as desired.

  - Recommendation: Continue emphasizing and building the Midstream Channel. Where possible, try to recruit additional distributors to expand the program's overall ability to affect the HVAC market in the Ameren Missouri service territory.

- **Conclusion**: While distributors are largely satisfied with and optimistic about the Midstream Channel, this was not necessarily the case for all participating contractors. Adding more steps or actors to an already complex HVAC Program application process risks alienating some contractors. If some contractors decide not to sell 18+ SEER units because it is more work, the introduction of the Midstream Channel could actually *hinder* the penetration of super-efficient HVAC systems into the market.

  - Recommendation: Consider changes to the program design to minimize the burden on contractors. As an example, some existing midstream program designs do not require contractors to complete paperwork for customer incentives allowing them to spend more time on delivering services to their customers. As part of this process, contractors would be required to provide distributors with information to verify customer eligibility (e.g., utility account number, contact information etc.), but distributors would take on responsibility for tracking program transactions and providing that data to program staff for processing. It is important to note, however, that Ameren Missouri would need to weigh the benefits of this approach with the potential drawbacks such as the inability to verify

early retirement and therefore transition away from an early retirement program offering at least for measures offered through the midstream channel.

- **Conclusion**: With the introduction of the Midstream Channel, an organic segmentation of the residential HVAC customer base becomes evident. In order to maximize the potential for the HVAC Program—as well as provide equitable access to energy-efficient HVAC upgrades for the entire residential customer base—acknowledging and leveraging the diversity across segments should be factored into program design and marketing and messaging where possible.
  - Recommendation: The evaluation team sees at least four unique customer segments that should be addressed strategically, leveraging the barriers and opportunities unique to each segment to refine program delivery:
    - The "Top 10%" that Ameren Missouri has traditionally targeted. These are generally more affluent customers who are willing and able to not just upgrade their equipment but can also afford to upgrade it to super-efficient (i.e., 18+ SEER) equipment. These are generally the customers that are now served with the Midstream Channel and Ameren Missouri should continue to target market to these customers as they have been for years. Note that FR is expected to be relatively high for this segment.
    - The customers that are willing and able to make an energy-efficient upgrade but need the rebate to do so. These customers are unable to afford super-efficient equipment but can afford standard efficient equipment. These will generally be middle-class customers. Notably, these are also the customers being served by the current Downstream Program. Cost is by far the most important barrier for this segment, so targeted marketing emphasizing things like the rebate, monthly energy savings, and lifetime cost savings should be the focus.
    - Customers who do not meet the criteria for low-income (thus do not qualify for the Single Family Income Eligible Program below), but still cannot afford energy-efficient HVAC equipment upgrades—of any efficiency—with or without a rebate. This is certainly a sizable segment of the population—maybe even the biggest segment—and they are customers running older, much less efficient systems. It is worth noting that the current HVAC Program is not serving this segment. This is both an equity issue and a missed energy savings opportunity. Accessing and serving this segment will be challenging and require alternative program designs that might utilize interventions such as tiered rebates, offering no-cost financing, or other strategies. Cost-effectiveness will certainly be a concern, but FR is also expected to be quite low for this segment.
    - The last segment is comprised of low-income customers who qualify for the Single Family Income Eligible Program. Though these customers certainly represent a segment of the residential HVAC market, they are not true targets of the HVAC Program. The Single Family Income Eligible Program was altered this past year in response to COVID-19 restrictions; nonetheless, it is expected that this segment will continue to be addressed through the Single Family Income Eligible Program moving forward.

1.2.3 Multifamily Market Rate

- **Conclusion:** Current protocols that allow trade allies to deliver the program with nearly full autonomy hinder the program team's ability to manage the project pipeline and incentive budget. Trade ally projects also tend to be limited in scope, which impacts the ability of program staff to realize the program goals of delivering comprehensive projects and deeper savings to participating customers.

- Recommendations: While the trade ally channel has brought eligible Ameren Missouri customers to the MFMR program particularly in PY2020, the program team, including Ameren Missouri, Franklin Energy, and ICAST, should consider the benefits and drawbacks of changing the process by which trade ally projects come through the program. For example, the program team could consider creating a more formal trade ally channel with a set budget that can be managed separately or adding further touchpoints between trade allies and the ICAST team to encourage more comprehensive project scopes. Potential strategies include requiring trade allies to conduct and share information from energy assessments.

1.2.4 Single Family Income Eligible

- **Conclusion:** Though PY2020 presented unique challenges for program administration and implementation, the program team successfully adapted the program design to address the health risks of COVID-19. Despite the shortened program year and having to implement a continuously changing program design, the program team achieved 84% of their net MWh goal and 104% of their net MW goal. Additionally, households that participated in the Single Family channel saved 16% of their baseline usage on average after participating in the program.
  - Recommendation: While the evaluation team acknowledges that these design changes were necessary, the PY2020 implementation budgets were not developed for this program design. The altered design, including paying relocation incentives, recruiting housing organizations, and coordinating the logistics of treating more than 1,500 customers (with some customers receiving return visits), strained the administrative budget for the program in PY2020. Therefore, we recommend re-visiting program budgets and updating them to reflect the current design if any of these changes are expected to persist in future years.
- **Conclusion:** The Grant channel is a viable option for expanding the influence of the SFIE Program and reaching customers in the target market beyond the Single Family channel.
  - Recommendation: The program team should continue to develop this channel in 2021 with the goals of expanding the number of actively participating community-based organizations (CBOs), enrolling CBOs specifically prepared to complete eligible direct installation (such as more Community Action Agencies), and enrolling CBOs serving rural communities.
  - Recommendation: While the program team made strides to improve data collection and QA/QC processes, staff should continue to improve in these areas beyond PY2020. The program team implemented expanded data collection efforts for in-home installations in PY2020, however, the information was captured in PDF documents and photographs, and often lacked sufficient detail to be used in ex post savings calculations. If the Grant channel continues to be a major component of the SFIE Program, these additional data will aid in program planning and improving the accuracy of savings estimation.

1.3 Portfolio 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 nine residential programs, using five costs-effectiveness tests recommended by the California Standard Practice Manual[4] and used in prior evaluations:

- **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; and
- **Societal Cost Test (SCT):** Perspective of all utility customers (participants and nonparticipants) in the utility service territory.[5]

Table 6 summarizes the cost-effectiveness results for the nine residential programs, including two residential Low-Income Portfolio programs. All programs were cost-effective in PY2020 based on the TRC test except Efficient Products, Appliance Recycling, and Multifamily Income Eligible Programs.[6] The Multifamily Income Eligible and Appliance Recycling Programs were also not cost effective under the UCT, and all programs had RIM results below 1.0.

Table 6 Summary of Residential Cost-Effectiveness Results

Program	TRC	UCT	RIM	PCT
Lighting	6.45	4.64	0.55	n/a
HVAC	1.49	1.81	0.59	3.72
HER	1.22	1.22	0.42	n/a
REP	0.98	1.46	0.50	2.85
EE Kits	2.03	3.32	0.54	6.85
MFMR	1.34	2.02	0.52	3.53
RAR	0.68	0.69	0.30	18.5
SFIE	1.32	1.29	0.44	4.72
MFIE	0.72	0.51	0.29	4.49

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

[4] California Standard Practice Manual: Economic Analysis of Demand-Side Programs and Projects. October 2001.
[5] 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.
[6] MEEIA and the Revised Statues 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, where needed, is presented in the individual program chapters.

2.1 Research Objectives

The residential portfolio evaluation was designed to address numerous process, gross impact, net impact, and cost-effectiveness objectives. A fifth category of objectives focused on responding to the five key research questions stipulated in 20 CSR 4240.22.070(A).[7] The research objectives addressed by the PY2020 residential portfolio evaluations include:

Process Objectives

- Obtain information on program design and planned implementation with a focus on differences from PY2019; and
- Understand program staff and implementer perceptions, experiences, and expected program impacts.

Gross Impact Objectives

- Verify program tracking data;
- Estimate the first-year ex-post gross average percent energy (kWh) savings per participating property; and
- Estimate the first-year ex-post gross demand (kW) savings.

Attribution/Net Impact Objectives

- Estimate the first-year ex-post net energy (kWh) and demand (kW) savings; and
- Estimate last-year ex post net demand (kW) savings, by EUL category.

Cost-Effectiveness

- Assess the cost-effectiveness of each business program and the business portfolio as a whole using industry-standard cost-effectiveness tests
- Ensure alignment of cost-effectiveness testing assumptions and parameters with the PY2019 business evaluation results, Ameren Missouri's TRM Revisions 3.0, and industry best practices.
- Provide total program benefits, costs, net benefits, and cost-effectiveness testing results.

[7] 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 Mandated Research Questions (20 CSR 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 end-use energy service needs and existing end-use 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 end uses/measure groups included in the Program?

2.2 Evaluation Activities and Methodologies

The evaluation team met the objectives of the PY2020 evaluation through a combination of research activities as outlined in Table 7. The evaluation team designed research for each program based on its design, level of participation, and type of energy efficiency technologies among other factors. Table 7 shows the research activities conducted for each program.

Table 7. Research Activities by Program

Research Activity	Lighting	HVAC	HER	REP	EEK	MF MR	RAR	SF IE	MF IE
Program Manager and Implementer Interviews	✓	✓	✓	✓	✓	✓	✓	✓	✓
Program Material Review	✓	✓	✓	✓	✓	✓	✓	✓	✓
Tracking System Review	✓	✓	✓	✓	✓	✓	✓	✓	✓
Participant Research									
Participant Survey	-	✓	-	-	-	✓	-	-	-
Market Partner Surveys/In-Depth Interviews	-	✓	-	-	-	-	-	-	-
Gross Impact Analysis									
Database Review	✓	✓	-	✓	✓	✓	✓	✓	✓
Engineering Analysis	✓	✓	-	✓	✓	✓	✓	✓	✓
Consumption Analysis	-	-	✓	-	-	-	-	-	-
Attribution/Net Impact Analysis									
Free Ridership	-	✓	-	-	-	✓	-	-	-
Participant Spillover	-	✓	-	-	-	✓	-	-	-

The following subsections provide a general description of each evaluation activity. Program-specific details are included in each program chapter, where relevant.

2.2.1 Program Manager and Implementer Interviews

To support evaluation planning, we conducted in-person interviews with program implementation staff in September and October of 2020. In these interviews, we explored details of the design and planned implementation for each program, as well as program staff's evaluation priorities.

Given that many of the residential programs launched later in the year than anticipated, we conducted a second round of interviews with the implementation team part way through the program year. We conducted this second in—depth interview to understand more about the early stages of program implementation, any challenges that program teams encountered to date, and program data tracking and reporting processes.

2.2.2 Program Material Review

We conducted a comprehensive review of all available program materials, including marketing and implementation plans, customer communications, and educational and training materials. This review served to familiarize the Team with details of program design and implementation.

2.2.3 Tracking System Review

In July of 2020, the evaluation team reviewed a set of proposed data fields for all residential energy efficiency programs. The purpose of this review was to ensure that the implementer, Franklin Energy, and its partners collected and were able to report on the data necessary for the evaluation team to accurately complete the evaluations. We developed a memo summarizing our findings of the review and recommended the additional fields be tracked.[8]

The evaluation team subsequently provided input on multiple iterations of the Franklin Energy data fields throughout PY2020. These reviews supported an interim impact analysis of the portfolio in September of 2020, and a final year-end impact evaluation detailed in the remainder of this report.

2.2.4 Participant Research

The evaluation team conducted research with the participants in the HVAC and Multifamily Market Rate (MFMR) programs. This participant research consisted of quantitative online surveys and in-depth interviews with Ameren Missouri residential customers and property managers/owners who had participated in the programs during PY2020. Topics covered included:

- Customer experience with the program
- Satisfaction with the program overall and different program components
- Recommendations for program improvement
- Free ridership (FR) and participant spillover (PSO)

Details of the individual data collection activities including population sizes, sampling approaches, and response rates are presented in the individual program chapters. Final data collection instruments used in developing net savings estimates are provided in Appendix C.

2.2.5 Market Partner Research

[8] Memo titled *Feedback on Residential Program Data Reports*, dated June 22, 2020.

We conducted market partner research for the HVAC Program evaluation. In particular, we conducted in-depth interviews with participating HVAC contractors and distributors. Details of the individual data collection activities including areas of exploration, population sizes, sampling approaches, and response rates are presented in the individual program chapters. Final data collection instruments are provided as Appendix C.

2.2.6 Gross Impact Analysis

The PY2020 gross impact analyses for the Ameren Missouri residential programs are based on the Ameren Missouri TRM and deemed savings tables, supplemented with evaluation-based results. Gross impact activities included review of the program-tracking database.

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

- We applied deemed technology-specific coincidence factors (CF) from Ameren Missouri's TRM to ex post energy savings to calculate ex post demand savings.
- Last year ex post energy and demand savings reflect baseline adjustments for lighting measures (see additional information below) and early-replacement HVAC measures (Central Air Conditioner, Air Source Heat Pumps, Ground Source Heat Pumps, and Ductless Minisplit Heat Pumps). For all other measure types, last year energy and demand savings equal first savings.
- Last year ex post demand savings are presented by three EUL categories: less than 10 years, 10-14 years, and 15 years or more.

Database Review and Engineering Analysis

To determine gross impacts associated with the majority of Ameren Missouri's PY2020 programs, we first reviewed the program-tracking database to check that project data was recorded fully and correctly, and that the database contained all needed information to estimate program savings. We also examined the incented measures to ensure that they met all program requirements. We then conducted an engineering analysis, which involved reviewing program tracking data to verify that 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 updated evaluation-estimated parameters, such as in-service rates derived from desk reviews and/or participant survey data.[9]

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

2.2.7 Net Impact Analysis

To determine net savings the PY2020 residential programs, we used a combination of PY2019 NTGRs and values developed based on research with PY2020 participants. For the HVAC and MFMR Programs, we developed NTGRs based on PY2020 participant and market actor research. For all other programs in the residential portfolio, we developed net savings by applying PY2019 researched net-to-gross ratios (NTGRs). Exceptions to this approach are made for the Home Energy Reports Program, which is evaluated using a

[9] Ex ante applied Revision 3.1 (dated March of 2020) of the Ameren Missouri 2019-21 MEEIA Energy Efficiency Plan Appendix F – TRM: Residential Measures (referred to as the "Ameren Missouri TRM"). Ex post applied Revision 4.0 (October 2020) of the Ameren Missouri TRM.

consumption analysis approach, and the Single Family and Multifamily Income Eligible Programs for which we assume a NTGR of 1.

Net-to-Gross Ratio Development

Our PY2020 NTG analyses included consideration of free ridership (FR), participant spillover (PSO), trade ally spillover (TASO), and non-participant spillover (NPSO), depending on program design. We developed estimates of FR and PSO based on surveys with participants. Trade ally spillover (TASO) and values for the HVAC Program, and non-participant spillover (NPSO) are based on research conducted through the PY2019 evaluation. NTGRs are calculated as follows:

Equation 1. NTGR

$$NTGR = 1 - FR + PSO + TASO + NPSO$$

Table 8 summarizes, by program, which NTGR components were estimated as part of the PY2020 evaluation. The subsections following the table provide more detail on the estimation of FR and PSO.

Table 8. Components of NTGR by Program

NTGR Component	Lighting	EEP	HVAC	HER	ARP	EE Kits	MF MR	SF LI	MF LI
Free Ridership	-	-	✓	-	-	-	✓	-	-
Participant Spillover	-	-	✓	-	-	-	✓	-	-
Trade Ally Spillover	-	-	-	-	-	-	-	-	-
Non-Participant Spillover	-	-	-	-	-	-	-	-	-

Free Ridership

Free riders are program participants who would have completed the same energy efficiency upgrade without the program. FR scores represent the percentage of savings that would have been achieved in the absence of the program. FR scores can range from 0% (not a free-rider; the participant would not have completed the project without the program) to 100% (a full free-rider; the participant would have completed the project without the program). FR scores between 0% and 100% represent partial free-riders, i.e., participants who were to some degree influenced by the program to complete the energy efficiency upgrade.

For programs within the residential portfolio, the FR assessment generally consisted of two components:[10]

- A Program Influence component, based on the participant's perception of the program's influence on the decision to carry out the energy-efficient project; and
- A No-Program component, based on the participant's intention to carry out the energy-efficient project without program funds.

When scored, each component assesses the likelihood of FR on a scale of 0 to 10, with the two scores averaged and for a combined total FR score. FR is the mean of the two components:

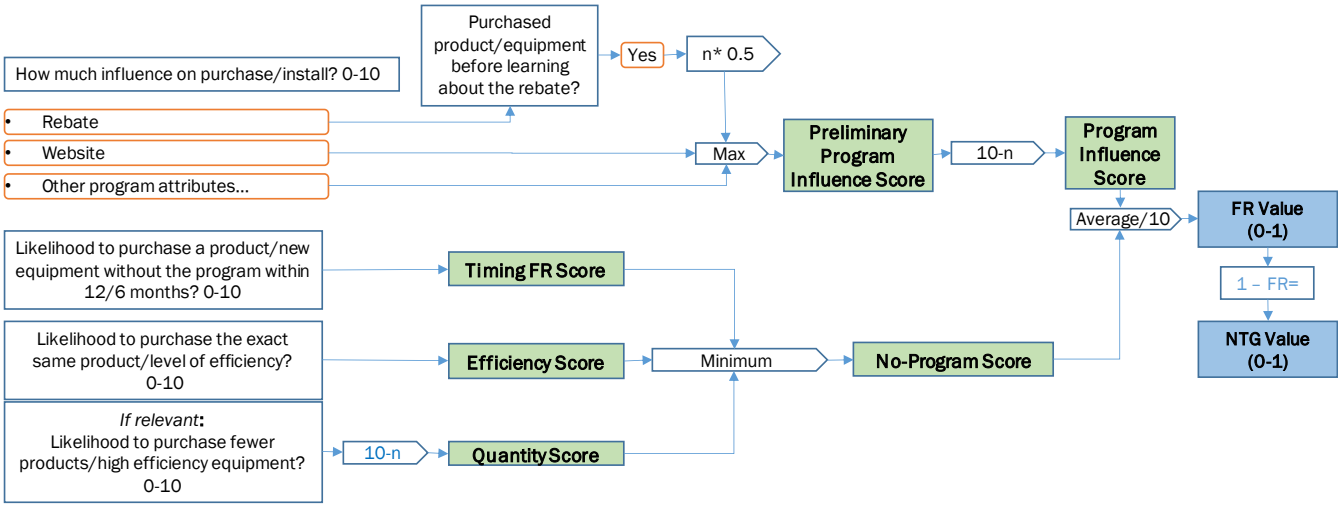
[10] The evaluation team used modified algorithms for the EE Kits and Appliance Recycling Programs given their program designs. Additional detail is provided within the program-specific chapters of the report.

Equation 2. Free Ridership

$$Free\ Ridership\ (FR) = Mean(Program\ Influence, No\ Program\ Score)$$

As different and opposing biases potentially affect the two main components, the No-Program component typically indicates higher FR than the Program Influence component. Therefore, combining these decreases the biases. Figure 1 presents a diagram of the respondent-level FR algorithm used for the HVAC, Efficient Products and Lighting (online component only).

Figure 1. Overview of General Residential Free-Ridership Algorithm



Additional detail on the free ridership methodology used in the evaluation of the residential portfolio is presented in each of the relevant program chapters.

Participant Spillover

PSO refers to additional energy efficiency upgrades participants made at the time of or after their participation in the residential programs that were influenced by the programs but for which they did not receive a program incentive. PSO is expressed as a percentage of program savings.

To determine if a survey respondent is eligible for PSO savings, we asked a series of questions about additional energy efficiency installations that they made without receiving an incentive and the degree to which the program influenced their decision to install the efficient equipment. The survey included two program influence questions:

a. *Q1. How much did your experience with the Program influence your decision to make these energy efficient improvements on your own? [SCALE 0-10; 0 means "no influence" and 10 means "greatly influenced"]*

b. *Q2. How likely is it you would have made these energy efficiency improvements if you had not received a rebate through the Program? [SCALE 0-10; 0 means "definitely would not" and 10 means "definitely would"]*

To supplement these numeric responses, the survey contains open-ended questions about how the program influenced the decision to make the upgrades and why the participant made the installations without a

program incentive. A respondent's additional energy efficiency installations are deemed eligible for PSO if two conditions are met: (1) the Program Influence Factor (see below) is greater than 5.0 and (2) the open-ended responses do not contradict that the installations were eligible for PSO.

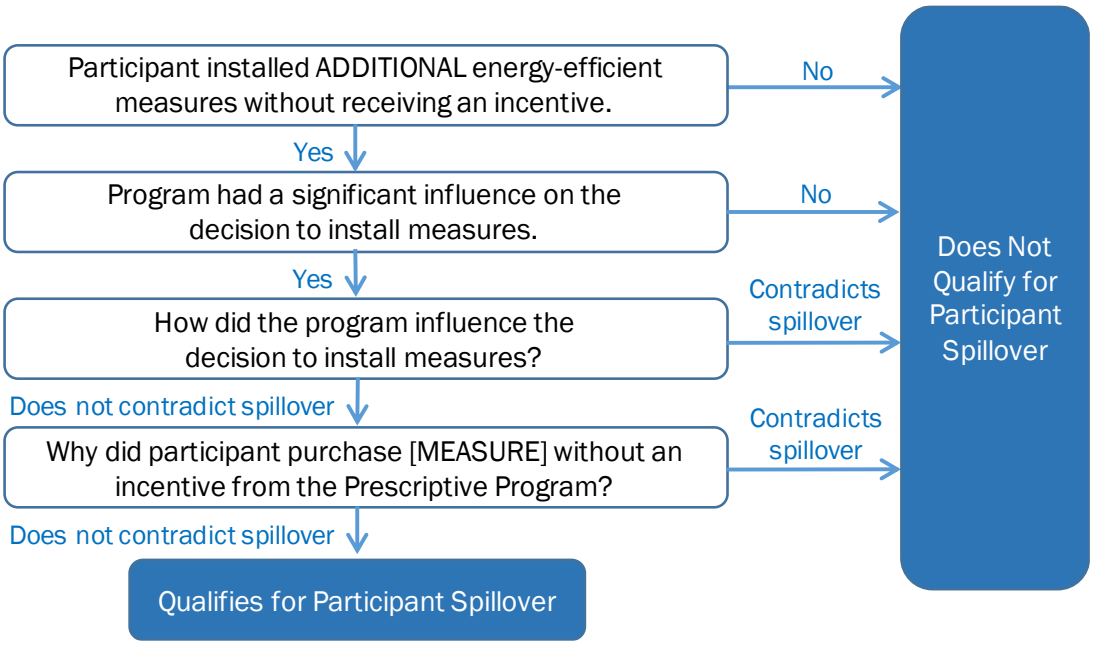
The Program Influence Factor was calculated as follows:

Equation 3. Program Influence Factor

$$\textit{Program Influence Factor} = (Q1\ \text{Response} + (10 - Q2\ \text{Response})) \div 2$$

Figure 2 presents a diagram of the PSO eligibility determination methodology used for this evaluation, including references to question numbers.

Figure 2. Participant Eligibility for Spillover



For participants with qualifying installations, we attempted to conduct follow-up calls to collect more-detailed information for each additional measure, such as quantities (where applicable), the baseline and efficient wattages (for lighting measures), or the hours of use (where relevant).

To estimate the savings achieved by spillover measures, we used two approaches:

- For spillover measures reported by survey respondent that also completed a follow-up call, we used the measure-specific data collected through the follow-up call, as well as the appropriate Ameren Missouri TRM algorithm to estimate measure-level savings. This is consistent with the approach we used to determine savings for measures installed through program participation (i.e., using measure-specific data from the program tracking database to calculate savings).
- For spillover measures reported by survey respondents that could not be reached for a follow-up call, we applied the average measure-level savings per participant calculated from those survey respondents for whom we were able to conduct follow-up calls. For measures for which we had no

additional information from follow-up calls, we used the Ameren Missouri TRM algorithm and default values to estimate the spillover measure savings.

It is important to note that the evaluation team did not include spillover savings from the installation of lighting measures given the potential for double counting with the Residential Lighting Program. Many customers do not know they are purchasing program-discounted LEDs so it is not possible to verify that the LEDs they purchased were not discounted by Ameren Missouri. In addition, the Residential Lighting Program evaluation estimates and claims savings from non-discounted LEDs that were influenced by the Ameren Missouri program.

Non-participant Spillover (NPSO)

Ameren Missouri has been running energy efficiency programs for many years, and a key component of the residential portfolio has been a marketing and outreach campaign to promote the programs and general energy-efficiency awareness among customers. Sustained utility program and general marketing can affect customers' perceptions of their energy usage, and, in some cases, motivate them to take efficiency actions outside of the utility's program. We define NPSO as the energy savings that Ameren Missouri's program marketing activities caused but did not rebate.

As outlined in the PY2020 evaluation plan, we planned to apply the NPSO percentages that we developed in PY2019 (13.7% for MWh and 7.7% MW) to PY2020 ex-post gross savings for four applicable programs: HVAC, Energy Efficient Products, Appliance Recycling, and Energy Efficient Kits. However, with the economic downturn due to the COVID-19 pandemic, we wanted to make sure that our plan to use the PY2019 results was still appropriate.

To make this determination, we looked to research conducted by the team in the summer of 2020. At that time, Opinion Dynamics conducted research with residential customers and HVAC contractors to assess the impact of the pandemic on Ameren Missouri residential customers and their likely program participation. Overall, our research found that the customers who are most likely to participate or make energy efficient upgrades outside a program were least impacted by the pandemic. These customers reported that the pandemic would have little impact on their purchase of energy efficient items or home improvements. For these reasons, we felt that applying the PY2019 NPSO percentage to PY2020 was reasonable despite the pandemic.

PY2020 NPSO Results

We allocated NPSO to each program based on the relative size of its ex-post gross savings. The specific allocations per program are in Table 9 and Table 10 below. NPSO represented 13.7% of the ex-post gross MWh savings and 7.7% of the ex-post gross MW savings among these programs.

Table 9. NPSO Allocation by Program (MWh)

Program	Ex-Post Gross Savings (MWh)	% Share	NPSO Allocation (MWh)	NPSO as % of Gross Savings
HVAC	36,908	70%	5,056	13.7%
Residential Efficient Products	8,981	17%	1,230	
Energy Efficient Kits	5,694	11%	780	
Residential Appliance Recycling	888	2%	122	
Total	**52,471**	**100%**	**7,189**	

Table 10. NPSO Allocation by Program (MW)

Program	Ex-Post Gross Savings (MW)	% Share	NPSO Allocation (MW)	NPSO as % of Gross Savings
HVAC	21.27	88%	1.79	7.7%
Residential Efficient Products	1.57	7%	0.22	
Energy Efficient Kits	0.98	4%	0.07	
Residential Appliance Recycling	0.28	1%	0.01	
Total	**27.17**	**100%**	**2.09**	

Home Energy Report Consumption Analysis

The evaluation team used a monthly consumption analysis approach to determine impacts from the Home Energy Reports Program. Given the experimental design, the estimated savings are considered net savings. We used treatment and control group monthly billing data to estimate net savings per household over the program period. The net savings are further adjusted using joint savings analysis to ensure that savings are not double-counted between programs. We also compared Uplight's (the program implementer) estimated electric savings to those we developed for this evaluation.

3. Residential Lighting

This section summarizes the PY2020 evaluation methodology and results for the Ameren Missouri Residential Lighting Program. This PY2020 evaluation is limited to an impact evaluation as a detailed process evaluation was conducted as part of the PY2019 evaluation activities. Additional details on the methodologies are presented in Appendix A.

3.1 Evaluation Summary

3.1.1 Program Description

The Ameren Missouri Residential Lighting Program is designed to increase sales and awareness of ENERGY STAR® qualified LED lighting products.[11] The target market consists of all residential customers within the Ameren Missouri service territory. Ameren Missouri delivers the Lighting Program through two channels: (1) an Upstream Channel,[12] through retail partners, and (2) through the Ameren Missouri Online Store.

Through its Upstream Channel, the program provides incentives to retail partners to reduce costs and increase sales of qualified energy-efficient LED lighting products. Though the incentives are paid to the retailers, they translate into immediate point-of-purchase discounts for customers when they purchase program-qualified LEDs.[13] The Upstream Channel also trains retail outlet staff to discuss the benefits of efficient lighting and offers in-store marketing materials to increase customer awareness. Additional marketing activities vary from year-to-year but can include lighting clinics and events at retailers, pop-up retail shops, proximity mobile marketing, on-line advertising, co-op advertising, coupons, print, radio, television commercials, billboards, and on-bill messaging.

The Online Store offers Ameren Missouri customers a select assortment of efficient LED lighting products that customers can purchase directly from the site.[14],[15] For the Online Store, the incentives translate to immediate online customer discounts at checkout. In addition to providing all customers access to a streamlined approach for obtaining energy-efficient products, the Online Store also ensures that customers who do not live near a participating retailer have access to discounted LED products.

There have been a couple notable changes to the Lighting Program in PY2020:

- **Upstream:** Ameren Missouri started the year with an increased focus on community-based, discount retailers, including stores such as Goodwill, St. Vincent De Paul, and Habitat Restore. The focus on these retailers is important because these stores do not typically sell lighting and generally have a lower-income clientele. The enhanced focus was intended to bring efficient lighting to a new segment of the Ameren Missouri customer base. Efforts to bring these stores into the program began in PY2019, and initially in PY2020, substantial budget was allocated to discount stores to build upon last

[11] All product or company names that may be mentioned in this publication are tradenames, trademarks or registered trademarks of their respective owners.
[12] Ameren Missouri and the implementer refer to this channel as upstream. However, upstream programs typically target manufacturers. This channel of the Lighting Program is really midstream, as the program intervenes with retailers, not manufacturers.
[13] However, like with most residential midstream/upstream lighting programs across the country, the individual customer purchase of bulbs is not tracked by the program. Instead, the participating retailers provide monthly aggregate data of sales by qualified bulb model to the implementer.
[14] In addition to lighting, the Online Store offers discounted smart thermostats and advanced Tier 1 and Tier 2 power strips. Only the lighting measures are evaluated in this study; the thermostats and power strips are evaluated as part of the Ameren Missouri Residential Efficient Products Program.
[15] The current Online Store lighting main page can be viewed at: https://amerenmissouristore.com/shop/led-bulbs/.

year's successes. Unfortunately, all these efforts quickly came to a halt with the arrival of the COVID-19 pandemic in March. The discount stores were not deemed "essential businesses" and had to close from Mid-March and into April. Worse, lost sales during store closures were not recovered for many of these discount stores for the remainder of the year. The additional budget that was initially allocated to the discount retailers was reallocated to big box and DIY stores later in the year to ensure the program met its goals.

- **Online Store:** The Ameren Missouri Online Store has been offered for several years with varying levels of success, though never meeting its savings targets until PY2020. In February 2020, Ameren Missouri changed Online Store implementers selecting the AM Conservation Group (AMCG). AMCG is a subsidiary of Franklin Energy, the overall program implementer. The change was intended to better promote lighting measures and coordination of marketing efforts with the Efficient Products Program, which also offers products through the Online Store.

Because the program is delivered via two very different channels, we present results by channel throughout this report. Additionally, results are generally presented by bulb type (standard, reflector, and specialty) as each type is associated with a different TRM savings value.

3.1.2 Participation Summary

In PY2020, the Upstream Channel incented 3,194,826 individual bulbs from sales across 266 participating retailer stores; the Online Store incented 44,156 bulbs purchased by 1,882 unique Ameren Missouri customers (Table 11). The Upstream Channel dominates the Residential Lighting Program, as it did in PY 2019, representing 98.4% of ex ante gross MWh and MW savings. While the Online Store represents a relatively small proportion of overall program savings; however, it is worth noting that from PY2019 to PY2020 Online Store bulb sales increased by roughly 311%.

Table 11. PY2020 Lighting Program Participation Summary by Channel

Channel	Customers/Stores		Bulbs		Ex Ante Gross Savings			
	Number	%	Number	%	MWh	%	MW	%
Upstream	266	12%	3,194,826	98.6%	103,657	98.4%	15.60	98.4%
Online Store	1,882	88%	44,156	1.4%	1,634	1.6%	0.25	1.6%
		Total	**3,238,982**	**100.0%**	**105,291**	**100.0%**	**15.85**	**100.0%**

Proportionally, customers purchased similar types of LEDs across channels with standard bulbs dominating sales (Table 12).[16] In the Upstream Channel, 76% of all bulbs sold were standard LEDs compared to 11% reflectors and 14% specialty bulbs. The Online Store sold a similar distribution of bulb types with 75% being standard, 15% reflectors, and 10% specialty bulbs.

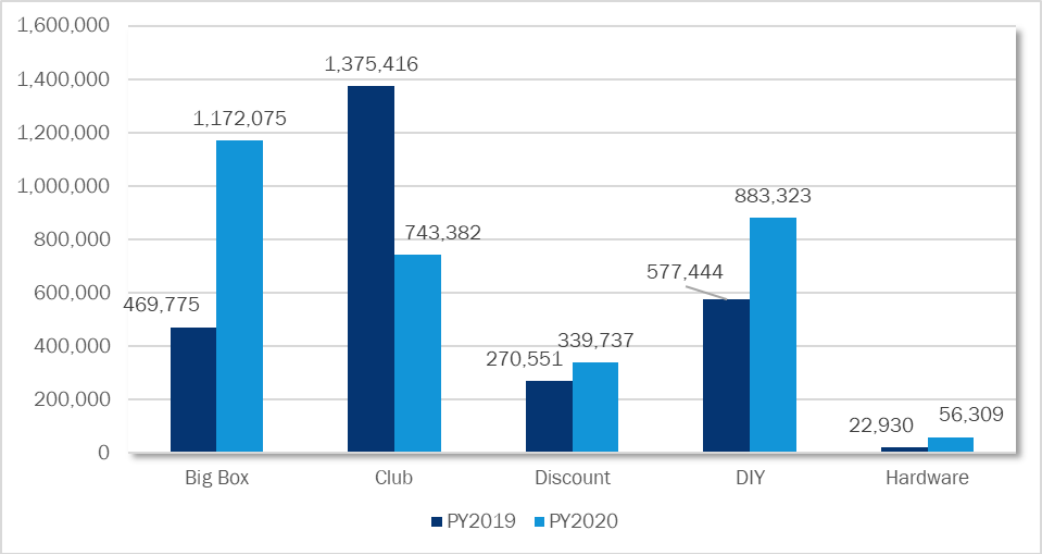
[16] The Ameren Missouri TRM Appendix I contains two LED measures: (1) 3.5.1 - LED Screw Based Omnidirectional Bulb, and (2) 3.5.2 - LED Specialty Lamp. While there is only a single class for omnidirectional bulbs, specialty bulbs are further broken down into three classes: (1) directional, (2) decorative, or (3) globe. For this evaluation, we refer to three bulb types: (1) standard, (2) reflector, and (3) specialty. Our standard bulb classification aligns entirely with the omnidirectional measure category and our reflector category aligns with the specialty directional bulbs. Our specialty category, however, includes both the decorative and globe TRM classes. We classify bulbs as such based on experience, which has shown notably different market performance and dynamics for globes/candelabras in contrast to directional/reflector bulbs.

Table 12. PY2020 Lighting Program Participation Summary by Channel and Bulb Type

Channel	Bulb Type	Customers/Stores		Bulbs		Ex Ante Gross Savings			
		Number	%	Number	%	MWh	%	MW	%
Upstream	Standard	266	44%	2,419,754	76%	74,870	72%	11.27	72%
	Reflector	180	30%	339,645	11%	14,609	14%	2.20	14%
	Specialty	160	26%	435,427	14%	14,178	14%	2.13	14%
Upstream Subtotal		**266**	**100%**	**3,194,826**	**100%**	**103,657**	**100%**	**15.60**	**100%**
Online Store	Standard	1,618	64%	33,210	75%	1,176	72%	0.18	72%
	Reflector	529	21%	6,478	15%	312	19%	0.05	19%
	Specialty	400	16%	4,468	10%	147	9%	0.02	9%
Online Subtotal		**2,547**	**100%**	**44,156**	**100%**	**1,634**	**100%**	**0.25**	**100%**
Total		**3,153**		**3,238,982**		**105,291**		**15.85**	

Because the Upstream Channel accounts for nearly all the program savings (98.4% of ex post gross MWh), the evaluation team took a deeper look at sales across years and throughout PY2020 to better understand how the channel operated in PY2020. Figure 3 shows Upstream Channel sales by retailer type in PY2019 and PY2020. Compared to PY2019, the program sold more bulbs in PY2020 (18% increase) and at different retailer types.

Figure 3. PY2020 Total Upstream Lighting Sales by Retailer Type

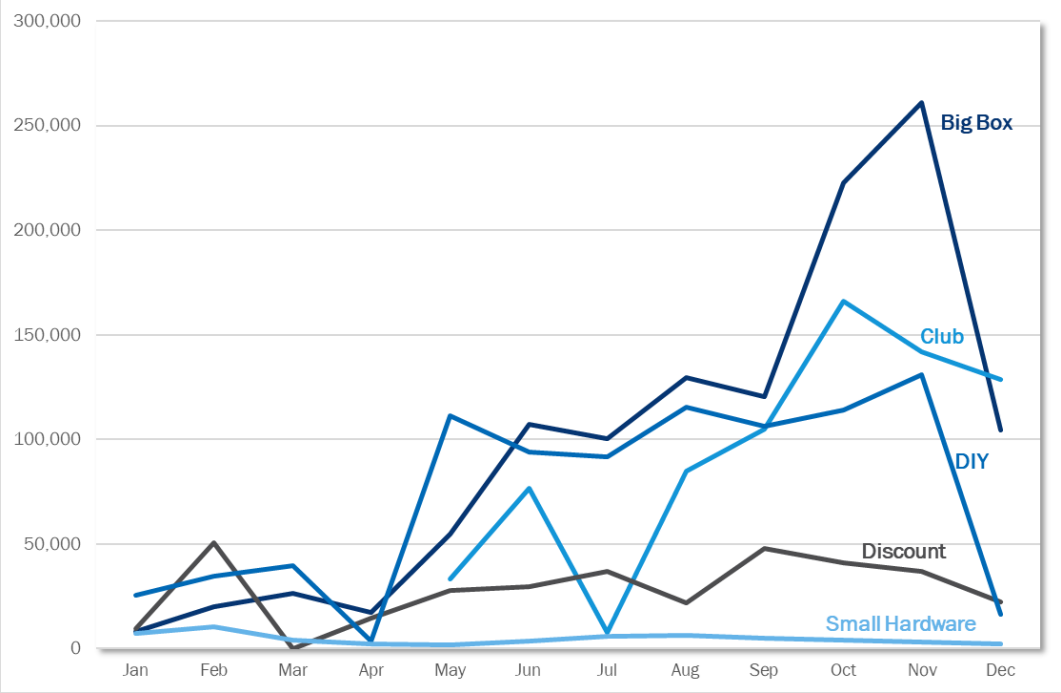


All retailer types sold substantially more bulbs in PY2020 than they did in PY2019, except club stores (46% decrease in sales).[17] Big box stores experienced a 149% increase in sales volume from PY2019 to PY2020. Even though they only account for a small proportion of total Upstream Channel sales, hardware stores saw a similar 146% increase. DIY and discount stores had more modest increases in sales (53% and 26% respectively). However, looking at overall sales does not tell the full story as 2020 was a very challenging year for some retailers due to the COVID-19 pandemic.

[17] Programmatically, much less effort was allocated to the club stores in PY2020 than in PY2019, reflecting this drop.

The performance of the program varied throughout the year and across retailer types, but certain retailer types faced bigger challenges in PY2020 than others. The pandemic impacted all retailers in the early months, but it had a longer lasting impact on discount and smaller hardware stores. Figure 4 shows PY2020 sales by retailer type by month revealing several interesting insights.

Figure 4. PY2020 Upstream Lighting Sales by Retailer Type Over Time



- **Early in PY2020 there was a large emphasis on the community-based, discount stores.** Ameren Missouri initially allocated significant budget to these stores, but these funds would ultimately go unused due to the pandemic and were reallocated to other retailers later in 2020. An indication of this renewed focus can be seen in February, where discount sales exceeded all other retailer type sales. Sales plummeted when discount stores were not deemed "essential businesses" and the majority of stores were closed from mid-March through April during the state's stay-at-home orders. While some gains are seen in the latter three quarters of the year with the discount stores, the program implementer highlighted the struggles many of these retailers faced with regards to keeping inventory on the shelves. For example, no bulb inventory could be placed in one retailer's stores for an extended period of time after the store was permitted to reopen because they were overwhelmed dealing with donations.
- **In contrast to the discount stores, most big box, club, and DIY stores were deemed essential business and were able to stay open for the entire year.** While sales of program-discounted bulbs at these retailers dropped at the start of the pandemic and appeared to rebound during the late spring and early summer, the reality is multiple factors are responsible for the sales trends during the year:
  - While big box, club, and DIY stores appear to have had a very slow start to the year, the reality is that most of these retailers did not have memorandums of understanding (MOUs) in place until late in the first quarter/early the second quarter. Thus, the low sales volumes are simply because most of these stores did not participate in the program early in the year.

- One club store did not begin selling program-discounted bulbs until April and another did not join the program until June.
- From mid-May to June a sizable retailer was added to the big box category and another added a substantial number of bulb models to their MOU.
- Between June and September, incentives were increased for certain bulbs to help promote participation. Also, a $1 multi-pack promotion launched in Q4 contributing to late-year spikes.
- December declines reflect that several MOUs were not in effect in December because targets had already been met for the year.
- As noted above, budget that had originally been allocated to discount stores was ultimately reallocated to the other store types later in the year.

3.1.3 Key Impact Results

Table 13 presents annual gross and net savings achieved in PY2020. As shown, the Lighting Program achieved 567% of the net first year energy savings goal, 588% of the net first year demand savings goal, and 425% of the last year demand goal in the 15+ effective useful lifetime (EUL) class. We discuss the factors contributing to these results in Section 3.3.1.

Table 13. PY2020 Lighting Program Impact Summary

	Ex Ante Gross	Realization Rate	Ex Post Gross	NTGR	Ex Post Net	Goal/Target Net	% of Goal/Target
First-Year Savings							
Energy Savings (MWh)	105,291	109.6%	115,409	64.8%	74,812	13,203	567%
Demand Savings (MW)	15.85	112.9%	17.90	64.8%	11.60	1.97	588%
Last-Year Demand Savings							
< 10 EUL (MW)	0.00		3.11	64.8%	2.02	0.00	0%
10–14 EUL (MW)	0.00		0.00		0.00	0.00	0%
15+ EUL (MW)	15.85	93.3%	14.78	64.8%	9.58	1.97	486%

Overall, the Lighting Program was the largest program in the PY2020 residential portfolio in terms of ex post net savings (49% of portfolio savings). In terms of ex post net demand, the Lighting Program, was the third largest contributor (24% of residential portfolio).

3.1.4 Conclusions and Recommendations

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

- **Conclusion #1**: Attention should be paid to the fact that the residential lighting market is transforming and barriers such as customer awareness and product availability no longer exist for most customers. According to the research we conducted for our evaluation of the PY2019 program, just over three-quarters of lighting products on retailer shelves are LEDs and nearly two-thirds of customers' light sockets contain an efficient bulb.
  - Recommendation: Ameren Missouri's Residential Lighting Program has been a successful program that has delivered a lot of energy savings to the residential portfolio, but the program should consider moving away from a mass market program design that sells a large volume of

standard bulbs at major retailers to a targeted design that focuses on bulb types with lower saturation and market share and on customers who still face barriers to adoption.

- **Conclusion #2:** For PY2020, Ameren Missouri attempted to build upon its PY2019 successes that brought several community-based, discount retailers such as St. Vincent De Paul, Salvation Army, Goodwill, and Habitat Restore into the Lighting Program. By bringing discounted LEDs into these stores, the program is more likely to reach low-income customers who may not shop at other participating retailers. This focus is appropriate. Past in-home lighting audits show that low-income customers lag behind other customers in their use of efficient bulbs. Our PY2019 evaluation also found that free ridership is lower at the community-based stores than at large retailers. However, the focus on discount retailers quickly came to a halt with the arrival of the COVID-19 pandemic. All the discount retailers were closed during the stay-at-home orders and many did not recover through the remainder of the year. Nevertheless, even with the huge challenges posed by the pandemic, the discount retailers still sold 26% more bulbs in PY2020 than they did in PY2019. With renewed effort and resources focused on these retailers, this number should be expected to increase in PY2021.
  - Recommendation: Ameren Missouri should continue, and if possible, expand efforts to reach low-income customers through the Lighting Program and other programs that target low-income customers.
- **Conclusion #3:** Even though sales through the Online Store grew by 311% in PY2020, the channel still represents only a small proportion of total program ex post gross savings. There is clearly opportunity for continued growth here, which would be beneficial for a couple reasons. With the growing customer reliance on online shopping more generally, the Online Store has unrealized potential. The channel is particularly useful for targeted marketing to underserved customers, which is more difficult to do through the mass market Upstream Channel.
  - Recommendation: Online stores are only limited by the amount of traffic hitting the site. In PY2019, we found that Online Store participants were more likely to learn about the store through direct communication from Ameren Missouri, as opposed to the mass media marketing activities the program used. As such, Ameren Missouri should consider increasing their own direct-to-customer marketing efforts to continue to drive general participation through this channel but also consider expanding mass media promotions due to their wider reach.

To meet the requirements of Missouri Code of State Regulations (CSR)[18] for demand-side process evaluations, we provide responses to the five required process evaluation questions in Table 14. Note that we did not conduct any process evaluation tasks for PY2020, so the findings denoted in the table are largely the same findings we reported in PY2019 with research results drawn from that evaluation.

Table 14. 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?	▪ Market imperfections have historically been product availability, customer awareness of energy-efficient lighting options and benefits, and the higher cost of these products. For PY2019, we found the following: ▪ Product availability is no longer a barrier. LEDs are the most frequently stocked bulb at lighting retailers across all bulb types (i.e., standard, reflector, and specialty).

[18] 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
	▪ Customer awareness is a decreasing barrier. The vast majority of customers have LEDs installed in their homes. Two-thirds of customer light sockets also contain either a CFL or an LED. ▪ LEDs still cost more than incandescent bulbs, but the price difference has narrowed. ▪ Despite these positive signs of market progress, customer use of efficient bulbs varies by household income and use case (i.e., socket type). Lower-income customers have lower LED penetration and efficient bulb saturation than other customers. Low-income customers are also more likely to purchase the lowest cost bulb rather than consider factors like energy efficiency. Sockets that take a standard bulb also have greater efficient bulb saturation than reflector or specialty sockets.
Is the target market segment appropriately defined, or should it be further subdivided or merged with other market segments?	▪ The target market for the Residential Lighting Program is all residential customers within Ameren Missouri service territory. ▪ The program targets low-income customers by engaging discount stores that do not typically sell lighting such as St. Vincent De Paul, Salvation Army, Goodwill, and Habitat Restore. These stores tend to serve lower-income customers. By bringing low-cost LEDs into these stores, the program attempted to reach customers it may not reach through other participating retailers or programs. ▪ Given the high level of efficient bulb socket saturation among non-low-income customers, the program could benefit from a more targeted design. Truly subdividing the market into low-income versus non-low-income and using tailored program designs for each customer segment would be appropriate.
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?	▪ Standard bulbs are the most commonly used bulb in customer homes and have long been the focus of the Residential Lighting Program. This focus made sense when socket saturation of efficient bulbs was low across all use cases. In our PY2019 evaluation, we found that 70% of light sockets that take a standard bulb contain an efficient bulb. A shift in program focus to LED reflector and specialty bulbs, which cost more and lag in use, would be appropriate. An exception is the low-income customer segment, as noted previously. Low-income customers could still use support increasing their use of all efficient bulb types, including standard bulbs.
Are the communication channels and delivery mechanisms appropriate for the target market segment?	▪ For the Upstream Channel, the program used in-store and out of store marketing. Our PY2019 evaluation found that in-store marketing was the primary driver of sales. Given the nature of the product, marketing at the point-of-purchase is appropriate. ▪ Program implementers added new discount retailers to the program increase the focus on low-income customers. This was an effective strategy that the program should continue and even expand, if possible. In turn, the program should reduce its emphasis on sales of standard bulbs at non-discount stores. ▪ The Online Store accounted for just over 1% of program sales and savings. With the growing customer reliance on online shopping more generally, the Online Store has unrealized potential. The channel is particularly useful for targeted marketing to underserved customers, which is more difficult to do through the mass market Upstream Channel.
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?	▪ Price is the remaining market imperfection, but much more so for low-income customers. The program should continue its partnerships with low-income retailers that do not traditionally sell lighting and other retailers in low-income neighborhoods. ▪ Customers have been slower to adopt reflector and specialty efficient lighting, in part because the previous product, CFLs, was expensive and did not meet customer expectations. LEDs are a superior product and price have fallen, but they still cost more than incandescent bulbs. The program could do more to increase adoption by focusing program budget on non-standard products.

3.2 Evaluation Methodology

For PY2019, our team conducted a comprehensive process evaluation of the Residential Lighting Program. These efforts included a detailed review of the program logic model, a program material review, Online Store participant surveys, in-store customer intercepts, lighting shelf stocking surveys, price elasticity modeling, and retailer/manufacturer interviews. From the surveys, intercepts, and price elasticity modeling the evaluation team derived key evaluation parameters including in-service rates (ISRs), leakage, residential-business split, participant free ridership (FR), and participant spillover (PSO). In PY2019, we also conducted a large-scale non-participant survey (n=4,804) to assess non-participant SO (NPSO), among other things.

Because there is no expectation of substantive shifts in any of these parameters in just a year, and to use evaluation resources more efficiently, for PY2020, the evaluation team focused our process evaluation efforts on program/implementer interviews and program material reviews. To derive PY2020 gross and net impact results, we apply the PY2019 evaluation-derived key parameters and the appropriate TRM inputs to PY2020 Lighting Program-tracking data.[19] The following sections provide the specific research objectives for the main evaluation efforts.

3.2.1 Gross Impact Analysis

Gross impact-related activities for the PY2020 Residential Lighting Program included review of the program-tracking databases and engineering analysis to estimate ex post gross savings. Key objectives of the PY2020 gross impact analysis include:

- Verify program-tracking data;
- Estimate the first-year ex post gross energy (MWh) and demand (MW) savings; and
- Estimate last year ex post gross demand (MW) savings, by EUL category.

3.2.2 Net Impact Analysis

Net impact-related activities for the PY2020 Residential Lighting Program included the application of PY2019 evaluation-derived estimates of PFR, PSO, and portfolio-level NPSO to the ex post gross energy (MWh) and demand (MW) savings to derive ex post net MWh and MW. We will also calculate last year ex post net demand savings.

Table 15 provides an overview of the PY2020 Residential Lighting Program evaluation activities.

Table 15. PY2020 Evaluation Activities for the Lighting Program

Task		Description
1	Program Manager and Implementer Interviews	▪ Conducted interviews in Q3/Q4 of PY2020 to understand program changes and staff's perspective on program implementation.
2	Program Material Review	▪ Review any new program materials to inform evaluation activities.
3a	Gross Impact Analysis - Database Review	▪ Review program database to check that program data are complete and within range and that program-incented measures meet all program requirements.

[19] For this evaluation, we used the Ameren Missouri 2019–21 MEEIA Energy Efficiency Plan Appendix I – TRM: Residential Measures (v3.0 dated January 1, 2020) and Appendix F (v4.0 dated November 7, 2019) (referred to as the "Ameren Missouri TRM").

Task		Description
3b	Gross Impact Analysis - Engineering Analysis	▪ Verify that ex ante savings estimates used correct TRM deemed savings values. ▪ Estimate overall and measure-level ex post gross impacts using TRM algorithms, deemed savings assumptions, and PY2019 evaluation-derived parameters.
4	Net Impact Analysis	▪ Apply PY2019 evaluation-derived estimates of free ridership, participant spillover, and non-participant spillover to estimate PY2020 net impacts.
5	Reporting	▪ Develop the draft and final annual report.

3.3 Evaluation Results

The following sections provide the PY2020 Lighting Program gross and net impact findings. Additional details regarding the impact evaluation and key inputs are included in Appendix A.

3.3.1 Gross Impact Results

The evaluation team calculated ex post gross electric and demand savings for both the Upstream and Online Store channels as well as overall. The evaluation team developed ex post gross savings estimates by examining all measures contained in the program-tracking database and applying algorithms and savings assumptions based on the appropriate Ameren Missouri TRM. We also applied key evaluation parameters collected through our PY2019 evaluation efforts, including ISRs, leakage, and the proportion of bulbs installed in residential applications.[20]

The PY2020 Lighting Program achieved 115,409 MWh and 17.90 MW in first year (and last year) ex post gross savings (Table 16). The realization rate for demand savings is slightly higher, at 112.9%, than for energy savings (109.6%). For last year demand savings, the realization rate is lower at 93.3% because the in-store intercepts conducted in PY2019 indicated that some bulbs purchased through the Upstream Channel (roughly 4%) were installed in business applications. LEDs in business applications have a lower EUL (six years) as compared to residential applications (19 years) due to much higher operating hours. This resulted in some last year demand savings being associated with the <10 EUL class (3.11 MW), which was not planned.

Table 16. PY2020 Lighting Program Gross Impact Summary

	Ex Ante	Realization Rate	Ex Post
First-Year Savings			
Energy Savings (MWh)	105,291	109.6%	115,409
Demand Savings (MW)	15.85	112.9%	17.90
Last-Year Demand Savings			
< 10 EUL (MW)	0.00		3.11
10–14 EUL (MW)	0.00		0.00
15+ EUL (MW)	15.85	93.3%	14.78

[20] The primary data collection efforts used to derive the PY2019 results included Online Store customer surveys, in-store shopper intercepts, and sales data modelling. Details of each of these and their combination are provided in Appendix A.

The following describes reasons for why realization rates differ from 100%:

- **The program calculated ex ante savings for the Upstream Channel based on the assumption that 100% of bulbs would be installed in residential settings.** Our PY2019 evaluation found that 4% of bulbs sold through the Upstream Channel were intended for use in a commercial setting. Commercial LED savings are much higher than residential savings for the same bulb because of dramatically different hours of use assumptions (995.18 for residential versus 3,612.00 for commercial).
- **For ex ante, electricity and demand savings values associated with an outdated version of the Ameren Missouri TRM (Appendix F v3.1) were applied to the program-tracking data.** For ex post, we apply the appropriate TRM values and assumptions (Appendix F v4.0).
- **Updated baseline and efficient wattages for ex post calculations based on more granular data.** In developing ex post savings estimates, we used more granular baseline and efficient wattage information found either through secondary research based on product SKUs or information available in the Ameren Missouri TRM Appendix I (v4.0).

Table 17 shows ex ante gross, ex post gross, and realization rates associated with first year energy (MWh) and demand (MW) savings. The highest realization rate (129.7%) was associated with reflector bulbs sold through the Upstream Channel; the lowest (86.9%) was associated with specialty bulbs rebated through the Online Store. In general, the realization rates are higher for the Upstream Channel than they are for the Online Store reflecting the effects of the issues presented above.

Table 17. PY2020 Lighting Program Annual First-Year Gross Impacts

Channel	Measure Category/Enduse	Energy Savings			Demand Savings		
		Ex Ante (MWh)	Realization Rate	Ex Post (MWh)	Ex Ante (MW)	Realization Rate	Ex Post (MW)
Upstream	Standard	74,870	104.7%	78,395	11.27	107.9%	12.16
	Reflector	14,609	129.7%	18,951	2.20	133.7%	2.94
	Specialty	14,178	117.0%	16,588	2.13	120.6%	2.57
Online Store	Standard	1,176	88.3%	1,038	0.18	87.6%	0.15
	Reflector	312	99.6%	310	0.05	98.8%	0.05
	Specialty	147	86.9%	128	0.02	100.0%	0.02
Program Total		**105,291**	**109.6%**	**115,409**	**15.85**	**112.9%**	**17.90**

Table 18 summarizes the total PY2020 last year ex ante and ex post demand savings and realization rates by channel, by bulb type. Upstream reflector bulbs have the highest realization rate (110.2%); Online Store specialty bulbs have the lowest (86.2%).

Table 18. PY2020 Lighting Program Annual Last Year Gross Demand Impacts

Channel	Bulb Type	Ex Ante (MW)			Realization Rate	Ex Post (MW)		
		<10	10-14	15+		<10	10-14	15+
Upstream	Standard	0.00	0.00	11.27	88.9%	2.14	0.00	10.02
	Reflector	0.00	0.00	2.20	110.2%	0.52	0.00	2.42
	Specialty	0.00	0.00	2.13	99.4%	0.45	0.00	2.12
Online Store	Standard	0.00	0.00	0.18	87.6%	0.00	0.00	0.15
	Reflector	0.00	0.00	0.05	98.8%	0.00	0.00	0.05
	Specialty	0.00	0.00	0.02	86.2%	0.00	0.00	0.02
Program Total		**0.00**	**0.00**	**15.85**	**93.3%**	**3.11**	**0.00**	**14.78**

3.3.2 Net Impact Results

Net-To-Gross Ratio Results

For PY2020, we use the results of our product level PY2019 net-to-gross ratio (NTGR) analyses to estimate net program impacts. In PY2019, the evaluation team conducted surveys with Online Store participants, in-store intercepts with bulb shoppers, surveys with non-participants, and price elasticity modeling with the program-tracking data to derive the NTGRs. For PY2020, the evaluation team re-weighted PY2019 values according to PY2020 distribution in terms of bulb type for both channels and retailer type for the upstream channel (i.e., different FR estimates for lamps sold in discount versus non-discounts retailers).[21] Based on this re-weighting, we derived the overall NTGR of 64.8% as shown in Table 19.

Table 19. PY2020 Lighting Program NTGRs

Channel	Free-Ridership (FR)	Participant Spillover (PSO)	Non-Participant Spillover (NPSO)	Net to Gross Ratio (NTGR)	% of Ex Post Gross Savings
Upstream	42.9%	0.0%	7.4%	64.5%	98.7%
Online Store	12.7%	1.7%	0.0%	89.0%	1.3%
Total	**42.5%**	**0.0%**	**7.3%**	**64.8%**	**100.0%**

Net Impacts

The evaluation team applied the re-weighted NTGRs to ex post gross energy and demand savings to derive final ex post net impacts for the PY2020 Residential Lighting Program (Table 20). Ex post net energy savings totaled 74,812 MWh and ex post net demand savings totaled 11.60 MW. As noted elsewhere, the vast majority (98.7%) of total ex post savings is associated with the Upstream Channel; only 1.3% associated with the Online Store.

Table 20. PY2020 Lighting Program Annual First Year Net Impacts

Channel	Energy Savings			Demand Savings		
	Ex Post Gross (MWh)	NTGR	Ex Post Net (MWh)	Ex Post Gross (MW)	NTGR	Ex Post Net (MW)
Upstream	113,933	64.5%	73,498	17.67	64.5%	11.40
Online Store	1,476	89.0%	1,313	0.22	89.0%	0.20
Total	**115,409**	**64.8%**	**74,812**	**17.90**	**64.8%**	**11.60**

[21] Details of the NTGR methodology are available in the Appendix A of the PY2019 report: *Ameren Missouri Program Year 2019 Annual EM&V Report – Volume 2: Residential Portfolio Appendices (June 18, 2020)*

Finally, Table 21 shows the last year demand savings (MW) by channel, by bulb type, by EUL class. The PY2020 Lighting Program delivered 2.01 MW of <10 year EUL class and 9.59 MW of 15+ year EUL class last year ex post net demand savings.

Table 21. PY2020 Lighting Program Annual Last Year Net Demand Impacts

Channel	Bulb Type	Ex Post Gross (MW)			NTGR	Ex Post Net (MW)		
		<10	10–14	15+		<10	10–14	15+
Upstream	Standard LED	2.14	0.00	10.02	64.5%	1.38	0.00	6.46
	Reflector LED	0.52	0.00	2.42	64.5%	0.33	0.00	1.56
	Specialty LED	0.45	0.00	2.12	64.5%	0.29	0.00	1.37
Online Store	Standard LED	0.00	0.00	0.15	89.0%	0.00	0.00	0.14
	Reflector LED	0.00	0.00	0.05	89.0%	0.00	0.00	0.04
	Specialty LED	0.00	0.00	0.02	89.0%	0.00	0.00	0.02
Total		**3.11**	**0.00**	**14.78**	64.8%	**2.01**	**0.00**	**9.59**

4. Heating Ventilation and Air Conditioning (HVAC)

This section summarizes the evaluation results and methodology for the PY2020 Ameren Missouri Residential HVAC Program. For PY2020, the evaluation team conducted detailed process and impact evaluations. Details on the methodologies are presented in Section 4.3 and Appendix A.

4.1 Evaluation Summary

4.1.1 Program Description

The Ameren Missouri Residential HVAC Program obtains energy and demand savings by incentivizing the installation of energy-efficient central air conditioning (CAC), heat pump (HP), advanced thermostat, and electronically commutated motor (ECM) measures.[22],[23] The HVAC Program target market is single and multifamily residential homeowners within the Ameren Missouri service territory with CACs or HPs.

In past years, the Ameren Missouri Residential HVAC Program consisted of only a Downstream Channel, but a new Midstream Channel was launched in PY2020 starting in May.[24] In the Downstream Channel, contractors submit the rebate application on the customer's behalf (which gets denoted as a line item on the contractor's receipt to the customer. In contrast, with the new Midstream Channel, the contractors complete the applications but the incentives are paid to the distributors who then pass on either some or all of the incentive amount to the contractors who in turn pass it on to the customers as a specific line items on the contractor's receipt to the customers.[25] Now, all CACs and HPs with a Seasonal Energy Efficiency Rating (SEER) of 18 or higher flow through the Midstream Channel; all CACs and HPs less than 18 SEER remain in the Downstream Channel.[26]

The Midstream focus is intended to incent super-efficient equipment more strategically, with the expectation that it will drive changes in distributor stocking and sales patterns which in turn will make super-efficient units more available to the market. In general, the expectation is that more super-efficient units will make it into the market faster by focusing on the supply side of the equation (i.e., distributors) than if focusing on the demand side (i.e., contractors or customers). Notably, such an approach is expected to accelerate market transformation.

Within both program channels, HVAC contractors play a critical role in delivering the HVAC Program to the target market. The contractors recommend the energy-efficient (and/or super-efficient) HVAC equipment to their customers, obtain the equipment from distributors, install the equipment, and assist in marketing and promoting the program to customers. To participate in the HVAC Program, contractors must complete the

[22] Note that for the sake of brevity we refer to "heat pumps" or "HPs" in general throughout much of this chapter. The HVAC Program HP category actually includes air source heat pumps (ASHPs), ground source heat pumps (GSHPs), and ductless mini split heat pumps (DMSHPs).
[23] In past years, all ECMs installed through the HVAC Program were included as part of program savings. Starting with PY2020, ECMs that are replace-on-failure do not accrue savings due to a recent change in the federal standards which now requires ECMs for all new furnaces. If an ECM is part of an early replacement project, savings are counted, but only for the remaining useful life of the existing furnace, which is deemed at six years.
[24] Though the implementer began recruiting and working with distributors earlier in 2020, the first incented units did not begin flowing through the Midstream Channel until May 1, 2020. Any 18 or higher SEER equipment that went through the program prior to May 1, 2020 are included in the Downstream Channel.
[25] Regardless of how the rebate gets split between the distributor and contractor, a minimum amount is required to make it to the enduse customer.
[26] In addition to the CAC and/or HP, advanced thermostats can also be installed through either channel. The thermostats are assigned to the channel associated with the installed CAC or HP.

program training course, as well as 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 also are assigned a dedicated Account Manager.

For years, Ameren Missouri has continuously implemented mass media and targeted marketing efforts to promote the HVAC Program.[27] They also provide marketing support to contractors including a co-op marketing program, co-branding opportunities, and a public relations tool kit. The result of these combined efforts is that customers are more aware of the HVAC Program than any other Ameren Missouri program in the residential portfolio.[28]

Beyond the addition of the Midstream Channel, the HVAC Program underwent a few design and implementation changes in PY2020 as detailed below:

- Removed ECM rebates for replace-on-failure (ROF) installs and now only count savings for early replacement (ER) ECMs using the remaining useful life of six years.
- Increased incentives for CAC and HPs by $50.
- Re-instituted incentives for new construction ASHPs.

Although the PY2020 program covers the entire calendar year, most of the changes to the program were not implemented until March 1, 2020 due to the amount of time it took to train contractors on changes and re-enroll them in the program. Also, though the implementer began recruiting and working with distributors earlier in the year for the Midstream Channel, the channel did not officially launch until May 1, 2020. During the lead-up to the channel launch date, program staff worked closely with distributors and contractors to both garner support for the Midstream Channel, and train trade allies on program processes and procedures.

4.1.2 Participation Summary

Over the course of PY2020, 13,324 unique customers completed 13,555 HVAC projects through the Downstream Channel (Table 22) and 1,047 unique customers completed 1,066 HVAC projects through the Midstream Channel. CACs and ASHPs were the largest contributors to ex ante gross MWh savings in both the Downstream and Midstream Channels. Collectively CACs and ASHPs accounting for almost 90% of ex ante gross energy savings for both channels (88% and 87% respectively).

Table 22. PY2020 HVAC Participation Summary

Enduse	Participants		Projects		Measures		Ex Ante Gross Savings	
	Number	%[a]	Number	%	Number	%	MWh	%
Downstream								
CAC	10,753	81%	10,858	80%	11,426	62%	19,521	55%
ASHP	1,402	11%	1,421	10%	1,489	8%	11,786	33%
GSHP	157	1%	165	1%	196	1%	1,486	4%
Advanced Thermostat	3,193	24%	3,224	24%	3,492	19%	1,349	4%

[27] Note that while the mass media campaigns have focused on the general residential homeowner population, the targeted campaigns have focused on a specific, more affluent segment of the overall customer base. The implications of this are discussed in more detail throughout the report.

[28] Based on a PY2019 non-participant survey (*n*=4,804), where 60% of respondents indicated they were aware of the HVAC Program; the next greatest program, Appliance Recycling, was only recognized by only 41% of respondents.

Enduse	Participants		Projects		Measures		Ex Ante Gross Savings	
	Number	%[a]	Number	%	Number	%	MWh	%
ECM	1,706	13%	1,720	13%	1,816	10%	1,056	3%
DMSHP	92	1%	93	1%	98	1%	276	1%
Downstream Total	**13,324**		**13,555**		**18,517**	**100%**	**35,475**	**100%**
Midstream								
CAC	743	71%	750	70%	797	44%	1,501	45%
ASHP	187	18%	190	18%	200	11%	1,408	42%
Advanced Thermostat	635	61%	642	60%	678	38%	287	9%
DMSHP	124	12%	124	12%	126	7%	159	5%
Midstream Total	**1,047**		**1,066**		**1,801**	**100%**	**3,355**	**100%**

[a] Percentages do not sum to 100 because some customers participated in both channels and some customers conducted multiple projects.

4.1.3 Key Impact Results

Overall, in PY2020, the HVAC Program achieved 59% and 64% of net energy (MWh) savings and demand (MW) savings goals, respectively (Table 23). The program also attained only 27% of its targeted last year demand for the 15+ EUL measure class. It is worth noting that the 2020 COVID-19 pandemic had significant but immeasurable impacts on the HVAC Program. Differences between ex ante and ex post savings estimates also contributed to the goal shortfalls.

Table 23. PY2020 HVAC Program Savings Summary

	Ex Ante Gross	Gross RR	Ex Post Gross	NTGR	Ex Post Net	Target Net	% of Target
First-Year Savings							
Energy Savings (MWh)	38,830	95.1%	36,908	76.5%	28,245	47,594	59%
Demand Savings (MW)	23.98	96.9%	23.24	69.9%	16.24	25.40	64%
Last-Year Demand Savings							
< 10 EUL	0.00		0.47		0.58	0	
10–14 EUL	0.74	78.9%	0.58	228.8%	1.34	0	
15+ EUL	7.25	85.0%	6.17	71.8%	4.43	16.17	27%

Overall, the HVAC Program was the third largest program in the PY2020 residential portfolio in terms of ex post net savings (18% of portfolio savings) and the second largest in terms of ex post net demand (34% of residential portfolio).

4.1.4 Key Process Findings

For PY2020, the evaluation team only conducted a process evaluation for the new Midstream Channel. Key findings from the PY2020 HVAC Program include:

- **The Midstream Channel is having a positive impact on Ameren Missouri customers and participating distributors.** Participants are quite satisfied with the Ameren Missouri HVAC Program, its elements, and Ameren Missouri itself. Nearly all responding participants (97%) said they were "Very" or

"Somewhat" satisfied with their program experience, with the same proportion (97%) saying they are "Very" or "Somewhat" satisfied with Ameren Missouri. The high satisfaction also carries over to the unique elements of the program: 98% "Very" or "Somewhat" satisfied with their contractor; 100% "Very" or "Somewhat" satisfied with their new equipment; 98% "Very" or "Somewhat" satisfied with the installation of their equipment; 96% "Very" or "Somewhat" satisfied with the information or instructions provided by contractors, and; 96% "Very" or "Somewhat" satisfied with their contractor. Further, about three-quarters (72%) reported a "More favorable" perception of Ameren Missouri due to their participation in the program. Distributors also seem to look favorably on the new channel stating they have already made stocking changes and are also optimistic, expecting to make even bigger stocking changes next year.

- **While distributors are largely satisfied with the Midstream channel, some contractors have concerns.** Several of the contractors we spoke with (3 of 14) voiced the concern that the Midstream Channel just adds additional complexity to an already complicated application process. The addition of another actor means additional steps, additional work, and additional time to carry the cost of the rebates. Further, contractors note they have yet to see any major advantages or benefits from the inclusion of the Midstream Channel. Given this added complexity, for some contractors the Midstream Channel seems to be serving as an obstacle to selling more 18+ SEER units.
- **Contractors working in the Midstream Channel (or both Downstream and Midstream) appear to be somewhat different than those working only in the Downstream Channel.** Evidence suggests the difference is likely a function of the customer segments served by each of the channels. The Midstream Channel appears best suited to contractors serving more affluent customers and/or areas while the Downstream Channel now is best suited for contractors serving customers who may be willing and able to make upgrades, but unable to do so without the rebates. Ameren Missouri should leverage this new knowledge moving forward to refine marketing and messaging strategies to ensure the HVAC Program is able to reach its full potential.

To meet the requirements of Missouri Code of State Regulations (CSR)[29] for demand-side process evaluations, we provide responses to the five required process evaluation questions in Table 24.

Table 24. 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?	At a high level, the primary market imperfections include the high upfront cost of high-efficiency HVAC equipment and a lack of customer awareness regarding the benefits of such systems (i.e., energy and utility bill savings). Contractors play an important role in addressing these market imperfections by educating customers and promoting program incentives to make the high-efficiency equipment affordable alternatives to standard efficiency equipment. Midstream research conducted for PY2020 also suggests, however, that there is an organic segmentation to the customer population that warrants consideration. Different segments of customers face different barriers—or at least the importance of the barriers can vary. The barriers faced by customers of higher sociodemographic attainment are not the same

[29] 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
	barriers of someone whose income is too high to qualify as a low-income customer, but is still not high enough to be able to afford the initial costs of an energy-efficient system upgrade. While the former may easily be a candidate for super-efficient equipment, the latter is not really a candidate for any equipment, regardless of efficiency level. Of course, in between are customers who can bear the cost of higher-efficiency equipment but might not be able to bear the additional costs associated with super-efficient equipment. While each of these different segments of customer face the same general barriers, the significance and importance of the different barriers certainly varies.
Is the target market segment appropriately defined, or should it be further subdivided or merged with other market segments?	The HVAC Program's target market segment includes single family and multifamily residential homeowners with central cooling systems that are older or in need of replacement due to their operating condition. However, our research this year suggests the target market structure should be revised to incorporate the added complexity that the addition of the Midstream Channel revealed. There are at least three segments of customers that fall under the program-described target market but are not actually served by the program. First, there are low-income customers that qualify for the Single Family Income Eligible Program. Though the program was changed in 2020 to address challenges posed by the COVID-19 pandemic (namely no in-home work was permitted), these customers would typically be the target of the Single Family Income Eligible Program and not the HVAC Program. Second, are customers with incomes that exceed the criteria for low-income, but still are unable to afford the costs associated with upgrading to an energy-efficient system—of any efficiency level. The reality is that this is likely a sizable segment—maybe even the biggest—and energy-efficient HVAC equipment is not really accessible to them. No program is serving this latter segment. Though savings opportunities surely exist with this segment, accessing them will likely require alternative program designs. Third and final, is a unique segment of customers who are willing to make energy-efficient HVAC upgrades and can afford to, but only with the rebates. The program requirement that an existing operating system can be at most 12 SEER limits some of these customers from participating (i.e., there may be customers that would benefit from participating, but have systems that don't meet this threshold). Consequently, this is also a segment that does not really have access to energy-efficient equipment.
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 HVAC Program offers incentives for heating and cooling equipment at various efficiency levels. The HVAC Program also correctly accounts for market and federal code changes, phasing out offerings (i.e., ECMs) when they are no longer effective under evolved market conditions. As noted above, however, the program requirement that the existing unit cannot exceed 12 SEER is a limitation. This limitation may be too stringent as the current federal minimum standard is 13 SEER (which is also the baseline for ROF measures), and the minimum SEER qualifying for the program is 15 SEER. Technically, the SEER ceiling could be increased to 13 (or even 14) SEER while still providing energy savings. Of course, baselines adjustments might be warranted for such higher SEER systems.

CSR Required Process Evaluations Questions	Findings
Are the communication channels and delivery mechanisms appropriate for the target market segment?	The HVAC Program is primarily driven by contractors. A majority of participants report having first heard about the program through contractors (this was 68% last year when only offering Downstream; it was 62% this when only considering the Midstream Channel). Notably, the HVAC Program is the most well-known program of all Ameren Missouri residential programs, with 60% of general population survey respondents reporting awareness of the program.[30] Ameren Missouri also promotes the HVAC Program through other forms of outreach including e-mails, newsletters, bill inserts, the Ameren Missouri website, home energy reports, and mass media advertising. 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?	Leverage the insights that arose with the introduction of the Midstream Channel. Acknowledge that the contractors operating in each channel are different, and much of this is likely based on the sociodemographic attainment of their targeted customer base. Segment the HVAC customer population to ensure that the program design and messaging are in alignment with the unique set of barriers and needs faced by the different segments.

4.1.5 Conclusions and Recommendations

The evaluation team offers the following conclusions and recommendations for the HVAC Program based on the results of the PY2020 evaluation:

- **Conclusion #1:** Ameren Missouri's decision to implement the Midstream Channel has already resulted in positive market impacts on distributors' sales, stocking, and business practices. Their optimism also suggests this is likely to continue and grow in the future. Overall, intervening in the supply chain seems to be stimulating supply as desired.
  - Recommendation #1: Continue emphasizing and building the Midstream Channel. Where possible, try to recruit additional distributors to expand the program's overall ability to affect the HVAC market in the Ameren Missouri service territory.
- **Conclusion #2:** While distributors are largely satisfied with and optimistic about the Midstream Channel, this was not necessarily the case for all participating contractors. Adding more steps or actors to an already complex HVAC Program application process risks alienating some contractors. If some contractors decide not to sell 18+ SEER units because it is more work, the introduction of the Midstream Channel could actually *hinder* the penetration of super-efficient HVAC systems into the market.
  - Recommendation #2: Consider changes to the program design to minimize the burden on contractors. As an example, some existing midstream program designs do not require contractors to complete paperwork for customer incentives allowing them to spend more time on delivering services to their customers. As part of this process, contractors would be required to provide distributors with information to verify customer eligibility (e.g., utility account number, contact

[30] Results are drawn from a survey of 4,804 Ameren Missouri non-participant residential customers conducted between January 13 and 27, 2020.

information etc.), but distributors would take on responsibility for tracking program transactions and providing that data to program staff for processing. It is important to note, however, that Ameren Missouri would need to weigh the benefits of this approach with the potential drawbacks such as the inability to verify early retirement and therefore transition away from an early retirement program offering at least for measures offered through the midstream channel.

- **Conclusion #3:** With the introduction of the Midstream Channel, an organic segmentation of the residential HVAC customer base becomes evident. In order to maximize the potential for the HVAC Program—as well as provide equitable access to energy-efficient HVAC upgrades for the entire residential customer base—acknowledging and leveraging the diversity across segments should be factored into program design and marketing and messaging where possible.
  - Recommendation #3: The evaluation team sees at least four unique customer segments that should be addressed strategically, leveraging the barriers and opportunities unique to each segment to refine program delivery:
    - The "Top 10%" that Ameren Missouri has traditionally targeted. These are generally more affluent customers who are willing and able to not just upgrade their equipment but can also afford to upgrade it to super-efficient (i.e., 18+ SEER) equipment. These are generally the customers that are now served with the Midstream Channel and Ameren Missouri should continue to target market to these customers as they have been for years. Note that FR is expected to be relatively high for this segment.
    - The customers that are willing and able to make an energy-efficient upgrade but need the rebate to do so. These customers are unable to afford super-efficient equipment but can afford standard efficient equipment. These will generally be middle-class customers. Notably, these are also the customers being served by the current Downstream Program. Cost is by far the most important barrier for this segment, so targeted marketing emphasizing things like the rebate, monthly energy savings, and lifetime cost savings should be the focus.
    - Customers who do not meet the criteria for low-income (thus do not qualify for the Single Family Income Eligible Program below), but still cannot afford energy-efficient HVAC equipment upgrades—of any efficiency—with or without a rebate. This is certainly a sizable segment of the population—maybe even the biggest segment—and they are customers running older, much less efficient systems. It is worth noting that the current HVAC Program is not serving this segment. This is both an equity issue and a missed energy savings opportunity. Accessing and serving this segment will be challenging and require alternative program designs that might utilize interventions such as tiered rebates, offering no-cost financing, or other strategies. Cost-effectiveness will certainly be a concern, but FR is also expected to be quite low for this segment.
    - The last segment is comprised of low-income customers who qualify for the Single Family Income Eligible Program. Though these customers certainly represent a segment of the residential HVAC market, they are not true targets of the HVAC Program. The Single Family Income Eligible Program was altered this past year in response to COVID-19 restrictions; nonetheless, it is expected that this segment will continue to be addressed through the Single Family Income Eligible Program moving forward.
- **Conclusion #4:** One of the barriers to customer participation noted by contractors is the fact that the program requires existing CACs and ASHPs to be 12 SEER or lower (and less than 12 EER for GSHPs). This requirement may be too stringent.

- Recommendation #4: Consider changing the program requirements to permit 13 SEER existing equipment—or maybe even 14 SEER. The current minimum federal standard is 13 SEER, which is also the baseline for ROF measures as noted in the Ameren Missouri TRM Appendix I (v4.0). The minimum SEER eligible for the program is 15 SEER, however, indicating there are existing energy savings opportunities the program is missing.

4.2 Evaluation Methodology

In general, the evaluation team performed both impact and process evaluation activities to assess the performance of the PY2020 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;
- Characterize contractor participation with respect to the number of participating contractors, number of customers served;
- Assess the effectiveness of the contractor training program;
- Assess the effectiveness of program marketing and customer targeting strategies;
- Measure customer and contractor satisfaction with program processes and motivations for participating; and
- Provide evaluation results that can be used to improve the design and implementation of the HVAC Program.

Table 25 provides an overview of the HVAC Program evaluation activities. Following the table, we outline program-specific aspects of key evaluation methodologies.

Table 25. PY2020 Evaluation Activities for the HVAC Program

Evaluation Activity	Description
Program Manager and Implementer Interviews	▪ Conduct interviews to assess changes in program design and implementation from PY2019, key program successes and challenges, program performance, and evaluation priorities. ▪ Probe the program theory to better understand the ER issue.
Program Material Review	▪ Review all program materials to inform evaluation activities.
Tracking System Review	▪ Review implementer's tracking system to ensure that data required for the evaluation is being collected.
Participant Surveys	▪ Collect data to inform gross impact analysis (e.g., verify installation and early replacement), NTG (i.e., free ridership and participant spillover), and yield process-related insights.
Contractor In-Depth Interviews	▪ Gather qualitative information to understand HVAC Program's impact on the larger market and early replacement market. ▪ Collect data to yield process-related insights.
Participating Distributor Interviews	▪ Collect data to inform NTG (i.e., distributor free ridership and participant spillover) and yield Midstream channel process-related insights.
Database Review	▪ Review program database to check that program data are complete and that program-installed measures meet all program requirements.

Evaluation Activity	Description
Engineering Analysis	▪ Verify that ex ante savings use correct deemed savings values. ▪ Estimate overall and measure-level ex post gross impacts using TRM algorithms, deemed savings assumptions, and evaluation-estimated parameters.
Attribution/Net Impact Analysis	▪ Develop estimates of free ridership and participant and non-participant spillover. ▪ Apply portfolio-level non-participant spillover. ▪ Estimate PY2020 net impacts.

Participant Surveys

The evaluation team conducted two waves of participant surveys for the PY2020 evaluation: one in October 2020; the other in December 2020. Wave 1 of the survey captured enough Downstream participants (n=451) to compute robust FR and SO values for that channel. Since the first units did not start flowing through the Midstream Channel until May 2020, however, we did not capture many Midstream participants with Wave 1 (i.e., only n=55). For that reason, Wave 2 of the survey focused exclusively on Midstream participants and was launched strictly to boost the number of completes to ensure robust estimation of FR, and SO for the Midstream Channel (final Midstream n=103). We also incorporated six participants who participated in both channels. For the purposes of analyses, these latter participants were included in the Midstream Channel.

Overall, the goals of the participant surveys were to:

- Verify measure installation to develop ISRs;
- Measure participant satisfaction with program processes, the installed HVAC measures, contractor interactions, and program informational materials;
- Estimate participant FR and SO at the channel level.

Response rates for Wave 1 of the participant survey was 15% for the Downstream channel, 21% for the Midstream Channel, and 10% for those who participated in both channels. Response rates for Wave 2 of the participant survey were 14% for the Midstream Channel and 13% for those who participated in both channels. Table 26 provides the final participant survey disposition summary.

Table 26. Participant Survey Disposition Summary

Disposition	Downstream	Midstream	Both Channels
Completed Surveys	451	103	6
Partial Complete—survey eligibility confirmed	135	44	5
Partial Complete—survey eligibility unknown	53	20	1
No response	2,127	394	37
Screened out	36	24	1
Bounced e-mail	295	20	1
Opt-out	7	2	0
Total Participants in Sample	**3,104**	**607**	**51**

Contractor In-Depth Interviews

The evaluation team conducted in-depth interviews with active, semi-active, and non-active contractors. We define active contractors as those who complete at least 10 projects, semi-active contractors as those who

complete less than 10 projects, and non-active contractors as those who participated in PY2019 but did not complete any projects in PY2020. The goals of these interviews were to:

- Gather qualitative information to understand the HVAC Program's impact on the larger market;
- Collect process related insights for the Midstream Channel; and
- Assess contractor satisfaction with program components such as training and marketing.

A total of 386 contractors completed at least one project through the HVAC Program in PY2020. The evaluation team offered an incentive of $75 to those who completed the phone interview. In all, we completed 14 contractor interviews. Table 27 shows the final distribution of contractor interviews by participant type and channel.

Table 27. Contractor In-Depth Interviews Completed Summary

Disposition	Downstream Only	Midstream Only	Both Channels
Active contractors	3	0	4
Semi-Active contractors	6	0	0
Non-Active contractors*	1	0	0
Total interviews	**10**	**0**	**4**
Contractor population+	**288**	**2**	**96**

* The single non-active contractor participated in the Downstream channel during PY2019.

+ Represents the total number of each type of contractor included in the PY2020 program tracking data.

Participating Distributor Interviews

The evaluation team conducted in-depth interviews with a sample of distributors participating in the Midstream Channel in PY2020. A total of 15 unique distributors participated in the Midstream Channel of the PY2020 HVAC Program.[31] Because of the small population size, we purposively sampled, targeting those who sold the most equipment through the Midstream Channel to ensure we captured those who represented the bulk of program sales and savings. The goals of these interviews were to:

- Support the estimation of distributor FR (DFR) associated with the program;
- Gather feedback on program requirements, processes, and design, including satisfaction with program components such as trainings and marketing; and
- Yield insights regarding the future of the Ameren Missouri HVAC market.
- The evaluation team offered an incentive of $100 to every distributor who completed the interview. Ultimately, we completed four interviews with a set of distributors representing 79% of total Midstream Channel ex post gross savings.

Impact Analysis

[31] It is possible that more than 15 distributors participated in the PY2020 Midstream Channel. However, it is not possible to tell from the program-tracking data as several records listed what seem to be contractor companies in the distributor field. The evaluation team noted from a slide deck titled *2020 Contractor Enrollment Training.pdf* that the field for entering the distributor in the Online Intake Tool (OIT) is an open-ended field. Moving ahead, we recommend making this data entry field a select field that is populated with the list of participating distributors.

Gross Impact Analysis

The gross impact analysis consisted of a program-tracking database review to identify database errors and duplicate records, as well as ensure that the implementer applied savings algorithms and assumptions as outlined in the appropriate version of the Ameren Missouri TRM and Appendix F deemed savings tables.[32] Additionally, the evaluation team developed measure-level ISRs from the participant surveys, which were applied to ex ante gross savings in the process of computing ex post gross savings. Ultimately, to determine ex post gross electricity and demand savings, the evaluation team computed savings for each measure using the engineering equations and assumptions shown in Appendix A. The deemed 85%/15% ER/ROF ratio had already been applied to the program-tracking data, so the evaluation team did not need to make any additional ER/ROF adjustments when developing ex post gross savings.[33]

Measure Verification

We used the PY2020 participant surveys to develop ISRs for the HVAC Program at the measure level.[34] In the survey, we first asked program participants if they recalled receiving the rebate(s) for the program-record measure(s). If they did, we than asked how many of their respective HVAC units were currently installed. We then calculated ISRs by dividing the number of HVAC units currently installed by the total number of equipment reported in the program-tracking database. The ISRs used for the PY2020 evaluation are shown in Section 4.3.2; details of the development of the ISRs are provide in Appendix A.

Attribution/Net Impact Analysis

The net-to-gross analysis and the development of the net-to-gross ratios (NTGRs) for the HVAC Program was conducted at the channel level.

The Downstream Channel NTGR includes channel-specific participant FR (PFR) and SO (PSO) derived from the PY2020 participant surveys. We relied on contractor (or trade ally [TA]) SO (TASO) estimated from the PY2019 contractor surveys. For the PY2020 Downstream Channel NTGR was computed as:

Equation 4. PY2020 Downstream HVAC NTGR Calculations

$$Downstream\ NTGR_{2020} = 1 - PFR_{Down.2020} + PSO_{Down.2020} + TASO_{Down.2019}$$

The Midstream Channel's NTGR also includes channel specific PFR and PSO derived from the PY2020 participant surveys. Because of the nature of the Midstream Channel and significant role of the distributors, it also includes distributor FR (DFR) derived from the PY2020 distributor interviews. Note that for the Midstream Channel, the evaluation team did not estimate distributor SO.[35]

The evaluation team recommended weighting the PFR and DFR equally when deriving the channel-level NTGR. However, because the Midstream Channel was new for PY2020 and the methodology for computing Midstream NTGRs were untested—especially the DFR component—the statewide Independent Auditor was

[32] Note that for ex ante, the TRM version applied to the program-tracking data was Revision 3.1 (dated February 6, 2020) of the Ameren Missouri 2019–21 MEEIA Energy Efficiency Plan Appendix F. For ex post, the evaluation team applied the updated Revision 4.0 (released October 2020) of the Ameren Missouri TRM.
[33] For PY2020, an agreement was reached between Ameren Missouri and the Public Service Commission deeming the ER/ROF ratio at 85%/15%.
[34] We did not have enough cases to compute robust ISRs at the measure by channel level.
[35] Since contractors initiate the Midstream application, the main avenue for distributor SO would be distributors selling 18+ SEER units to *non*-participating contractors who then install units into eligible customers' homes. This type of SO is captured in the NPSO values that the evaluation team estimated for PY2019, which are applied to the PY2020 results as noted above.

concerned that anomalous results could have an undue influence on the final NTGRs. To avoid surprises in this first year of estimating Midstream NTGRs, in consultation with regulatory stakeholders in Missouri, evaluation team established an 80%/20% weighting of PFR/DFR.[36] Thus, the PY2020 Midstream NTGR was computed as:

Equation 5. PY2020 Midstream HVAC NTGR Calculations

$$Midstream\ NTGR_{2020} = 1 - (PFR_{Mid.2020} * 80\%) + (DFR_{Mid.2020} * 20\%) + PSO_{Mid.2020}$$

Non-Participant SO (NPSO) is also applied at the program level to derive the final net electricity and demand savings. The NPSO rates applied to PY2020 were originally derived from a large-scale (n=4,804) non-participant survey conducted as part of the PY2019 evaluation. For PY2020, we use the PY2019 NPSO rates and re-weight to account for the PY2020 ex post gross savings distribution across measures and channels. In the end, the overall program NTGR is:

Equation 6. PY2020 HVAC Program NTGR Calculations

$$Mean(Downstream\ NTGR_{2020}, Midstream\ NTGR_{2020}) + NPSO_{Down.2019}$$

Details of how each of the elements of the NTGRs are computed are included in Appendix A.

4.3 Evaluation Results

4.3.1 Process Results

Program Marketing and Outreach

To better understand how the program is being marketed and promoted, the evaluation team conducted interviews with Ameren Missouri and implementation staff as well as a comprehensive review of marketing and promotional materials. Based on these analyses, it is clear that Ameren Missouri has effectively marketed the program as an ER offering. However, such a strong focus on ER and targeting marketing only to more affluent customers likely limits the impacts and potential of the program (see Cross-Cutting Process Findings in Section 4.3.1 for further discussion).

Program staff and the implementer indicated that Ameren Missouri has always heavily marketed the HVAC Program to a unique segment of customers. In particular, both the implementation and program staff reported conducting targeted marketing campaigns based on propensity score modeling incorporating factors such as income, housing type, age, and other demographic markers to drive participation in the HVAC Program. Overall, this approach has resulted in targeted marketing efforts focusing on the "Top 10%" (the top 10th percentile) of the Ameren Missouri residential customer base.[37]

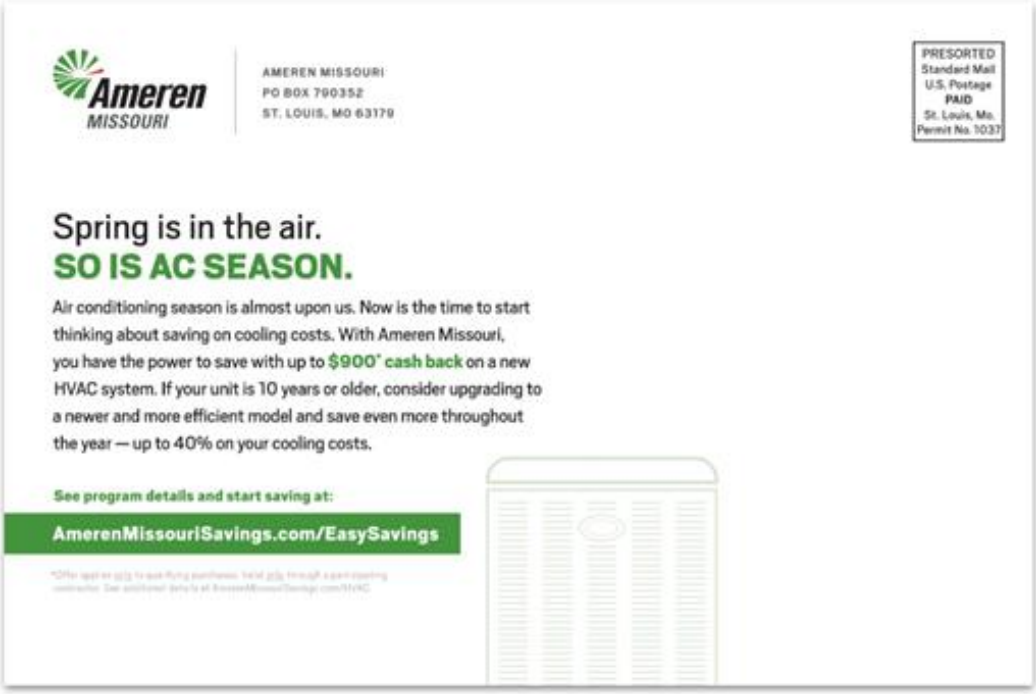
> "When we're targeting for propensity, we're targeting for people who have mid to older homes or HVAC systems and are also likely to participate, meaning they are more likely to have the funds to be able to replace even if their system is not totally failed. They have some discretion

[36] The evaluation team feels the approach for estimating DFR worked as designed and moving forward recommends that we apply equal weight to PFR and DFR.
[37] While here we specify the targeted marketing efforts, Ameren Missouri also conducts mas media marketing aimed at the general residential population.

> in how to use those funds. So, this means it's often higher income, often higher educated, customers that get targeted."
>
> "The design around the program really was to target the person that can afford it to see this advertising and make that decision to replace [their HVAC unit] without anything being wrong with it."

In general, the evaluation team found the targeted marketing messaging to be very proactive and oriented towards getting people to replace their units early. In PY2020, the HVAC Program was promoted through TV, radio, digital ads, and targeted direct mail. Contractors also promote the program in the field based on training provided by the implementer. Our review of the marketing and training materials revealed a strong emphasis on concepts such as comfort, reliability, electric bill savings, and how customers can prepare for the coming heating or cooling season. An example of a targeted direct mail promotion is shown in Figure 5.

Figure 5. March 2020 HVAC Direct Mail Promotion



The program also does a considerable amount of customer education aimed at making customers more aware of their options when it comes to their heating and cooling needs. The HVAC Program sends out customer education flyers designed to educate customers about various types of HVAC units that are incented through the program, information about SEER ratings and AHRI to educate customers about energy efficiency, and information about how to find contractors. One flyer also addresses whether or not a customer should replace their unit by asking a series of simple questions: Is your system 10 or more years old? Does your system require frequent repairs? Are you topping off your system frequently with R-22? Has your system experienced a major component failure? Does your system seem to run a lot to keep your home comfortable? Notably, all these questions are aimed at getting customers to think about replacing their HVAC system early.

It is also worth noting that in interviews with contractors, the evaluation team asked what proportion of their overall residential installs are typically ER, in contrast to how many program installs are ER. On average,

contractors reported that 50% of their overall residential installs are ER compared to 72% of program installs. This additional evidence shows the program is indeed targeting ER.

Participant Process Results

Program Midstream Channel Program Awareness

In PY2019, more than two-thirds of participants (69%) stated they first learned about the Downstream HVAC Program through their contractor. Similarly, in PY2020, most participants (62%) reported finding out about the Midstream Channel of the HVAC Program through their contractor (Table 28).

Table 28. How Midstream Participants First Heard About the HVAC Program

First Heard About the HVAC Program	Percent of Participants (n=109)
A contractor/trade ally	62%
An e-mail, newsletter, bill, door hanger, or other material from Ameren Missouri	17%
Ameren Missouri's website	4%
Ameren Missouri Home Energy Reports	4%
A line item on the bill from my contractor	4%
An internet search on Google, Yahoo, Bing, or some other search site	3%
An advertisement from the internet, social media, TV, radio, newspaper, billboard, or retail store	2%
An Ameren Missouri Representative	2%
A family member, friend, and/or colleague	1%
Other	1%
Don't Know	1%

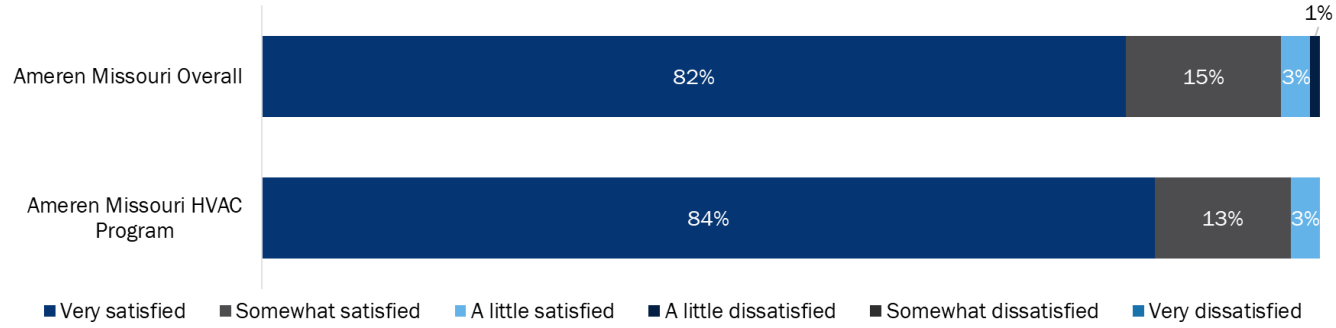
However, drawing any distinction between the channels using these numbers may be inappropriate. Participants know they received a rebate from Ameren Missouri for installing energy-efficient HVAC equipment as it appears as a line item on their receipt (and contractors are certainly telling them), but this is regardless of channel. There is no evidence to suggest that customers are aware of the Downstream versus Midstream Channel distinction.

Nevertheless, these results continue to point to the importance of the contractor-customer relationship for the program, even in the Midstream Channel. However, it is also notable that one-quarter of participants (25%) reported first hearing about the program through e-mails, newsletters, bills, door hangers, home energy reports, and the Ameren Missouri website, providing evidence that Ameren Missouri is continuing to market and promote the HVAC Program effectively.

Midstream Channel Program Satisfaction

Midstream participants are highly satisfied with both Ameren Missouri and the HVAC Program overall. Nearly all participants were very satisfied with Ameren Missouri and the HVAC Program, with almost all (97%) reporting they were "Very satisfied" or "Somewhat satisfied" (Figure 6). Only one participant rated their satisfaction with the program below "A little dissatisfied" (none scored it lower) and they noted it was because they have not received their rebate yet.

Figure 6. Participant Satisfaction with the Ameren Missouri and the HVAC Program (n=109 for each)

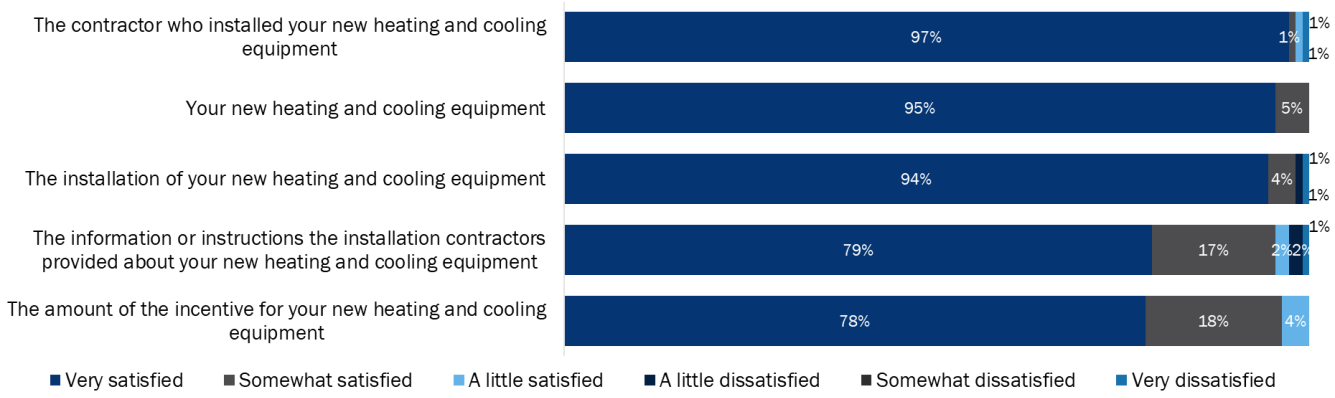


Additionally, almost three-quarters of participants (72%) reported a "More favorable" perception of Ameren Missouri due to their participation in the program. Due to the high levels of satisfaction with the HVAC Program overall, it is unsurprising that almost three-quarters of participants (74%) are either "Somewhat" or "Very" likely to recommend the program to a family member or friend. In addition to that, 17% of participants said that they already have recommended the program to others.

Overall, the majority of participants (82%) found it very easy to participate in the HVAC Program. A small number of participants (3%) rated their program participation process as being "Somewhat" or "A little" difficult." These latter participants attributed their difficulty to the length of time that it took for them to receive their rebate (n=2).

HVAC Program participants also generally expressed high levels of satisfaction with individual elements of the program (Figure 7). Participants were most satisfied with the contractor who installed their heating and cooling equipment (97% "Very satisfied") and least satisfied with the amount of the incentive that they received (78% "Very satisfied"). That said, the incentive levels do not seem to be a big pain-point for customers as almost all (96%) were "Very" or "Somewhat" satisfied, and none were "Very" or "Somewhat" dissatisfied.

Figure 7. Participant Satisfaction with Program Components (n=109 for each)



Contractor Process Evaluation Results

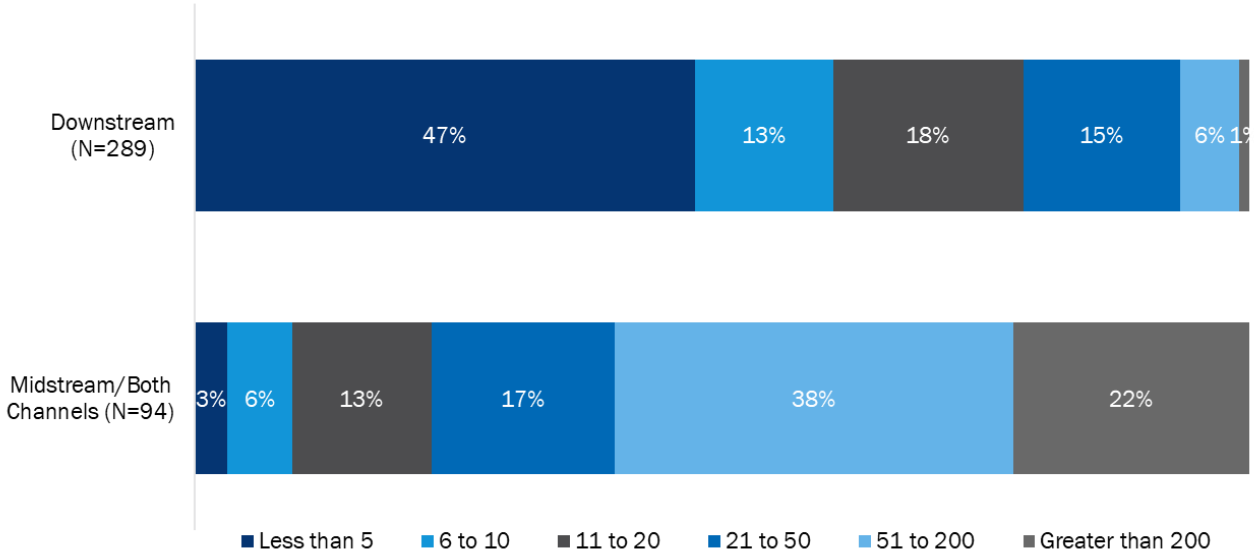
Characterizing Contractors

A total of 387 unique contractors installed 20,310 measures through the Midstream and Downstream Channels of the HVAC Program in PY2020. A total of 289 contractors participated in the Downstream Channel,

2 contractors participated in only the Midstream Channel, and 92 participated in both the Midstream and Downstream Channels.

The distribution of program activity across contractors and channels varies quite a bit (Figure 8). A little over half of all Downstream contractors (61%) installed fewer than 10 measures in PY2020. On the other end of the spectrum, only 7% of Downstream contractors installed over 51 measures. Comparatively, 60% of contractors who participated in only Midstream or in both Midstream and Downstream installed over 51 measures in PY2020 with 22% of those installing over 200 measures. In general, there appears to be a correlation between the channel and how many measures they install; those who participate only in the Downstream Channel tend to install fewer measures through the HVAC Program than those who participate in the Midstream Channel (or both).

Figure 8. Number of Measures Installed by Contractor by Channel



Contractor Training

The HVAC Program requires two types of mandatory training for participating contractors: (1) an initial enrollment training session, and (2) an annual refresher training at the beginning of each program year. During the trainings, the implementation team provides contractors with updates about program changes, strategies for how to sell high-efficiency units to customers, and provides materials to promote the program.

Contractors who remembered attending trainings (n=9) reported that they felt the yearly trainings were helpful in providing them updates and changes to the program. Contractors were asked to rate their training on a scale from 0 to 10 with 0 being "Extremely dissatisfied" and 10 being "Extremely Satisfied." Eight of nine contractors (89%) rated the trainings as a 9 or higher while only one (11%) rated the training as a 0. The one contractor who expressed that they were dissatisfied with the Ameren Missouri training noted it was due to the lack of technical training provided:

> "We do most of our trainings through manufacturers. There is some good information that comes out of [the Ameren training] but if we sold units the way that they want us to every time I am not sure we would sell much of anything. We really try to sell our company and our service rather than the unit themselves."

A few contractors (4 of 9, or 44%) also expressed that while they were satisfied with the part of the training that taught them how to participate in the program, they would like to see more sales techniques and sales topics in the yearly trainings. In general, they felt that there was not enough focus on upselling high-efficient units in the training and would often attend distributor and manufacturer trainings to learn how to upsell equipment to customers:

> "I have only received basic program training from the program. I receive our main sales training through our distributors."

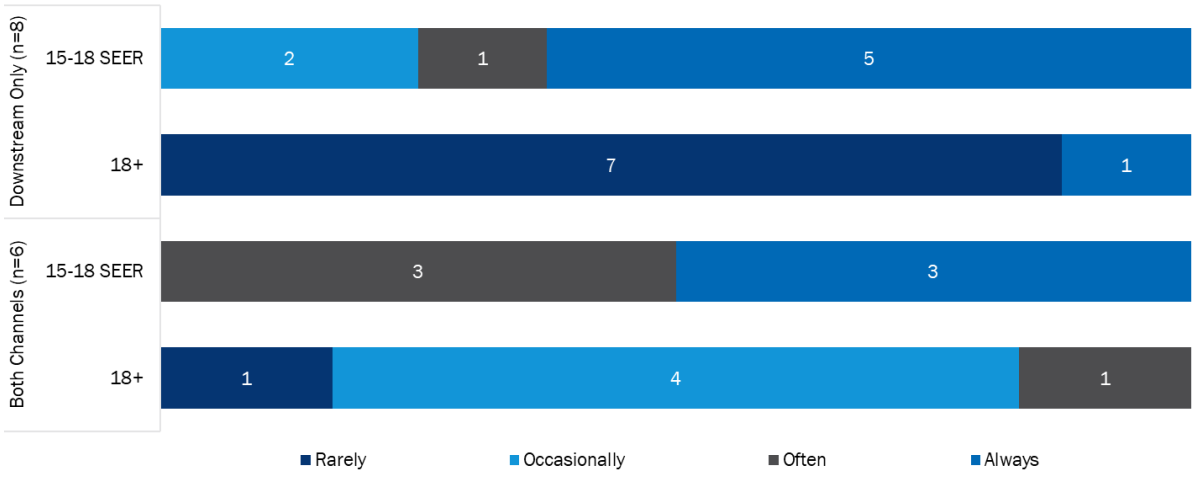
Contractor Sales Strategies

The interviewed contractors (n=14) reported largely adhering to the "good, better, best" approach taught in the training. However, it became immediately clear that this means different things to different contractors.

All interviewed contractors noted that they use a sales model aimed at providing customers with three options of units they could install: (1) a base unit, (2) an efficient unit, and (3) a highly efficient unit; however, the intensity of upselling varies by channel and system efficiency level. When asked how often they try to upsell customers to 15—18 SEER units, Downstream contractors said that they "Always" (5 of 8, or 63%), "Often" (1 of 8, or 13%), or "Occasionally" (2 of 8, or 25%) recommend a unit in this range. This compares similarly with the contractors who work in both the Midstream and Downstream Channels, where all six contractors indicated the upsell to 15—18 SEER "Always" or "Often."

The difference between channels is more striking when looking at 18+ SEER units. Most contractors working only in the Downstream Channel (7 of 8, or 88%) indicated "Rarely" recommending 18+ SEER units in contrast to only one of the six Midstream Channel contractors (17%). Further, while one of the eight Downstream Channel contractors (13%) reported "Always" recommending 18+ SEER units, five of six of the contractors that worked in the Midstream Channel (83%) reported "Often" or "Occasionally" recommending 18+ SEER units (Figure 9).

Figure 9. Contractor Upselling Strategies by Channel



Contractor recommendations are consistently rated the most influential aspect of customers' HVAC purchase decisions. When recommending units, however, contractors report that they typically determine what range of units to present before even talking with the customer. Contractors said they make these judgements based on factors such as the neighborhood (i.e., sociodemographics), home age, home condition, and characteristics

of the customer. While they also report trying to better understand a customer's needs in terms of price range and what they care about when it comes to their unit (e.g., energy savings, comfort, reliability, etc.) during the "kitchen table conversations," it is clear they walk into the situation with a bounded predetermination.

While all the contractors reported knowing that rebates are available for 18+ SEER systems, as shown above, many indicated they have a hard time recommending 18+ SEER units to customers. They stated that the upfront cost is the largest barrier for many customers and the contractors do not feel that the rebate is enough to convince most customers to upgrade from a 16 SEER to an 18 SEER system:

> "[The Midstream channel] operates just fine. I think we have only utilized it my guess is two times. It is not something that our customers, due to the pricing of the equipment, it's not something our customers are taking real good advantage of because of the cost of the unit really prohibits the rebate from making a difference."

Therefore, we see seven of eight Downstream contractors (88%) saying they "Rarely" recommend such super-efficient models. Instead, in these instances, when using the "good, better, best" model, the "best" unit is often a 16 to 17 SEER range unit.

These findings suggest there are likely different customer segments being served by the two channels. This appears to be driven by the diversity of the customer population. The Midstream Channel is appropriately designed and implemented to serve a more affluent customer base while the Downstream Channel is likely serving a less affluent segment. This topic is discussed in more depth in the Cross-Cutting Process Findings section.

Contractor Market Insights

The evaluation team asked contractors for their general insights into the Ameren Missouri HVAC market. This topic included questions about the future of HVAC market in Missouri, trends in energy efficiency and equipment sales, factors that contribute to additional sales of program qualified units, and the potential for the HVAC Program to affect the broader market.

When asked about trends in high-efficiency HVAC sales over the next five years, most contractors (12 of 14, or 86%) felt strongly that the market is in an upward trend with more efficient units becoming the norm in the residential sector. There were various reasons why contractors felt that the market is shifting towards higher-efficiency units: some contractors felt that manufacturers are driving efficiency levels forward as they develop more efficient units (5 of 14, or 36%); a few contractors felt that increasing energy costs would drive high-efficiency units in the HVAC market (4 of 14, or 29%); others felt that as more people become educated about energy efficiency, and more become conscious of climate change, more people will want to install higher-efficiency systems (3 of 14, or 21%).

Most contractors (10 of 14, or 71%) reported that program rebates are the most influential factor in their sale of high-efficiency equipment. Other factors that were mentioned included upfront cost (3 of 14, or 21%); energy costs and energy efficiency (3 of 14, or 21%); age of the unit being replaced (1 of 14, or 7%); and manufacturer pricing (1 of 14, or 7%).

Only about half of interviewed contractors (8 of 14, or 57%) felt that the program can affect the broader market. Of those that did, five of 14 (36%) cited the influence of the rebate on customers' decision' to install higher-efficiency units. The other three contractors (21%) emphasized the program's consistent marketing efforts to advertise and promote the program has been effective in reaching their customer base.

Three of the 14 contractors (21%) were unsure if the program will influence the broader market the way it is currently operating. One of these latter contractors suggested that the program should focus more on customer education for it to achieve more of an impact on the market. The last two contractors felt that the program would be more influential in the market if the rebates were increased so that more low-income customers could participate in the program.

Contractor Program Satisfaction & Recommendations

Most contractors were satisfied with the HVAC Program overall with more than three-quarters of contractors (11 of 14, or 79%) rating the program an 8, 9, or 10 (on a 0 to 10 scale where 0 is "Extremely dissatisfied" and 10 is "Extremely satisfied"). When asked what parts of the program worked well this year, contractors noted that the program's marketing benefitted them (five mentions). Other than the marketing, contractors appreciated the good relationship that they have with their Ameren Missouri representative (two mentions), as well as the simplicity of the Downstream rebate application process (three mentions).

While most participating contractors were satisfied with the new Midstream Channel, some also noted that there is room for improvement. When asked what could be improved about the program, two contractors said they wished that 18+ SEER units were still incented through the Downstream Channel rather than having to go through a distributor to participate. They noted that the Midstream Channel is adding additional complexity to an already complex application process. Other recommendations to improve the program included increasing the rebate amount for 18+ SEER systems to make the cost of the unit more bearable for the customer (two mentions) and improvements to the application process to make it easier to fill out such as automatically saving contractor information or making it easier to resolve problems with customer applications (two mentions). Another contractor suggested they would like to see a physical badge or certification of some kind that lets customers know that they are an Ameren Missouri-approved contractor.

One contractor stated they felt that there were too many steps involved with participating in the Midstream Channel. They shared their opinion that it would be much easier if the program operated more like the Downstream Channel, removing the distributor from the process. Removal of the distributor would inherently turn the program back into a Downstream-only program, which is not recommended. Rather, these findings suggest working to streamline the Midstream processes may benefit the program.

One contractor mentioned that they felt some additional financial pressures associated with the Midstream Channel:

> "You have to provide an instant rebate on the invoice so of course you are $900 out so say you do four or five of them you know it adds up. But they got it together, so it's fine. When it meets 18 SEER you have to show on the invoice that you gave the $900 off because Ameren is crediting our distributor for that so, it doesn't hit our account right away."

While this is also an issue with contractors who perform a rebate reassignment with customers in the Downstream Channel, it is exacerbated in the Midstream Channel as the distributor is now added to the chain and the application must go through another layer of approval:

> "It's too many hands, it's too much. It's too convoluted to get it handled, I don't mind giving the customer an instant rebate, but I would rather Ameren send me a check rather than having to go through my distributor. I haven't even been keeping up with that side of the program because it's a paperwork nightmare."

That said, another contractor felt the instant incentive was good because it ensured the customer does not have to wait six to eight weeks to receive their funds. Though we do not have enough data to show this

definitively, it is likely that this issue is related to the size of the contractor organization. The burden of bearing the incentives until payment is almost certainly a bigger concern for smaller firms with less cash flow than larger firms. Focusing on streamlining the Midstream incentive processes would benefit the program.

Distributor Process Results

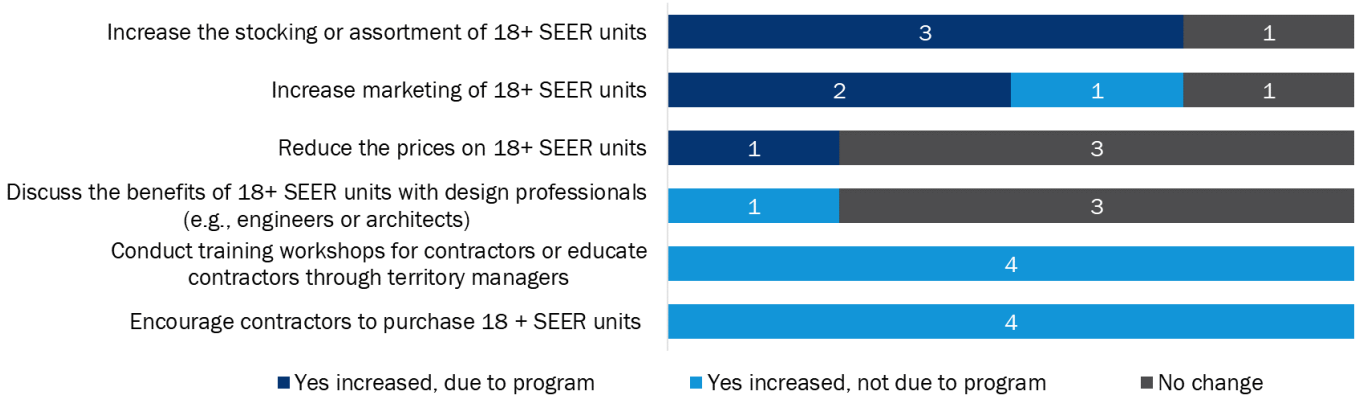
Distributor Characterization

Three of the distributors we interviewed are regional independent HVAC equipment distributors that distribute multiple brands of equipment. The remaining distributor is a national manufacturer-owned distributor that distributes one brand of equipment for a franchise. Two of the four distributors had been operating in the Ameren Missouri service territory for over 75 years while the other two had been operating in the area for 15 and 2 years, respectively.

Distributor Stocking & Sales Strategies

We asked the distributors about various sales strategies that could have implemented to sell 18+ SEER units and whether the program influenced any increases in the use of these strategies in PY2020 (Figure 10).

Figure 10. Sales Strategies Implemented by Distributors



While one distributor indicated their ability to stock more 18+ SEER units was hampered due to COVID-19, the other three did report stocking more 18+ SEER units because of the program. One of these distributors reported that they tripled their purchases of 18+ SEER equipment in PY2020. This was due in part to the Midstream Channel and in part to an additional financial incentive that they offered. More specifically, this distributor noted that they offered $250–$500 gift cards in addition to the Ameren Missouri rebate to encourage people to sell more super-efficient systems. Two others said that their increase in stocking in PY2020 was moderate. One of these distributors felt that some of this increase was due to the program and some was due to organic growth in the market. The other distributor felt that the program was much more influential on their increase in stocking. Regardless of the issues suffered in 2020, however, all the distributors stated they are preparing to stock more 18+ SEER units next year since they feel there will be more uptake in the Midstream Channel in 2021. In general, the distributors we spoke with seem rather optimistic that the program will be influential moving ahead.

One dynamic of the market we wanted to better understand was how often lack of inventory might affect sales of super high-efficiency units, and we learned that stocking limitations are not a big challenge for these distributors. We asked what percentage of the units they sell they stock in their inventory versus order from a

manufacturer on an as-needed basis. We asked this at three levels of efficiency: (1) 13–14 SEER, (2) 15–17 SEER, and (3) 18+ SEER. Two distributors said that they rarely come across situations in which they would have to order from a manufacturer and that they stock all of their units in-house, regardless of efficiency level. One distributor mentioned that they mainly stock 15–17 SEER equipment (60%), and that 13–14 SEER equipment (30%) and 18+ SEER equipment (10%) is less common. However, this distributor also mentioned they are not far from their manufacturer, so ordering any equipment that may be needed does not take a lot of time.

All four distributors noted that they have conducted workshops and trainings to educate contractors about the benefits of high-efficiency units and all reported encouraging contractors to purchase 18+ SEER units. All four distributors also said that they have always used these sales strategies, however, even before the Midstream Channel was introduced.

Impacts of COVID-19

The COVID-19 pandemic affected the distributors in multiple ways in PY2020 and while it is unclear exactly how much the program was affected in PY2020, distributors clearly adapted their business operations because of the pandemic. All four distributors reported the COVID-19 pandemic resulted in industry shortages and problems in the supply chain. However, three of the distributors said they were still able to stock more 18+ SEER units than prior years. The other specifically stated the reason they did not stock more 18+ SEER units was the pandemic:

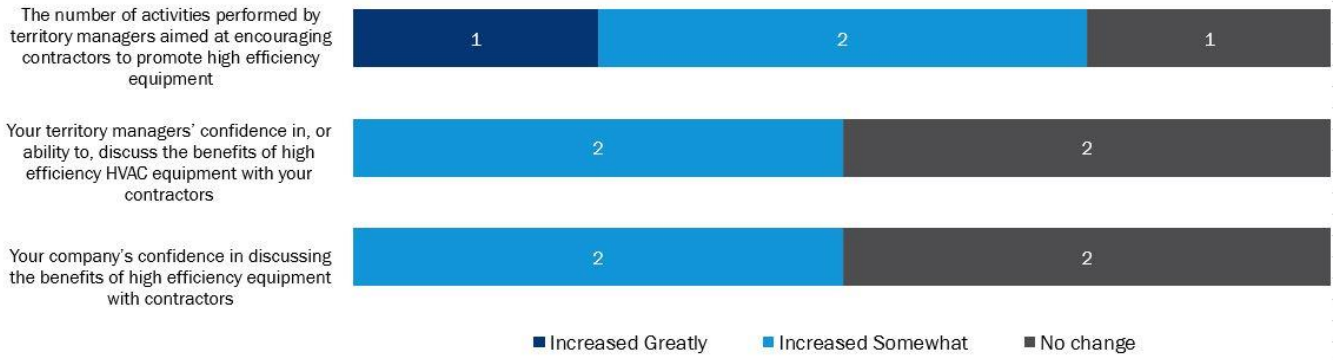
> "This year it was a moderate, next year it will be a large increase. And really this year was just… it was so unpredictable. Our industry was down tremendously after the first four months of the year. Huge unemployment because of COVID, everyone was expecting a very slow summer and industry-wide we just had a record year. We just had massive supply shortages; we couldn't get equipment…. We don't want to have those shortages again. And so moving into 2021, we are going to be making much larger preseason orders and we're going to try to anticipate these shortages. And so we will be increasing, I would say by 20% to 25%, our 18+ SEER inventory."

Not surprisingly, because of COVID all distributors reported that the number of in-person trainings they offered contractors was greatly reduced in PY2020. However, the distributors also reported successfully transitioning to webinar trainings to help educate contractors about the Midstream Channel.

Changes in Business Practices

The Midstream Channel is also having notable impacts on participating distributors' business practices beyond sales and stocking. We asked the distributors, since participating in the Ameren Missouri HVAC Program in PY2020, if certain aspects of their business have changed—including their company's confidence in discussing the benefits of high-efficiency equipment with contractors, their territory manager's confidence in discussing the benefits of high-efficiency equipment with contractors, and/or the number of activities performed by territory managers aimed at encouraging contractors to promote high-efficiency equipment (Figure 11).

Figure 11. Effects of the Midstream Channel on Business Practices



Three of the four distributors reported that the number of activities that they have done to promote high-efficiency equipment to contractors has either "Increased Greatly" (n=1) or "Increased Somewhat" (n=2). The distributor who said that their efforts have increased greatly noted that some of the activities that they perform to promote high-efficiency equipment were due to their own company efforts, but some were definitely due to the HVAC Program. The other two distributors reported similar sentiments about the program influencing increases. While both distributors had plans to provide this sort of support to territory managers, they felt that the program made it easier for distributors to encourage their territory managers to sell more high-efficiency units.

> "I would say yes. The [territory managers] would feel more comfortable talking about it. And before, ringing some of the territory managers, they were the same as the smaller dealer. They just wanted to get a sale and go to the next one, get a sale, go to the next one and they didn't care whether it was a high-efficiency unit or not. I think now that they have more knowledge about how the programs work, and all the rebate programs that are out there, they feel more comfortable talking about it. And I think it's really benefited everybody, including me. [The program] helped. We were moving that direction, but it just made it easier."

Cross-Cutting Process Findings

A number of key insights arise from the process evaluation results across the various actors. In this section, we bring together the various threads and describe how Ameren Missouri might want to leverage some of the results to segment their customer base and more effectively market the HVAC Program. We also touch on the topic of energy equity that has recently taken center-stage in the energy industry.

As discussed throughout this report, Ameren Missouri has decided to emphasize super-efficient measures (i.e., 18+ SEER) via the introduction of the Midstream Channel. This appears to be a wise move as results suggest that the market itself may not be able to stimulate adequate demand for these super-efficient models. That is, if the contractors are not offering these systems to their customers, a Midstream intervention aimed at stimulating the supply side of the market makes sense. However, upfront cost remains a significant barrier for a large number of customers who are unable to afford an 18+ SEER system. This suggests there are multiple segments of the residential HVAC market Ameren Missouri may want to consider moving forward. This is useful and important because marketing and promotions can be designed and implemented in a manner that leverages the differences between these segments resulting in greater participation, overall program performance, and increased program savings.

At one end of the spectrum there is the "Top 10%" segment that Ameren Missouri has been targeting. These are generally customers who can afford to replace their equipment before failure and can also afford the

higher costs of super-efficient equipment. The Midstream Channel is the perfect program design for these customers. While contractors working in the Midstream Channel are already much more likely to recommend super-efficient units—and their customers can afford them—stimulating the supply chain will likely result in accelerated and more widespread penetration of super-efficient equipment in the market. There is already evidence of such impacts as was described above. Overall, there are much fewer barriers to overcome for this segment. It is also worth noting that relatively high rates of FR are going to be associated with this segment.

At the other end of the spectrum are low-income customers eligible for the Single Family Income Eligible Program.[38] The Single Family Income Eligible Program is designed to provide whole-home energy efficiency upgrades to low-income Ameren Missouri customers living in single family properties, including mobile homes and duplexes. The program typically leverages three participation channels to achieve this goal: (1) the Single-Family Neighborhoods Channel; (2) the Mobile Home Park Channel; and (3) the Low-Income Efficiency Housing Grant Channel.[39] Each channel is designed to reach low-income customers in different ways that collectively overcome barriers to energy efficiency among this segment. As such, low-income customers typically have access to energy efficient HVAC equipment and are not true targets of the HVAC Program.

In between these two extremes are at least two additional segments; one that has access to energy efficient HVAC equipment while the other does not. First is the segment comprised of what is probably the "Next 30%" or so—these are customers that cannot afford super-efficient equipment but can afford equipment that is standard high-efficiency. These are the customers best served with the Downstream Channel and the ones to which contractors are recommending 15–18 SEER units. These are customers that can be swayed with marketing messaging emphasizing the benefits of an energy-efficient HVAC system, but the messaging also needs to address the number one barrier as well—cost. Concepts such as comfort and reliability could be included in messaging, but emphasis really needs to be placed on concepts like the rebate, monthly energy bill savings, and lifetime savings.

One particular program design element, however, serves as an additional barrier for this segment constraining its size and the program's overall ability to influence the market. Namely, the program requires that existing operating CACs and ASHPs must have a nameplate SEER of 12.0 or lower. Contractors suggested there is a sizable segment of customers that are amenable to energy efficiency, but the SEER ceiling is preventing them from making the upgrade. The federal minimum standard is 13 SEER, which is also the baseline efficiency for an ROF measure in the TRM. However, the minimum SEER eligible for the program is currently set at 15 SEER. Technically, increasing the existing equipment SEER ceiling to 13 (or even 14) SEER would still deliver energy savings, though baselines might need to be adjusted for these units. This would also, notably, make energy-efficient HVAC equipment accessible to a customer segment that is currently not served by any HVAC program.

From a programmatic perspective, the last segment is the most challenging. They are customers that make too much money to be considered low-income, but do not make enough to afford the cost of an energy-efficient HVAC system upgrade—of any efficiency level. Notably, this is certainly a sizable segment of Ameren Missouri's residential customer population—maybe the largest segment—and these customers effectively have no reasonable access to energy-efficient HVAC equipment. Marketing alone is unlikely to be effective with this segment because the cost barrier is simply insurmountable. Significant alterations to the program design will be needed to make any HVAC energy efficiency advances with this segment. They should not be ignored, however, as the energy savings opportunity with this segment is huge. Different cost-effectiveness

[38] Defined as income levels at or below 80% of area median income (AMI) or 200% of the federal poverty level.
[39] However, due to the health risks associated with COVID-19, the program team temporarily modified the program for PY2020 with the goal of delivering energy savings to low-income customers while limiting contact between customers and implementation staff. As such, no in-home work was conducted in PY2020.

requirements, higher or tiered rebates, and/or offering financing may be needed. It is also worth noting that if the program can serve this segment, FR should be quite low for these customers.

4.3.2 Gross Impact Results

Measure Verification

As part of our evaluation, we calculated ISRs for each measure based on responses to the participant survey (Table 29). The ISR values for all measures are equal to or close to 100% as we would expect for large and expensive measures that are typically installed by contractors and are difficult for residents to remove.

Table 29. PY2020 HVAC ISR Results

Measure Category	ISR
CAC	99.8%
HPs (ASHPs, GSHP, DMSHP)	100.0%
ECMs	100.0%
Advanced Thermostats	100.0%
Program	99.9%

Gross Impact Results

As presented in Table 30, the PY2020 HVAC Program achieved 36,908 MWh and 23.24 MW in ex post gross savings, representing a 95% energy and 97% demand savings realization rate.

Table 30. PY2020 HVAC Program Annual Savings

	Ex Ante Gross	Gross RR	Ex Post Gross
First Year Savings			
Energy Savings (MWh)	38,830	95.1%	36,908
Demand Savings (MW)	23.98	96.9%	23.24
Last Year Demand Savings			
< 10 EUL	0.00		0.47
10–14 EUL	0.74	78.9%	0.58
15+ EUL	7.25	85.0%	6.17

Table 31 summarizes the total PY2020 HVAC Program ex ante and ex post energy (MWh) and demand (MW) savings and realization rates by channel and measure. The Downstream Channel accounted for the vast majority (91%) of ex post gross energy savings. Overall, CACs contributed 56% of the program ex post gross energy savings program savings, followed by ASHPs (32%). GSHPs, advanced thermostats, ECMs, and ductless mini-split heat pumps (DMSHPs) together contributed the remaining 12% of program ex post gross energy savings.

Table 31. PY2020 HVAC Program First Year Gross Impacts

Channel	Measure Category	Energy Savings			Demand Savings		
		Ex Ante (MWh)	Realization Rate	Ex Post (MWh)	Ex Ante (MW)	Realization Rate	Ex Post (MW)
Downstream	CAC	19,521	97.0%	18,937	18.49	97.0%	17.94
	ASHP	11,786	87.4%	10,300	2.06	90.1%	1.85
	GSHP	1,486	128.6%	1,911	0.36	114.3%	0.41
	Advanced Thermostat	1,349	78.6%	1,061	0.62	80.4%	0.50
	ECM	1,056	94.8%	1,002	0.49	94.8%	0.47
	DMSHP	276	93.4%	257	0.07	67.7%	0.05
Downstream Total		**35,475**	**94.3%**	**33,467**	**22.09**	**96.0%**	**21.21**
Midstream	CAC	1,501	114.7%	1,721	1.42	114.7%	1.63
	ASHP	1,408	95.2%	1,340	0.29	89.4%	0.26
	Advanced Thermostat	287	76.3%	219	0.12	70.8%	0.09
	DMSHP	159	101.1%	161	0.05	91.7%	0.04
Midstream Total		**3,355**	**102.6%**	**3,441**	**1.88**	**107.3%**	**2.02**
Total		**38,830**	**95.1%**	**36,908**	**23.98**	**96.9%**	**23.24**

Table 32 summarizes the HVAC Program's total PY2020 last year ex ante and ex post electric demand savings and realization rates by channel and measure. Last year demand savings are lower than first year demand due to baseline shifts which occur after six years for ER, CAC, and HP measures. CAC measures contribute the majority (73%) of last year ex post gross savings (65% Downstream, 8% Midstream), followed by advanced thermostats (8%–7% Downstream, 1% Midstream) and ASHPs (8%–6% Downstream, 2% Midstream) measures. ECMs, DMSHPs, and GSHPs account for the remaining 11% of last year demand.

Table 32. PY2020 HVAC Program Last Year Gross Electric Demand Savings by Measure

Channel	Measure Category	Ex Ante Gross Savings (MW)				Gross Realization Rate	Ex Post Gross Savings (MW)			
		<10	10–14	15+	Total		<10	10–14	15+	Total
Downstream	CAC	0.00	0.00	5.22	5.22	89.3%	0.00	0.00	4.66	4.66
	Advanced Thermostat	0.00	0.62	0.00	0.62	80.4%	0.00	0.50	0.00	0.50
	ASHP	0.00	0.00	0.51	0.51	90.4%	0.00	0.00	0.46	0.46
	ECM	0.00	0.00	0.49	0.49	94.8%	0.47	0.00	0.00	0.47
	GSHP	0.00	0.00	0.27	0.27	95.2%	0.00	0.00	0.26	0.26
	DMSHP	0.00	0.00	0.04	0.04	72.3%	0.00	0.00	0.03	0.03
Downstream Total		**0.00**	**0.62**	**6.54**	**7.16**	**89.1%**	**0.47**	**0.50**	**5.41**	**6.38**
Midstream	CAC	0.00	0.00	0.55	0.55	110.8%	0.00	0.00	0.61	0.61
	ASHP	0.00	0.00	0.13	0.13	83.9%	0.00	0.00	0.11	0.11
	Advanced Thermostat	0.00	0.12	0.00	0.12	70.8%	0.00	0.09	0.00	0.09
	DMSHP	0.00	0.00	0.04	0.04	96.2%	0.00	0.00	0.04	0.04
Midstream Total		**0.00**	**0.12**	**0.72**	**0.84**	**100.1%**	**0.00**	**0.09**	**0.75**	**0.84**
Total		**0.00**	**0.74**	**7.25**	**7.99**	**90.3%**	**0.47**	**0.58**	**6.17**	**7.22**

Reasons for Discrepancies

Below, we detail the discrepancies that drive the electric energy and demand realization rates for the PY2020 HVAC Program. We discuss the Downstream and Midstream Channels together because, while realization rates for measures differ by channel, differences are driven by the same overarching themes.

- **Central Air Conditioners (CAC):** The gross electric energy and demand realization rates are 97.0% for Downstream CACs, and 114.7% for Midstream CACs. The overall program realization rates for CACs are 98.3%.
  - Ex post applied actual existing SEER, efficient SEER, and capacity values from the program-tracking database when available, whereas ex ante applied defaults from Appendix F (v3.1). Ex post de-rated tracked existing SEER values based on the tracked age of the removed equipment, when available, or otherwise by a default of 12 years, as required by the TRM.
    - For Downstream channel CACs, existing SEER values used in ex post were higher on average than Appendix F defaults, contributing to lower ex post savings.
    - For Midstream channel CACs, in comparison to Appendix F defaults, average existing SEER values used in ex post were lower and efficient SEER values used in ex post were higher, both driving higher ex post savings.
  - The evaluation team applied a realization rate of 98.3% to first year savings for all CAC measures, based on results from the desk reviews conducted as a part of the PY2019 HVAC Program evaluation, contributing to lower ex post savings.
  - October 2020 updates to Appendix F incorporated results from the PY2019 evaluation for the CAC parameters capacity, existing SEER, and efficient SEER. While ex ante savings correctly applied the savings assumptions from an older version of Appendix F (v3.1), ex post impacts relied on inputs in the most recently released version (v4.0). Differences between versions of Appendix F impacted 93% of measures.
- **Air Source Heat Pumps (ASHP):** The gross electric energy and demand realization rates for Downstream ASHPs are 87.4% and 90.1%, respectively, and for Midstream ASHPs are 95.2% and 89.4%, respectively. The overall program gross electric energy and demand realization rates for ASHPs are 88.2% and 90.0%, respectively.
  - The evaluation team applied a realization rate of 90.2% to first year savings for all ASHP measures, based on results from the desk reviews conducted as a part of the PY2019 HVAC Program evaluation, contributing to lower ex post savings. Removing desk review realization rates results in measure realization rates of 98% for electric energy and 100% for demand.
  - October 2020 updates to Appendix F incorporated results from the PY2019 evaluation for the following ASHP parameters: capacity, efficient heating season performance factor (HSPF), existing SEER, and efficient SEER. While ex ante savings correctly applied the savings assumptions from an older version of Appendix F (v3.1), ex post impacts relied on inputs in the most recently released version (v4.0). Differences between versions of Appendix F impacted 79% of measures.
  - Ex post applied actual efficiency and capacity values from the program-tracking database when available, whereas ex ante applied defaults from Appendix F (v3.1) for all measures. Ex post de-rated tracked existing SEER values based on the age of the removed equipment, or otherwise by a default of 12 years when tracked age was not available, as required by the TRM. Actual values were both higher and lower than Appendix F defaults, increasing realization rates for some

measures while decreasing rates for others. Overall, average actual de-rated existing SEER values are higher than Appendix F default values, contributing to lower total ex post savings.

- **Ground Source Heat Pumps (GSHP):** The gross electric energy and demand realization rates for GSHPs are 128.6% and 114.3%, respectively.
  - Ex post applied actual efficiency and capacity values from the program-tracking database when available, whereas ex ante applied defaults from Appendix F (v3.1) for all measures. Ex post de-rated tracked existing SEER values based on the age of the removed equipment, or otherwise by a default of 12 years when tracked age was not available, as required by the TRM. In comparison to Appendix F defaults, average existing SEER values used in ex post were lower and efficient SEER values used in ex post were higher, both driving higher ex post savings.
- **Advanced Thermostats:** The gross electric energy and demand realization rates for Downstream advanced thermostats are 78.6% and 80.4%, respectively, and for Midstream advanced thermostats are 76.3% and 70.8%, respectively. The overall program gross electric energy and demand realization rates for advanced thermostats are 78.2% and 78.9%, respectively.
  - Ex ante claimed savings for multiple thermostats per household. According to the Ameren Missouri TRM, however, the installation of more than one thermostat per household does not accrue additional savings. When calculating ex post, the evaluation team only awarded savings for one thermostat per household (identified as unique electric account numbers). As a result, 373 thermostats (9% of Downstream thermostats and 9% of Midstream thermostats) received zero ex post savings. This contributed to lower ex post savings.
  - The ex post analysis applied actual tracked heating equipment data to determine appropriate values for the parameters %ElectricHeat, %FossilHeat, and HeatingConsumption, whereas ex ante applied defaults from Appendix F (v3.1) for all measures. In the absence of tracked heating fuel type data, the ex post analysis assumed 0% electric heating for participants with both natural gas water heating and a boiler or furnace. For many of these measures, ex ante assumes "unknown" heating equipment type, applying the Appendix F default which assumes 16% electric heating. This discrepancy drives lower ex post electric energy and demand savings. Additionally, for participants who also installed a new CAC or HP, the ex post analysis applied the SEER value of the new equipment, contributing to lower ex post savings.
  - Electronically Commutated Motor (ECM): The gross electric energy and demand realization rates for ECMs are 94.8%. Due to a July 2019 change in federal code requiring ECMs on all new furnaces, in PY2020 the evaluation team only allowed savings to be claimed for early replacement (ER) ECM measures, and gave zero savings to replace-on-fail (ROF) ECM measures. All ER ECM measures have a realization rate of 100%. Lower total ex post savings are entirely driven by ROF ECMs.
- **Ductless Mini-Split Heat Pumps (DMSHP):** The gross electric energy and demand realization rates for Downstream DMSHPs are 93.4% and 67.7%, respectively, and for Midstream DMSHPs are 101.1% and 91.7%, respectively. The overall program gross electric energy and demand realization rates for DMSHPs are 96.2% and 77.4%, respectively.
  - October 2020 updates to Appendix F incorporated results from the PY2019 evaluation for the following DMSHP parameters: capacity, efficient HSPF, existing SEER, and efficient SEER. While ex ante savings correctly applied the savings assumptions from an older version of Appendix F (v3.1), ex post impacts relied on inputs in the most recently released version (v4.0). Differences between versions of Appendix F impacted 46% of measures.

- Ex post applied actual existing SEER, efficient SEER, and capacity values from the program-tracking database when available, whereas ex ante applied defaults from Appendix F (v3.1). Ex post de-rated tracked existing SEER values based on the tracked age of the removed equipment, when available, or otherwise by a default of 12 years, as required by the TRM. Actual values were both higher and lower than Appendix F defaults, increasing realization rates for some measures while decreasing rates for others. Overall, average actual de-rated existing SEER values are higher than Appendix F default values, contributing to lower total ex post savings.

4.3.3 Net Impact Results

Net-To-Gross Ratio Results

For PY2020, the evaluation team conducted surveys with both Downstream and Midstream Channel participants to estimate PFR and PSO at the channel by enduse levels. We also conducted in-depth interviews with Midstream distributors, which were used to estimate DFR. TASO was not recomputed for PY2020, and instead, the evaluation team used TASO derived from the interviews conducted with contractors as part of the PY2019 evaluation. Table 33 shows the components of the NTGRs used for the PY2020 HVAC Program evaluation. Details on the methods used to compute the various elements of the NTGRs is provided in Appendix A.

Table 33. PY2020 HVAC Program NTGRs by Channel by Enduse

Measure/Enduse	Participant Free Ridership (PFR)	Distributor Free Ridership (DFR)	Participant Spillover (PSO)	Trade Ally Spillover (TASO)	Net-to-Gross Ratio (NTGR)
Downstream					
CACs	39.5%		0.6%	0.3%	61.4%
ASHP	37.0%				63.9%
GSHP					
DMSHP					
ECM[a]					68.4%
Advanced Thermostats	29.6%		0.6%		71.3%
Downstream Total	**38.2%**		**0.6%**	**0.3%**	**62.7%**
Midstream [b]					
CACs	36.0%	39.6%	0.1%		63.4%
ASHP	39.6%				60.5%
DMSHP					
Advanced Thermostats	28.0%				72.1%
Midstream Total	**37.1%**	**39.6%**	**0.1%**		**62.7%**

[a] The evaluation team did not estimate ECM PFR or PSO as part of the PY2020 evaluation. We used the PY2018 NTGR for ECMs as that was the last time that a robust ECM NTGR was estimated.

b The evaluation team developed FR estimates for midstream measures through a weighted average of PFR (80% weight) and DFR (20% weight).

Based on results from the participant survey, we identified 20 respondents who had installed measures that qualified for PSO. Our engineering analysis of SO measures for these participants yielded total spillover savings

of 8,435 kWh for the downstream channel and 473 kWh for the midstream channel, for a total of 8,907 kWh (see Table 34).

Table 34. HVAC Program Participant Spillover Measures and Savings

Channel	Spillover Measure	Number of Unique Participants	Total kWh
Downstream	Air Purifier	2	1,230
	Clothes Washer	4	370
	Dehumidifier	4	816
	Refrigerator	3	167
	Dishwasher	4	61
	Tier 1 APS	1	56
	Low-Flow Faucet Aerator	3	178
	Low-Flow Showerhead	4	244
	Heat Pump Water Heater	1	2,640
	Programmable Thermostat	1	335
	Pool Pump	1	1,800
	Air Sealing	5	409
	Insulation	3	74
	Windows	3	54
Midstream	Clothes Washer	1	48
	Refrigerator	1	51
	Dishwasher	1	14
	Air Sealing	3	186
	Insulation	1	31
	Windows	1	142
	Total	**20**	**8,907**

Dividing the estimated total SO in our sample for each program (8,435 kWh for the Downstream Channel and 473 kWh for the Midstream Channel) by total program ex post gross savings of the overall participant sample for each channel (1,459,391 kWh for the downstream channel and 354,284 kWh for the midstream channel) yields a SO rate of 0.58% for the downstream channel and 0.13% for the midstream channel, as shown in Equation 7 and Equation 8.

Equation 7. PY2020 HVAC Program Downstream Channel Participant Spillover Rate

$$PSO\ \%_{Energy} = \frac{Total\ participant\ sample\ SO\ (kWh)}{Total\ participant\ sample\ savings\ (\mathrm{kWh})} = \frac{8{,}435\ kWh}{1{,}459{,}391\ \mathrm{kWh}} = 0.58\%$$

Equation 8. PY2020 HVAC Program Midstream Channel Participant Spillover Rate

$$PSO\ \%_{Energy} = \frac{Total\ participant\ sample\ SO\ (kWh)}{Total\ participant\ sample\ savings\ (\mathrm{kWh})} = \frac{473\ kWh}{354{,}284\ \mathrm{kWh}} = 0.13\%$$

Net Impacts

The evaluation team applied the PY2020 NTGRs to ex post gross energy (MWh) and demand (MW) savings to determine ex post net energy (MWh) and demand (MW) impacts for the PY2020 HVAC Program. Table 35 and Table 36 present the net impacts for the PY2020 HVAC Program.

Table 35. PY2020 HVAC Program Annual First Year Net Impacts

Channel	Measure Category	Energy Savings			Demand Savings		
		Ex Post Gross (MWh)	NTGR	Ex Post Net (MWh)	Ex Post Gross (MW)	NTGR	Ex Post Net (MW)
Downstream	CAC	18,937	61.4%	11,628	17.94	61.4%	11.02
	ASHP	10,300	63.9%	6,577	1.85	63.9%	1.18
	GSHP	1,911	63.9%	1,220	0.41	63.9%	0.26
	Advanced Thermostat	1,061	71.3%	756	0.50	71.3%	0.36
	ECM[a]	1,002	68.4%	685	0.47	68.4%	0.32
	DMSHP	257	63.9%	164	0.05	63.9%	0.03
	Non-Participant Spillover			4,585			1.63
Downstream Total		**33,467**	**76.5%**	**25,616**	**21.21**	**69.8%**	**14.80**
Midstream	CAC	1,721	63.4%	1,091	1.63	63.4%	1.03
	ASHP	1,340	60.5%	811	0.26	60.5%	0.16
	Advanced Thermostat	219	72.1%	158	0.09	72.1%	0.06
	DMSHP	161	60.5%	97	0.04	60.5%	0.03
	Non-Participant Spillover			471			0.16
Midstream Total		**3,441**	**76.4%**	**2,629**	**2.02**	**71.0%**	**1.44**
Total		**36,908**	**76.5%**	**28,245**	**23.24**	**69.9%**	**16.24**

[a] The evaluation team used PY2018 NTG results for ECMs as that was the last time that a robust ECM NTGR was estimated.

Table 36. PY2020 HVAC Program Annual Last Year Net Demand Impacts

Channel	Measure Category	Ex Post Gross Savings (MW)				NTGR	Ex Post Net Savings (MW)			
		<10	10–14	15+	Total		<10	10–14	15+	Total
Downstream	CAC	0.00	0.00	4.66	4.66	61.4%	0.00	0.00	2.86	2.86
	Advanced Thermostat	0.00	0.50	0.00	0.50	71.3%	0.00	0.36	0.00	0.36
	ASHP	0.47	0.00	0.00	0.47	68.4%	0.32	0.00	0.00	0.32
	ECM[a]	0.00	0.00	0.46	0.46	63.9%	0.00	0.00	0.30	0.30
	GSHP	0.00	0.00	0.26	0.26	63.9%	0.00	0.00	0.17	0.17
	DMSHP	0.00	0.00	0.03	0.03	63.9%	0.00	0.00	0.02	0.02
	Non-Participant Spillover						0.04	0.04	0.42	0.49
Downstream Total		**0.47**	**0.50**	**5.41**	**6.38**	**70.7%**	**0.36**	**0.39**	**3.76**	**4.51**
Midstream	CAC	0.00	0.00	0.61	0.61	63.4%	0.00	0.00	0.38	0.38
	ASHP	0.00	0.00	0.11	0.11	60.5%	0.00	0.00	0.07	0.07
	Advanced Thermostat	0.00	0.09	0.00	0.09	72.1%	0.00	0.06	0.00	0.06
	DMSHP	0.00	0.00	0.04	0.04	60.5%	0.00	0.00	0.02	0.02
	Non-Participant Spillover						0.00	0.01	0.06	0.06

Channel	Measure Category	Ex Post Gross Savings (MW)				NTGR	Ex Post Net Savings (MW)			
		<10	10–14	15+	Total		<10	10–14	15+	Total
Midstream Total		0.00	0.09	0.75	0.84	71.5%	0.00	0.07	0.53	0.60
Total		0.47	0.58	6.17	7.22	87.9%	0.58	1.34	4.43	6.34

[a] The evaluation team used PY2018 NTG results for ECMs as that was the last time that a robust ECM NTGR was estimated.

5. Home Energy Reports (HER)

This section summarizes the PY2020 evaluation methodology and results for the HER Program. We provide additional details on the methodology used to estimate impacts in Appendix A.

5.1 Evaluation Summary

Ameren Missouri designed the HER Program to promote changes in energy consumption behaviors that result in reduced electricity usage. The target market consists of residential customers in the Ameren Missouri service territory. This program is deployed as a randomized controlled trial (RCT), where customers are randomly assigned to a treatment or control group. HERs provide the treatment customers with a comparison of their energy usage to the usage of similar homes based on home size and location. At the same time, the implementer identifies and maintains a control group of non-participation customers.

The PY2020 HER Program is an ongoing program from MEEIA Cycle II, with Franklin Energy serving as the residential portfolio implementer and Uplight serving as the day-to-day implementer of the HER Program. Ameren Missouri initiated the program in PY2016 when the program team began to send paper reports to the first wave of treatment group customers.[40] In PY2018, the program team launched a second wave of customers who received paper reports and another that received e-mailed HER reports only. In PY2019, a large third wave of customers was added to the program who received both report types, as long as Ameren Missouri had valid e-mail addresses. Additionally, the HER Program included a few enhancements. Franklin Energy developed an energy portal to provide customers with access to energy usage information and Uplight began sending out high usage alerts to program participants.[41]

In PY2020, Ameren Missouri added Wave 4 treatment and control customers to the program. Due to concerns that originated during the PY2019 evaluation, Uplight checked to ensure that customers included in Wave 4 resided in single family homes. Approximately 10% of the customers in Wave 3 were residents that lived in multifamily buildings, which tend to have a smaller effect sizes for HER Programs when compared to those living in single family housing. Wave 4 included 69,831 customers with 44,882 treatment and 24,949 control customers. In PY2020, Uplight sent out six paper HERs in the months of February, April, May, July, August, and November.[42] Uplight also sent out eHERs every month of the year in 2020 except January to those customers with a valid e-mail on record.

In March 2020, Ameren Missouri made a number of changes to the program to address the COVID-19 pandemic. From March to August, the HERs included language to address increased home occupancy since many workplaces and schools operated remotely, in addition to halting high usage alerts. Uplight also removed high-cost and high-contact tips from the HERs for the remainder of the program year.

5.1.1 Participation Summary

Table 37 presents participation in the HER Program during PY2020, including the start date and length of time that each wave participated in the HER Program. Note that because the evaluation team relies on an intention-to-treat approach, the number of customers included in the table below reflects the number of treatment and

[40] Note that Uplight began implementing the HER Program in PY2019 and the previous program cycle was implemented by a different implementation contractor.
[41] Between March and August of 2020, Ameren Missouri and Uplight ceased sending out high usage alerts due to COVID-19.
[42] Because Wave 4 did not start until end of April, treatment customers in this group received only 5 HERs in PY2020.

control customers that Ameren Missouri included at the beginning of PY2020 and does not remove customers who opted out of the program or moved out of the service territory.[43]

Table 37. PY2019 HER Participation Summary

Wave	Number of Customers		Start Date	Length of Time in HER Program
	Treatment	Control		
Wave 1	24,059	71,903	August 2016	4 years and 5 months
Wave 2	8,762	31,680	March 2018	2 years and 10 months
Wave 3	60,561	151,203	April 2019	1 year and 9 months
Wave 4	44,882	24,949	April 2020	9 months
Total	**138,264**	**279,735**		

5.1.2 Key Impact Results

Table 38 presents the annual savings achieved in PY2020. Note that the contracted electric savings goal for PY2020 is 37,012,500 kWh. The savings calculated using a consumption analysis are unadjusted net savings given that the program framework is an RCT (i.e., incorporates any FR or SO estimates). To arrive at adjusted net savings, the evaluation team calculated an uplift adjustment via a joint savings analysis to ensure that any actions taken by participants claimed by other energy efficiency programs are not double-counted. To calculate demand savings, the evaluation team applied a coincidence factor to both the unadjusted and adjusted savings. While the team did not calculate a separate uplift adjustment for demand savings, the adjusted demand savings do reflect the savings uplift as we used adjusted energy savings to estimate adjusted demand savings. The PY2020 HER Program realized 146% of ex ante energy and demand savings and 102% of Ameren Missouri's energy and demand savings goals.

Table 38. PY2019 HER Savings Summary

	Ex Ante Program Savings[a]	Unadjusted Ex Post Net Savings	Uplift Adjustment[b]	Adjusted Ex Post Net Savings	Net Realization Rate	Goal Net[c]	% of Goal
Energy Savings (MWh)	24,693	36,467	465	36,002	146%	35,250	102%
Demand Savings (MW)	11.51	17.00		16.78	146%	16.43	102%

[a] Ex ante savings are based on deemed per participant savings estimates included in the Ameren Missouri TRM Appendix F version 3.0 (dated November of 2019) as that was the most recent version of the TRM available at the start of PY2020.

[b] To arrive at the adjusted ex post net demand savings, the kW savings factor is applied to the adjusted ex post net energy savings. As such, we did not calculate a separate uplift adjustment for demand savings, though adjusted kW savings reflect kWh uplift adjustments.

c The 2019-21 MEEIA Energy Efficiency Plan does not include incremental MWh or MW goals for the PY2020 HER Program, but we include goals here based on PY2019 for purposes of comparison.

Overall, the HER Program was the second-largest program in the PY2020 residential portfolio, accounting for 23% of ex post net residential portfolio energy savings and 35% of ex post net residential portfolio demand savings.

[43] To estimate program savings, the evaluation team multiplies the annual per household energy savings estimated from the consumption analysis by the number of customers who Ameren Missouri intended to treat. The only exception is that for customers who moved out of the service territory, the savings are pro-rated for the number of days the customers resided in their homes before moving.

5.1.3 Key Process Findings

The PY2020 evaluation did not include an assessment of HER program processes. Findings from a limited set of PY2020 research activities, as well as information from the program-tracking database, however, can help inform the process evaluation requirements for Ameren Missouri's HER program.[44] Table 39 summarizes responses to the five CSR process evaluation questions.

Table 39. PY2020 CSR Process Questions

CSR Required Process Evaluations Questions	Findings
What are the primary market imperfections that are common to the target market segment?	▪ Though we did not complete a survey for the PY2020 evaluation, PY2019 survey responses from the treatment and control customers indicated that they have a general understanding of how behavioral changes lead to reductions in energy usage. A market imperfection common to both customer groups is the lack of a more nuanced awareness of how their actions to reduce energy consumption impact their utility bills. Reports sent through the HER Program are designed to address this market imperfection for treatment customers by providing them with information about energy efficiency program opportunities and recommendations to modify behaviors to reduce energy consumption in their homes.
Is the target market segment appropriately defined, or should it be further subdivided or merged with other market segments?	In PY2020 Ameren Missouri and the HER program implementation team made adjustments based on the PY2019 evaluation to target higher energy users and customers in single family homes to be included in Wave 4. The program implementer included the top two quartiles in terms of energy consumption in the program from the legacy waves (i.e., Waves 1 and 2). These customers were virtually all single family customers. Unlike the legacy waves, 25% of the treated Wave 3 customers lived in multifamily housing with generally lower energy consumption, limiting energy savings potential from those participants. The implementation team addressed this in PY2020 as the newest wave (Wave 4) exclusively targeted single family customers with higher energy usage.
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 main form of treatment for customers is the paper or electronic HER. The HERs reflect the diversity of enduse energy service needs of residential homes, which is the target market. They include information related to the last 13 months of electric consumption, including load that is disaggregated by home area, as well as comparisons of monthly energy usage to similar homes. Reports also include customized tips aimed at modifying behavior related to the installation of LED lighting to replace less efficient lighting, installing programmable or advanced thermostats, and adjusting the way customers operate their washers/dryers, dishwashers, and HVAC equipment. In addition, HERs include information about applicable energy efficiency rebate programs that may lead customers to retrofit aging inefficient equipment.
Are the communication channels and delivery mechanisms appropriate for the target market segment?	The communication channels and delivery mechanisms are appropriate for the target market. Based on the PY2019 participant survey, the majority of respondents were satisfied with the way they receive HERs, and with the information they contained. Additionally, the HERs made customers aware of the energy efficiency programs Ameren Missouri offers. ▪ Late in PY2019, Ameren Missouri launched an additional communication channel for this program—an online portal that provides similar information as the HERs, but on a continual basis. These forms of communication are used

[44] See note 8 above.

CSR Required Process Evaluations Questions	Findings
	to inform customers about how much energy they use as well as about equipment upgrade opportunities and behavioral changes they can make to reduce electricity usage.
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 PY2020 evaluation did not include process research designed to answer this question. The PY2019 evaluation provided the following recommendation: ▪ HERs increased awareness of energy saving opportunities. Treatment customers were more likely to be aware of energy savings opportunities compared to control customers (64% compared to 53%). However, a higher percentage of treatment customers reported feeling like they do not have control over the amount of household energy that is used relative to control customers. Since treatment customers receive HERs, Ameren Missouri should consider providing information about how much energy various enduses and behavioral changes are projected to save for the average home. One potential way to communicate this is to monetize the energy savings so that treatment customers gain some understanding of how much money they can save by replacing old equipment and/or making changes to how they use energy.

5.1.4 Conclusions and Recommendations

The evaluation team offers the following conclusion for the HER Program moving forward:

- The HER Program performed well in PY2020, both exceeding ex ante savings estimates (146% realization rate) and net savings goals (102% of goals). On average, participants across all four waves saved 122 kWh per household annually. Wave 2 participants realized the highest average energy savings per household annually (250 kWh), when compared to participants in other waves, and also had the highest pre-period average daily energy consumption (65 kWh). By contrast, in their first year of treatment, Wave 4 participants realized the lowest average energy savings per household (74 kWh) and had the lowest pre-period average daily consumption (33 kWh). It is not uncommon for HERs participants to experience lower treatment effects during their first year of treatment.

5.2 Evaluation Methodology

The evaluation team performed both impact and process evaluation activities to assess the performance of the HER Program in PY2020. In addition to the overarching research objectives outlined for the residential portfolio, the evaluation team explored the following HER Program-specific objectives:

- Confirm treatment and control groups in each wave are equivalent;
- Estimate unadjusted and adjusted ex post net energy and demand savings;
- Provide evaluation results that can be used to improve the design and implementation of the HER Program.

Table 40 provides an overview of the HER Program evaluation activities. Following the table, we outline program-specific aspects of key evaluation methodologies.

Table 40. PY2020 Evaluation Activities for the HER Program

Task		Description
1	Program Manager and Implementer Interviews	▪ Conduct interviews in Q3 of PY2020 to understand program changes and staff perspectives on program implementation.
2	Consumption/Net Impact Analysis	▪ Conduct equivalency analysis for Wave 4 to check if treatment and control customer groups are equivalent in terms of average daily consumption of electricity. ▪ Conduct consumption analysis to quantify the changes in energy use among the treatment and control groups and arrive at unadjusted PY2020 net impacts. ▪ Determine savings from participation in other Ameren Missouri residential programs through a joint savings analysis. ▪ Remove double counted savings from unadjusted net impacts and estimate adjusted PY2020 net impacts.
3	Reporting	▪ Develop the draft and final annual reports.

5.2.1 Equivalency Analysis

The evaluation team performed an equivalency analysis to ensure that the treatment and control groups for each of the four waves participating in the HER Program in PY2020 were equivalent in terms of energy consumption (see Table 41). We compared average daily consumption (ADC) of electricity between treatment and control groups during their pre-participation periods to assess whether these groups were equivalent before cleaning billing data to ensure quality and completeness. Because we rely on an intent-to-treat (ITT) approach, we used the population of treatment and control customers in this equivalency analysis. We found that the two groups were equivalent for each of the waves. We used consumption data for the year prior to program participation to calculate ADC for each wave.

We provide detailed results showing the equivalency of the treatment and control groups for all waves in Appendix A.

Table 41. Pre-Participation Average Daily Consumption of HER Program Treatment and Control Groups

Wave	Treatment (Pre-Participation) Consumption	Control (Pre-Participation) Consumption
Wave 1	47.03	46.93
Wave 2	64.69	64.84
Wave 3	41.04	40.98
Wave 4	33.08	33.09

5.2.2 Consumption Analysis

The evaluation team performed a consumption analysis to assess any changes in energy consumption as a result of receiving HERs using an ITT approach[45]. We conducted a statistical analysis of monthly electric billing data for all Ameren Missouri customers who received a HER (the treatment group) and a randomly selected group of customers who did not receive a HER (the control group). The inclusion of a control group in the

[45] Intent-to-treat (ITT) estimates the impacts of the initiative for a group of customers the initiative intended to treat, (i.e., customers AIC intended to receive HERs or eHERs). An alternative approach is the average treatment effect of the treated (ATT), which estimates the impacts of the initiative for the group of customers that received HERs and/or eHERs. These approaches differ in the number of customers used in the analysis.

program design ensures that the statistical model controls for exogenous factors and robustly isolates the treatment effect. Consistent with evaluation best practices, we tested several model specifications and selected the one with the best fit. The selected model is a Lagged Dependent Variable model, which uses pre-period average seasonal consumption for each customer to control for customer-specific effects. We present further details about the consumption analysis in Appendix A.

5.2.3 Demand Reductions

We calculated demand impacts based on the Ameren Missouri TRM, which applies a peak adjustment factor to modeled energy savings results. The factor value used to arrive at PY2020 HER demand savings is 0.000466081 kW.[46]

5.2.4 Joint Savings Analysis

The evaluation team also determined whether the Ameren Missouri HER Program generated participation uplift in PY2020—that is, an increase in participation in other energy efficiency programs in PY2020 as a result of the Ameren Missouri HER Program. To complete this joint savings analysis, we calculated whether more treatment than control group customers participated in other residential energy efficiency programs after receiving HERs. We cross-referenced the HER Program database—both treatment and control groups—with the databases of other residential energy efficiency programs offered by Ameren Missouri in PY2020, including:

- Appliance Recycling
- Efficient Products
- Peak Time Savings
- Single Family Income Eligible (SFIE)
- Multifamily Income Eligible (MFIE)
- Multifamily Market Rate (MFMR)
- Heating, Ventilation, and Air Conditioning
- Online Retail Lighting

To estimate participation uplift, we calculated the number of customers that participated in both the HER Program and other energy efficiency programs in PY2020. To ensure participation in other programs is attributable solely to the HER Program, we calculate participation uplift using a post-only difference estimator and tested the results for statistical significance. To do so, we identified the total number of treatment and control customers who participated in an Ameren Missouri energy efficiency program in PY2020. Any positive difference between the treatment and control population that is statistically significant is the net participation due to the HER Program.

5.3 Evaluation Results

In the remainder of this section, we present the results of the impact evaluation.

[46] Revision 3.1 (dated March 11, 2020) of the Ameren Missouri 2019–21 MEEIA Energy Efficiency Plan Appendix F – Deemed Savings Table, Home Energy Report Deemed Table (referred to as the "Ameren Missouri TRM").

5.3.1 Net Unadjusted Impact Results

The evaluation team estimated unadjusted annual net savings using a consumption analysis (see Section 5.2). Unadjusted annual net savings are the savings derived from the consumption analysis and include savings from other energy efficiency programs in which treatment customers participated in PY2020. The PY2020 HER Program achieved 36,46 MWh and 16.8 MW in ex post unadjusted net savings (see Table 42—Table 44). Note that the EUL of HERs is one year, and, for this reason, the tables below do not present demand savings by different EUL categories.

Table 42. PY2020 HER Program Unadjusted Ex Post Net Annual Savings

Savings	Number of Customers Treated in PY2019	Unadjusted Net Savings (% per household)[a]	Unadjusted Net Savings (per household)[b]	Unadjusted Net Program Savingsb
Energy Savings (MWh)	299,668	0.78%	0.122	36,467
Demand Savings (MW)			0.052	17

Note: The unadjusted net savings per household (% and kWh) are weighted averages across the four waves.

[a] Because the demand savings rely on demand savings factor applied to energy savings, we do not present ex post net demand savings as a % per household.

[b] Totals may not sum due to rounding.

Table 43. PY2020 HER Program Unadjusted Ex Post Net Annual Electric Energy Savings by Wave

Wave	Number of Customers Treated in PY2020	Unadjusted Net Savings (% per household)	Unadjusted Net Savings (kWh per household)	Unadjusted Net Program Savings (MWh)
Wave 1	71,903	0.92%	157.0	11,288
Wave 2	31,680	1.13%	249.9	7,917
Wave 3	151,203	0.70%	92.3	13,958
Wave 4	44,882	0.61%	73.6	3,032

Note: The unadjusted net savings per household (% and kWh) are weighted averages across the four waves.

Table 44. PY2020 HER Program Unadjusted Ex Post Net Annual Electric Demand Savings by Wave

Wave	Number of Customers Treated in PY2019	Unadjusted Net Savings (% per household)[a]	Unadjusted Net Savings (kW per household)	Unadjusted Net Program Savings (MW)[b]
Wave 1	71,903		0.07	5.2
Wave 2	31,680		0.12	3.7
Wave 3	151,203		0.04	6.4
Wave 4	44,882		0.03	1.5

Note: The unadjusted net savings per household (% and kWh) are weighted averages across the four waves.

[a] Because the demand savings rely on a demand savings factor applied to energy savings, we do not present net demand savings as a % per household.

[b] Totals may not sum due to rounding.

5.3.2 Joint Savings Analysis

We considered energy savings that resulted from energy-efficient actions taken through other Ameren Missouri residential energy efficiency programs in our joint savings analysis. While we would expect a base rate of participation in these programs from both the treatment and control groups, it is possible that the HER program

resulted in an increase, or "uplift," in participation in other Ameren Missouri residential energy efficiency initiatives among the members of the treatment group by promoting these programs to treated customers.

Table 45 presents a summary of the participation uplift for the Ameren Missouri residential programs that were active during PY2020. The evaluation team found a statistically significant difference in program participation between treatment and control customers for the HVAC, Lighting Online Store, Residential Appliance Recycling, Residential Efficient Products, SFIE, and Peak Time Savings Programs. As such, the evaluation team deducted approximately 465 MWh of unadjusted energy savings due to this analysis, which represents 1% of the program's unadjusted ex post net energy savings.

Table 45. PY2019 HER Program Savings Uplift Results

Savings	PY2019 Savings Uplift	
	Savings	%[a]
Energy Savings (MWh)	465	1%
Demand Savings (MW)[b]		

[a] The savings uplift percentage is a percentage of the program unadjusted savings.

[b] Since a demand savings factor is applied to the estimate of energy savings, the evaluation team does not use the joint savings analysis to estimate demand savings uplift. Instead, we apply the demand savings factor to the adjusted ex post net energy savings to arrive at the adjusted ex post net demand savings for the program.

5.3.3 Net Adjusted Impact Results

The total PY2020 adjusted net impacts for the HER Program were 36,002 MWh and 16.78 MW, which reflect the results of the joint savings analysis (Table 46). Table 47 and Table 48 present the ex post adjusted net impacts for each of the waves in PY2020.

Table 46. PY2020 HER Program Adjusted Annual Net Annual Savings

Savings	Unadjusted Net Program Savings	Savings Uplift[a]	Final Adjusted Net Program Savings
Energy Savings (MWh)	36,467	465	36,002
Demand Savings (MW)	17.00		16.78

[a] Because the demand savings rely on a demand savings factor applied to energy savings, we do not present savings uplift for demand savings and instead apply the kW peak factor ratio to the final adjusted net program energy savings.

Table 47. PY2020 HER Program Adjusted Annual Net Electric Energy Savings by Wave

Wave	Unadjusted Net Program Savings (MWh)	Savings Uplift (MWh)	Final Adjusted Net Program Savings (MWh)
Wave 1	11,289	39	11,250
Wave 2	7,918	193	7,725
Wave 3	13,958	182	13,777
Wave 4	3,302	52	3,250
Total	**36,467**	**465**	**36,002**

Table 48. PY2020 HER Program Adjusted Net Electric Demand Savings by Wave

Wave	Unadjusted Net Program Savings (MW)	Savings Uplift (MW)[a]	Final Adjusted Net Program Savings (MW)
Wave 1	5.26		5.24

Wave	Unadjusted Net Program Savings (MW)	Savings Uplift (MW)[a]	Final Adjusted Net Program Savings (MW)
Wave 2	3.69		3.60
Wave 3	6.51		6.42
Wave 4	1.54		1.51
Total	**17.00**		**16.78**

[a] Because the demand savings rely on a demand savings factor applied to energy savings, we do not present savings uplift for demand savings and instead apply the kW peak factor ratio to the final adjusted net program energy savings for each wave.

6. Residential Efficient Products (REP)

This section summarizes the PY2020 evaluation methodology and results for the Residential Efficient Products (REP) Program. This PY2020 evaluation is limited to an impact evaluation as a detailed process evaluation was conducted as part of the PY2019 evaluation activities. Additional details on the methodologies are presented in Appendix A.

6.1 Evaluation Summary

6.1.1 Program Description

The REP Program is designed to raise customer awareness of the benefits of high-efficiency products, to educate residential customers about energy use in their homes, and to offer information, products, and services to residential customers to save energy cost-effectively. The target market consists of all residential customers within the Ameren Missouri service territory.

The REP Program is designed to be an umbrella program, incorporating various program partners, products, and program delivery strategies. The REP is intended to be flexible. As it 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 PY2020, four measures were included in the program:

- **Advanced thermostats:** $50 rebate per unit; limited to one thermostat per system and up to three thermostats per residential electric account[47]
- **Tier 1 power strips:** $9 rebate per unit; limited to five power strips per residential electric account
- **Tier 2 power strips:** $25 rebate per unit; limited to three power strips per residential electric account
- **Variable speed and multi-speed pool pumps:** $200 rebate per unit; limited to two pool pumps per residential electric account
- **Heat pump water heaters:** $350 rebate per unit; limited to two rebates per residential electric account

As in past years, the REP Program used two delivery channels in PY2020:

- **Online Store:** Advanced thermostats and power strips are sold directly to customers through Ameren Missouri's Online Store where the rebates are applied immediately at checkout.[48],[49]

[47] Note that while customers could purchase more than one thermostat and *ex ante* savings reflect this, the Ameren Missouri TRM 2019–21 MEEIA Plan (Revision 4.0 dated October 2020) states, "Energy savings are applicable at the household level; all thermostats controlling household heat should be programmable and *installation of multiple advanced thermostats per home does not accrue additional savings*." (p. 59, emphasis added). As such, only one thermostat per customer account number is included in *ex post* savings computations. As a result, a total of 2,963 advanced thermostats present in the program-tracking data were excluded from ex post computations.

[48] In addition to advanced thermostats and power strips, the Online Store offers discounts on LEDs. However, LEDs are evaluated as part of the Residential Lighting Program evaluation. The store also sells some connected home products without a discount, which are not included in this evaluation.

[49] The current Online Store main page can be viewed here: https://amerenmissouristore.com/.

- **Mail-in Channel:** Customers can purchase program-qualified thermostats,[50] heat pump water heaters, and pool pumps anywhere and then submit a rebate application via e-mail or mail-in.

The PY2020 REP Program ran the entire program year from January 1, 2020, through December 31, 2020.

Notable changes from PY2019 to PY2020 implementation included:

- Tier 1 power strips were added (only Tier 2 power strips were discounted in PY2019).
- Advanced thermostats were added to the Mail-in Channel.
- The implementer for the Online Store was replaced with a new implementer.
- Significant effort was allocated to increasing marketing collateral and signage in stores. Signage was rebranded for Ameren using "Power to Save" branding.
- The number of field staff responsible for going into stores and confirming signage is in place was increased.
- For several months, field staff were unable to enter stores due to COVID-19.

6.1.2 Participation Summary

The vast majority of program activity is associated with the Online Store. The Online Store channel included the most participants, sold the most measures, and generated the greatest ex ante gross savings for the REP Program. Nine-tenths (90%) of all REP Program participants participated through the Online Store; only 10% through mail-in rebates. Likewise, the vast majority (92%) of unit measures were rebated through the Online Store while only 8% flowed through mail-in rebates. In all, the Online Store accounted for more than three-quarters (78%) of PY2020 REP Program ex ante gross savings; less than one-quarter (22%) were associated with mail-in rebates (see Table 49).

Table 49. PY2020 REP Program Participation Summary by Channel

Delivery Channel	Participants		Measures		Ex Ante Savings	
	Number	%	Number	%	MWh	%
Online Store	13,996	90%	18,596	92%	7,643	78%
Mail-in	1,573	10%	1,721	8%	2,180	22%
Total	**15,527**	**100%**	**20,317**	**100%**	**9,823**	**100%**

Note: The total number of participants shown in the table (15,527) is less than the sum of the number of participants across both channels (15,569) because 42 participants (defined by unique account numbers) purchased products from more than one channel.

Looking at the various measures rebated through each channel in PY2020, advanced thermostats were the most popular product that the REP Program offered (88% of all measures sold through the Online Store; 48% of all measures from the Mail-in Channel, or 84% of all REP Program measures combined) (Table 50). Tier 1 power strips were the next most popular measure (11% of all REP Program measures), followed by pool pumps (3% of all REP Program measures). The least common measures were heat pump water heaters (1% of all REP Program measures) and Tier 2 power strips (<1% of all REP Program measures). Accordingly, the bulk of ex ante gross MWh program savings (79%) came from sales of advanced thermostats, while pool pumps

[50] PY2020 was the first year thermostats were rebated through the Mail-in Channel. They were only rebated through the Online Store prior to PY2020.

accounted for 15% and heat pump water heaters 5%. The power strips accounted for relatively small proportions of ex ante gross MWh savings—Tier 1 1%; Tier 2 <1%.

Table 50. PY2020 REP Program Participation Summary by Measure

Measure	Delivery Channel	Participants		Measures		Ex Ante Savings	
		Number	%	Number	%	MWh	%
Advanced Thermostats	Online Store	13,486	84%	16,282	80%	7,499	76%
Tier 1 Power Strips		844	5%	2,245	11%	133	1%
Tier 2 Power Strips		50	<1%	69	<1%	11	<1%
Advanced Thermostats	Mail-in	693	4%	821	4%	286	3%
Heat Pump Water Heaters		198	1%	200	1%	459	5%
Pool Pumps		689	4%	700	3%	1,435	15%
Total		**15,527[a]**	**100%**	**20,317**	**100%**	**9,823**	**100%**

[a] The total number of participants shown in the table (15,527) is less than the sum of the number of participants across channels and measures (15,960) because 433 participants (defined by unique account numbers) purchased products from more than one enduse.

6.1.3 Key Impact Results

Table 51 presents the REP Program annual savings achieved in PY2020. As shown, the program achieved 84% of Ameren Missouri's net energy savings goal and 95% of the net demand savings goal. We discuss some the factors contributing to the goal shortfalls in Section 6.3.1 Gross Impact Results of this evaluation.

Table 51. PY2020 REP Program Savings Summary

	Ex Ante Gross	Realization Rate	Ex Post Gross	NTGR	Ex Post Net	Goal/Target Net	% of Goal/Target
First Year Savings							
Energy Savings (MWh)	9,823	91.4%	8,981	85.8%	7,705	9,188	84%
Demand Savings (MW)	3.42	84.0%	2.88	80.3%	2.31	2.43	95%
Last Year Demand Savings							
< 10 EUL (MW)	0.00		0.00		0.00	0.03	
10–14 EUL (MW)	3.42	84.0%	2.88	76.6%	2.20	2.39	92%
15+ EUL (MW)	0.00		0.00		0.08	0.00	

Overall, the REP Program was the fourth-largest program in the PY2020 residential portfolio in terms of both ex post net savings (5% of residential portfolio) and ex post net demand (5% of residential portfolio).

6.1.4 Conclusions and Recommendations

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

- **Conclusion #1:** One of the reasons for the PY2020 REP Program falling short of its targeted goals is associated with advanced thermostats. While the program allowed rebates for multiple thermostats purchased by a customer, the Ameren Missouri TRM limits thermostat savings to one unit per household.

- Recommendation #1: Limit customer rebates for advanced thermostats to a single unit per residential account number.

- **Conclusion #2:** Some ex ante assumptions were incorrectly applied based on the Ameren Missouri TRM Appendix F. More specifically, for almost all measures, a 100% ISR was applied to the program-tracking data when the TRM prescribed lower ISRs based on past evaluations. Also, ex ante was based on the Ameren Missouri TRM Appendix F (v3.1) while ex post is based on TRM Appendix F (v4.0).
  - Recommendation #2: Ensure the appropriate TRM version and parameters are applied to program-tracking data.

To meet the requirements of Missouri CSR for demand-side process evaluations, we respond to the five required process evaluation questions in Table 52.[51] Note that we did not conduct any process evaluation tasks for PY2020, so the findings denoted in the table are largely the same findings we reported last year.

Table 52. 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?	The primary market imperfections for the REP Program are customer awareness of energy efficient product options and their benefits, and the higher price of efficient products. In terms of knowledge, many customers are not aware of energy efficiency and energy-efficient technologies. And even those that are aware are often not informed of actual energy savings opportunities available in their homes. For programs like the REP Program, customer awareness of the availability of the rebate is paramount. Customers need to either be proactive and search out the rebates, or they need to be informed 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. Other market imperfections are measure-specific and generally apply to the market potential: ▪ Only 4% of homes in the Ameren Missouri service territory have inground pools. Thus, the market for pool pumps is very limited, and the product selection is largely driven by contractor recommendations. ▪ While nearly every home has at least one thermostat, thermostats do not routinely fail, so customers will 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.
Is the target market segment appropriately defined, or should it be further subdivided or	Officially (per MEEIA III), the target market for the REP Program is all residential customers within the Ameren Missouri service territory. When the measure mix is considered (heat pump water heaters, pool pumps, and advanced thermostats), however, the actual market is predominantly homeowners. That said, virtually all residences (even rentals) could

[51] 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
merged with other market segments?	benefit from advanced Tier 1 or Tier 2 power strips. Some measures like pool pumps should be targeted at residences with pools, but no further subdivision seems needed.
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 currently offers only five measures: (1) advanced thermostats, (2) Tier 1 power strips, (3) Tier 2 power strips, (4) heat pump water heaters, and (5) pool pumps. When one considers the diversity of energy-consuming items in the typical residence (the target market), a very wide range of other enduse measures appear potentially applicable to the REP Program. Of course, cost-effectiveness and overlap with other programs needs to be considered. ENERGY STAR room air conditioners, air purifiers, and dehumidifiers were included when developing targets/goals in 2018, so they may be good candidates for measure expansion.
Are the communication channels and delivery mechanisms appropriate for the target market segment?	In PY2020, program marketing activities included TV/radio ads, social media ads, paid search optimization, e-mail campaigns, including rebate information on energy statements or Home Energy Reports, and location-based ads and promotions. In PY2019, most participants who purchased products through the Online Store reported learning about the program through direct communication from Ameren Missouri or the Ameren Missouri website. Mass marketing does not appear to have been that effective. Customers who purchased pool pumps and heat pump water heaters were more likely to learn about the program through a contractor than other communication channels. Increasing outreach to contactors to increase their involvement with the program could increase participation for 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 both the Online Store and Mail-in Channels. Increased participation can likely be attained by expanding the breadth of measures rebated under the program, however, focusing additional marketing efforts on contractors, and increasing general customer awareness of the energy efficiency opportunities as well as available rebates.

6.2 Evaluation Methodology

For PY2020, the Opinion Dynamics team focused its efforts on an impact evaluation having completed detailed process and impact evaluations of the REP Program for PY2019. The following sections provide the specific research objectives for this year's evaluation efforts.

6.2.1 Gross Impact Analysis

Gross impact-related activities for the PY2020 REP Program included review of the program-tracking databases and engineering analysis to estimate ex post gross savings. ISRs derived from the PY2019 evaluation were applied to PY2020 ex ante savings as part of the computation of ex post gross savings. Key objectives of the PY2020 gross impact analysis include:

- Verify program-tracking data;
- Estimate the first year ex post gross energy (MWh) and demand (MW) savings; and
- Estimate last year ex post demand (MW) savings, by EUL category.

6.2.2 Net Impact Analysis

Net impact-related activities for the PY2020 REP Program included the application of PY2019 evaluation-derived estimates of FR, PSO, and portfolio-level NPSO to the ex post gross energy (MWh) and demand (MW) savings to derive ex post net MWh and MW. We also calculated last year ex post net demand savings. Table 53 provides an overview of the PY2020 REP Program evaluation activities.

Table 53. PY2020 Evaluation Activities for the REP Program

Evaluation Activity	Description
Program Manager and Implementer Interviews	▪ Conduct interviews in Q3 of PY2020 to understand program staff's perspective on program implementation.
Program Material Review	▪ Review new program materials to inform evaluation activities.
Gross Impact Analysis - Database Review	▪ Review program database to check that program data are complete and that program-installed measures meet all program requirements.
Gross Impact Analysis - Engineering Analysis	▪ Verify that ex ante savings use correct deemed savings values. ▪ Estimate overall and measure-level ex post gross impacts using TRM algorithms, deemed savings assumptions, and PY2019 evaluation-estimated parameters.
Net Impact Analysis	▪ Apply PY2019 evaluation-derived estimates of free ridership, participant spillover, and non-participant spillover to estimate PY2020 net impacts.
Reporting	▪ Develop the draft and final annual reports.

6.3 Evaluation Results

The following sections provide the PY2020 REP Program gross and net impact findings. Additional details regarding the impact evaluation are included in Appendix A.

6.3.1 Gross Impact Results

For PY2020, the evaluation team used the ISRs derived from the participant surveys we conducted as part of the PY2019 evaluation (see Table 54). The ISRs were 100% for the pool pumps and heat pump water heaters. A few surveyed customers reported having not installed their advanced thermostats (ISR = 98.8%) or power strips (ISR = 93.8%) and did not plan to have them installed within the next six months. Note that no Tier 1 power strips were sold through the program in PY2019, so we rely on the PY2019 Tier 2 power strip ISR for PY2020. Also, advanced thermostats were not rebated through the Mail-in Channel in PY2019, so we rely on the Online Store ISR for PY2020. The overall total ISR (99.0%) is weighted for PY2020 based on this year's ex post gross savings by measure.

Table 54. PY2020 REP Program ISRs by Measure

Channel	Measure	ISR
Online Store	Advanced Thermostats	98.8%
	Tier 1 Power Strips	93.8%[a]
	Tier 2 Power Strips	93.8%
Mail-in	Advanced Thermostats	98.8%[b]
	Heat Pump Water Heaters	100.0%
	Pool Pumps	100.0%
	Total	**99.0%**

[a] No Tier 1 power strips were sold through the Online Store in the PY2019 REP Program. For PY2020, we assumed the same ISR as Tier 2 power strips.
[b] For PY2019, advanced thermostats were not rebated through the Mail-In Channel. For PY2020, we assume the same ISR as advanced thermostats sold through the Online Store.

The PY2020 REP Program achieved 8,981 MWh and 2.88 MW of ex post gross savings, resulting in 91.4% and 84.0% realization rates, respectively (Table 55).

Table 55. PY2020 REP Gross Impact Summary

	Ex Ante	Realization Rate	Ex Post
First Year Savings			
Energy Savings (MWh)	9,823	91.4%	8,981
Demand Savings (MW)	3.42	84.0%	2.88
Last Year Demand Savings			
< 10 EUL (MW)	0.00		0.00
10-14 EUL (MW)[a]	3.42	84.0%	2.88
15+ EUL (MW)	0.00		0.00

[a] All program measures offered in PY2020 have a measure life between 10–14 years (13 years for heat pump water heaters; 10 years for the remainder of the measures).

Table 56 shows the ex post gross savings and realization rates by channel and measure. The realization rates range from a high of 110.6% for advanced thermostats rebated through the Mail-in Channel to 88.5% for advanced thermostats rebated through the Online Store.

Table 56. PY2020 REP Program Annual First Year Gross Impacts

Channel	Measure Category/Enduse	Energy Savings			Demand Savings		
		Ex Ante (MWh)	Realization Rate	Ex Post (MWh)	Ex Ante (MW)	Realization Rate	Ex Post (MW)
Online Store	Advanced Thermostats	7,499	88.5%	6,639	2.88	82.0%	2.36
	Tier 1 Power Strips	133	93.8%	125	0.02	93.8%	0.01
	Tier 2 Power Strips	11	93.8%	10	0.00	93.8%	0.00
Mail-in	Advanced Thermostats	286	110.6%	316	0.15	82.1%	0.12
	Heat Pump Water Heaters	459	99.1%	455	0.04	99.1%	0.04
	Pool Pumps	1,435	100.0%	1,435	0.34	100.0%	0.34
Total		**9,823**	**91.4%**	**8,981**	**3.42**	**84.0%**	**2.88**

Table 57 summarizes the total PY2020 last year ex ante and ex post electric demand savings and realization rates by channel, by measure, by EUL class. Advanced thermostats contribute the majority of the REP Program's ex post gross demand savings (82% Online Store; 4% Mail-in) followed by pool pumps (12%), heat pump water heaters (1%), and Tier 1 and Tier 2 power strips (both <1%).

Table 57. PY2020 REP Program Annual Last-Year Gross Demand Impacts

Channel	Measure Category	Ex Ante (MW) Total				Gross Realization Rate	Ex Post (MW) Total			
		<10	10–14 [a]	15+	Total		<10	10–14 a	15+	Total
Online Store	Advanced Thermostats	0.00	2.88	0.00	2.88	82.0%	0.00	2.36	0.00	2.36
	Tier 1 Power Strips	0.00	0.02	0.00	0.02	93.8%	0.00	0.01	0.00	0.01
	Tier 2 Power Strips	0.00	<0.01	0.00	<0.01	93.8%	0.00	<0.01	0.00	<0.01
Mail-in	Advanced Thermostats	0.00	0.15	0.00	0.15	82.1%	0.00	0.12	0.00	0.12
	Heat Pump Water Heaters	0.00	0.04	0.00	0.04	99.1%	0.00	0.04	0.00	0.04
	Pool Pumps	0.00	0.34	0.00	0.34	100.0%	0.00	0.34	0.00	0.34
Total		**0.00**	**3.42**	**0.00**	**3.42**	**84.0%**	**0.00**	**2.88**	**0.00**	**2.88**

[a] All measures offered in PY2020 have a measure life between 10–14 years (13 years for heat pump water heaters; 10 years for all other measures).

Below we detail each of the reasons, by channel and measure, for realization rates discrepancies.

- **Online Store: Advanced Thermostats:** The gross realization rate for advanced thermostats through the Online Store is 88.5% for electric energy and 82.0% for demand.
  - Ex ante claimed savings for multiple thermostats per household. According to the Ameren Missouri TRM, however, the installation of more than one thermostat per household does not accrue additional savings. When calculating ex post, the evaluation team only awarded savings for one thermostat per household (identified as unique electric account numbers). As a result, 2,826 thermostats (17.3% of ex ante gross MWh) received zero ex post savings. This was the primary driver of discrepancies for electric energy and electric demand for advanced thermostats.
  - For records with unknown heating equipment, ex ante applied the Appendix F default, which assumes 16% of homes have electric heating equipment. The evaluation team applied weighted average assumptions based on PY2020 records with known heating equipment type (33% of homes have electric heating equipment). This affected 24.8% of online store thermostat records, and increased ex post electric energy savings.
  - Appendix F (v4.0) updated the ISR for advanced thermostats from 100% to 98.8% and corrected savings for a multifamily measure code that previously referenced the effective full load cooling hours (EFLHcool) value for weatherized multifamily homes. While ex ante correctly applied an older version of Appendix F (v3.1), the evaluation team relied on inputs from the most recent version (v4.0), overall increasing ex post savings.
- **Online Store: Tier 1 Power Strips:** The gross realization rate for Tier 1 power strips was 93.8% for both electric energy and electric demand.
  - Appendix F (v4.0) updated the ISR for power strips to 93.8%. While ex ante correctly applied an older version of Appendix F (v3.1), the evaluation team relied on inputs from the most recent version (v4.0), driving all discrepancy between ex ante and ex post savings.
- **Online Store: Tier 2 Power Strips:** The gross realization rate for Tier 2 power strips was 93.8% for both electric energy and electric demand.

- Appendix F (v4.0) updated the ISR for power strips to 93.8%. While ex ante correctly applied an older version of Appendix F (v3.1), the evaluation team relied on inputs from the most recent version (v4.0), driving all discrepancy between ex ante and ex post savings.

- **Mail-in: Advanced Thermostats:** The gross realization rate for advanced thermostats through the mail-in channel was 110.6% for electric energy and 82.1% for electric demand.
  - Ex ante claimed savings for multiple thermostats per household. According to the Ameren Missouri TRM, however, the installation of more than one thermostat per household does not accrue additional savings. When calculating ex post, the evaluation team only awarded savings for one thermostat per household (identified as unique electric account numbers). As a result, 45 thermostats (6.2% of ex ante gross MWh) received zero ex post savings.
  - All thermostats through the Mail-in Channel had an unknown heating equipment type. For these records, ex ante applied the Appendix F default, which assumes 16% of homes have electric heating equipment. The evaluation team applied weighted average assumptions based on PY2020 records with known heating equipment type (33% of homes have electric heating equipment). This increased ex post savings and was the primary driver of discrepancies between ex ante and ex post energy savings.
  - Appendix F (v4.0) updated the ISR for advanced thermostats from 100% to 98.8%. While ex ante correctly applied an older version of Appendix F (v3.1), the evaluation team relied on inputs from the most recent version (v4.0), decreasing ex post savings.

- **Mail-in: Heat Pump Water Heaters:** The gross realization rate for heat pump water heaters was 99.1% for both electric energy and electric demand.
  - Appendix F (v4.0) updated the default percentage of homes with central cooling (%Cool) value from 100% to 95%. While ex ante correctly applied Appendix F (v3.1), the evaluation team relied on the most recent version (v4.0), driving all discrepancy between ex ante and ex post savings.

It is also worth noting that there is an issue with the target net goals themselves. The goals, which were developed in 2018, include several measures that are not even part of the program. These measures include ENERGY STAR room air conditioners (227 units included in PY2020 targets), ENERGY STAR air purifiers (770 units included in PY2020 targets), and ENERGY STAR dehumidifiers (315 units included in PY2020 targets). In all, the measures not currently included in the program represent roughly 4% of the target net MWh savings.

6.3.2 Net Impact Results

Net-To-Gross Ratio Results

For PY2020, we use the results of our product level PY2019 NTG analyses to estimate net program impacts. In PY2019, the evaluation team surveyed 1,063 total REP Program participants to develop product-level FR and PSO scores. The values are re-weighted by the distribution of PY2020 product-level ex post gross savings to derive the overall NTGR of 72.1% as shown in Table 58.

Table 58. PY2020 REP Program NTGRs

Channel	Measure/Enduse	Free Ridership (FR)	Participant Spillover (PSO)	NTGR (1-FR+PSO)
Online Store	Advanced Thermostats	29.3%	2.8%	73.5%
	Tier 1 Power Strips[a]	16.6%	2.8%	86.2%

Channel	Measure/Enduse	Free Ridership (FR)	Participant Spillover (PSO)	NTGR (1-FR+PSO)
	Tier 2 Power Strips	16.6%	2.8%	86.2%
Mail-in	Advanced Thermostats[b]	29.3%	2.8%	73.5%
	Heat Pump Water Heaters	40.4%	2.8%	62.4%
	Pool Pumps	35.6%	2.8%	67.2%
	Total	**30.7%**	**2.8%**	**72.1%**

[a] No Tier 1 power strips were sold through the Online Store in the PY2019 REP Program. For PY2020 we assumed the same FR and PSO values as tier 2 power strips.
[b] For PY2019, advanced thermostats were not rebated through the Mail-in Channel. For PY2020 we assume the same FR and PSO values as advanced thermostats sold through the Online Store.

Net Impacts

The evaluation team applied the product-level PY2019 NTGRs as well as the portfolio-wide energy NPSO rate of 13.7% and the demand NPSO of 7.7% to ex post gross savings values to determine net impacts for the PY2020 REP Program (see Table 59). Overall, the PY2020 REP Program delivered a total of 7,705 MWh of ex post net energy savings and 2.31 MW of ex post net demand savings when incorporating NPSO.

Table 59. PY2020 REP Program Annual First Year Net Energy and Demand Savings

Channel	Measure Category	Energy Savings			Demand Savings		
		Ex Post Gross (MWh)	NTGR	Ex Post Net (MWh)	Ex Post Gross (MW)	NTGR	Ex Post Net (MW)
Online Store	Advanced Thermostats	6,639	73.5%	4,877	2.36	73.5%	1.73
	Tier 1 Power Strips[a]	125	86.2%	108	0.01	86.2%	0.01
	Tier 2 Power Strips	10	86.2%	9	0.00	86.2%	0.00
Mail-in	Advanced Thermostats[b]	316	73.5%	232	0.12	73.5%	0.09
	Heat Pump Water Heaters	455	62.4%	284	0.04	62.4%	0.03
	Pool Pumps	1,435	67.2%	965	0.34	67.2%	0.23
Non-Participant Spillover				1,230			0.22
	Total	**8,981**	**85.8%**	**7,705**	**2.88**	**80.3%**	**2.31**

[a] No Tier 1 power strips were sold through the Online Store in the PY2019 REP Program. For PY2020 we assumed the same NTGR value as Tier 2 power strips.
[b] For PY2019, advanced thermostats were not rebated through the Mail-in Channel. For PY2020 we assume the same NTGR value as advanced thermostats sold through the Online Store.

Finally, Table 60 shows the last year demand savings by channel, by measure, by EUL class. The PY2020 REP Program delivered 2.315 MW of 10–14 year last year ex post net demand savings when incorporating NPSO.

Table 60. PY2020 REP Program Annual Last Year Net Demand Impacts

Channel	Measure Category	Ex Post Gross (MW)				NTGR	Ex Post Net (MW)			
		<10	10–14[a]	15+	Total		<10	10–14[a]	15+	Total
Online Store	Advanced Thermostats	0.00	2.36	0.00	2.36	73.5%	0.00	1.73	0.00	1.73
	Tier 1 Power Strips[b]	0.00	0.01	0.00	0.01	86.2%	0.00	0.23	0.00	0.23

Channel	Measure Category	Ex Post Gross (MW)				NTGR	Ex Post Net (MW)			
		<10	10–14[a]	15+	Total		<10	10–14[a]	15+	Total
	Tier 2 Power Strips	0.00	<0.01	0.00	<0.01	86.2%	0.00	0.09	0.00	0.09
Mail-in	Advanced Thermostats[c]	0.00	0.12	0.00	0.12	73.5%	0.00	0.03	0.00	0.03
	Heat Pump Water Heaters	0.00	0.04	0.00	0.04	62.4%	0.00	0.01	0.00	0.01
	Pool Pumps	0.00	0.34	0.00	0.34	67.2%	0.00	0.00	0.00	0.00
Non-Participant Spillover							0.03	0.11	0.08	0.22
Total		**0.00**	**2.88**	**0.00**	**2.88**	**80.3%**	**0.03**	**2.20**	**0.08**	**2.31**

[a] All measures offered in PY2020 have a measure life between 10–14 years (13 years for heat pump water heaters; 10 years for all other measures).

[b] No Tier 1 power strips were sold through the Online Store in the PY2019 REP Program. For PY2020 we assumed the same NTGR value as Tier 2 power strips.

[c] For PY2019, advanced thermostats were not rebated through the Mail-in Channel. For PY2020 we assume the same NTGR value as advanced thermostats sold through the Online Store.

7. Energy Efficiency Kits (EEK)

This section summarizes the PY2020 evaluation methodology and results for the Energy Efficiency Kits (EEK) Program. Additional details on the methodology are presented in Appendix A.

7.1 Evaluation Summary

The Energy Efficiency Kits (EEK) Program is designed to increase customer awareness of the benefits of high-efficiency products, educate residential customers about energy consumption in their homes, and offer information, products, and services to residential customers to encourage cost-effective energy savings. The target market includes all residential customers within the Ameren Missouri service territory. EEK includes a range of small energy-efficient products, such as LED light bulbs, hot water pipe wrap, low-flow showerheads, and faucet aerators.

The EEK Program provides energy efficiency kits and education materials to customers through an educational channel that targets, but is not limited to, sixth-grade students. The program combines a set of classroom activities with projects in the home to install energy-efficient products. PY2020 marketing activities included as needed mailings and emails to teachers.

7.1.1 Participation Summary

In PY2020, 204 schools distributed 16,726 kits to their students through the EEK Program. Throughout PY2020, the implementation team tracked 37 schools that were unable to distribute their 3,311 kits due to COVID-19 school closures in 2020. Table 61 provides a summary of all the kits initially shipped to schools, and Table 62. shows a summary of the kits that schools were actually able to distribute to students in PY2020. The 37 schools that were unable to distribute their kits in PY2020 plan to do so in early PY2021. In total, 85% of schools distributed their allotment of kits in PY2020.

Table 61. PY2020 EEK Program Reported Participation Summary

Enduse/Channel	Participants (Schools)		Work Orders [a]		Measures		Ex Ante Savings	
	Number	%	Number	%	Number	%	MWh	%
Pipe Insulation [b]	241	100%	474	100%	60,111	27%	199	4%
LED - 10W (Halogen baseline) [c]	241	100%	474	100%	80,148	36%	1,848	34%
Kit Faucet Aerator (Bathroom)	241	100%	474	100%	20,037	9%	161	3%
Kit Faucet Aerator (Kitchen)	241	100%	474	100%	20,037	9%	843	16%
Low-Flow Showerheads	241	100%	474	100%	20,037	9%	1,348	25%
Dirty Filter Alarm (Single Family)	241	100%	474	100%	20,037	9%	1,031	19%

[a] The Work Order is a unique ID assigned to each class in which the kits are distributed. Each teacher can have multiple Work Orders, one for each class where they distribute kits. Therefore, an individual school and teacher can have multiple Work Orders.

[b] This is the total square feet of pipe insulation, 3 feet per kit (20,037×3=60,111).

[c] This is the total lamps from 20,037 kits, which is 4 lamps per kit (20,037×4 lamps = 80,148 lamps).

Table 62. PY2020 EEK Program Verified Participant Summary

Enduse/Channel	Schools Delivered to Students		Work Orders [a] Delivered to Students		Ex Ante Measures	Delivered Measures in 2020
	Number	%	Number	%		
Pipe Insulation	204	85%	399	84%	60,111	50,178
LED - 10W (Halogen baseline)	204	85%	399	84%	80,148	66,904
Kit Faucet Aerator (Bathroom)	204	85%	399	84%	20,037	16,726
Kit Faucet Aerator (Kitchen)	204	85%	399	84%	20,037	16,726
Low-Flow Showerheads	204	85%	399	84%	20,037	16,726
Dirty Filter Alarm (Single Family)	204	85%	399	84%	20,037	16,726

[a] The Work Order is a unique ID assigned to each class in which the kits are distributed. Each teacher can have multiple Work Orders, one for each class where they distribute kits. Therefore, an individual school and teacher can have multiple Work Orders.

7.1.2 Key Impact Results

The EEK Program offers six measures to participants. Program staff use measure-specific equations and inputs sourced from the Ameren TRM v3.0[52] to estimate ex ante savings for each. In PY2019 the evaluation team conducted a participant survey to collect self-reported values to update the following savings equation inputs: measure in-service rates, household occupancy, percentage of homes with electric hot water heaters, and leakage out of the Ameren Missouri territory. These updates were adopted in the Ameren TRM V4.0[53] and was the basis for the evaluation ex post savings estimates.

As shown in Table 63., the EEK Program achieved 52% of Ameren Missouri's net energy savings goal and realized 80% and 83% of ex ante gross energy and demand savings, respectively, in PY2020.

Table 63. PY2020 EEK Program Impact Summary Impact

	Ex Ante Gross	Gross Realization Rate [a]	Ex Post Gross	NTGR	Ex Post Net [b]	Goal/Target Net [c]	% of Goal/Target [d]
First Year Savings							
Energy Savings(MWh)	5,429	80%	4,346	78.5%	3,410	6,551	52%
Demand Savings (MW)	0.98	83%	0.81	79.3%	0.65	1.16	56%
Last Year Demand Savings							
< 10 EUL (MW)					0.01		
10–14 EUL (MW)	0.71	84%	0.59	90.2%	0.53	0.76	70%
15+ EUL (MW)	0.28	80%	0.22	46.0%	0.10	0.40	26%

[a] Gross Realization Rate = Ex Post/Ex ante.

[b] Ex Post Net = Ex Post x NTGR

[c] Source: Ameren Missouri Appendix A - Portfolio and Program Summary

[d] % Goal/Target = Ex Post Net/Goal Net

[52] The ex ante savings were based on the Ameren TRM v3.0 Appendix F - Deemed_Savings_Table_Clean_2019_11_07.xlsx.
[53] The ex post savings were based on the Ameren TRM v4.0 Appendix F - Deemed Savings Table_Clean_2020_10_16.xlsx, and the Appendix I - TRM-Vol 3_Res_2020_10_16.docx.

Overall, the EEK Program was the fifth-largest program in the PY2020 residential portfolio, accounting for 3% of ex post net residential portfolio energy savings and 2% of ex post net residential portfolio demand savings.

7.1.3 Key Process Findings

The evaluation team identified the following key process findings based on the PY2020 evaluation:

- **COVID-19 resulted in program design changes from PY2019 to PY2020 for most schools.** For schools that continued to deliver in-person education, the program design remained unchanged from PY2019. For schools that offered either remote or hybrid learning formats (i.e., combination of in-person and remote instruction), program staff created electronic files for teachers to use during instruction and electronic workbooks for students to complete once parents collected Ameren Missouri's program materials at their children's schools. This pivot allowed the program to continue operating at a time when schools were not instructing students in person as normal.

As a key part of the evaluation, we explored a set of evaluation questions required by 20 CSR 4240-22.070.[54] Table 64. shows the related findings for each.

Table 64. 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?	The primary market imperfection that the program addresses is the lack of consumer awareness about (or the reluctance to purchase) the energy-saving kit items. The program addresses these two barriers to installation by providing the kit items free of charge and educating the children (and, indirectly, household members) about the energy savings potential of installing the items. All potential housing stock characteristics may be included in kit product distribution due to the program being offered to all sixth-grade students. The 2019 residential baseline study results indicate shrinking opportunity for the standard LEDs included in the kit. Nearly 70% of light sockets in Ameren Missouri's service territory that take a standard bulb contain an efficient bulb (either CFL or LED). LEDs also had higher FR than other kit measures, suggesting that many families were already using LEDs and would purchase them on their own. Faucet flow rate data from the baseline study indicate somewhat more opportunity for high-efficiency faucet aerators (39% of customers have aerators with flow rates greater than 2.2 GPM).
Is the target market segment appropriately defined, or should it be further subdivided or merged with other market segments?	Yes. The program targets residential customers with children in the sixth grade. The intent is to increase awareness of energy efficiency and Ameren Missouri's energy efficiency programs and achieve energy savings through the installation of kit items.
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. Since the residential customer enduse technologies can vary so widely in age, make, model, and pre-existing efficiencies, kit programs like this must carefully weigh the cost of included items and the potential for the items not to be installed by the customer. Results from the PY2019 participant survey indicated the following measure in-service rates: at least one LED bulb (88%), hot water pipe insulation (56%), showerhead (54%), bathroom faucet aerator (48%), furnace filter whistle (44%), and kitchen faucet aerator (40%).

[54] Please note, prior to September 2019, the reference for this Missouri CSR was 4 CSR 240-22.070(8). It has since been moved the location cited in the text and available here: https://www.sos.mo.gov/CMSImages/AdRules/csr/current/20csr/20c4240-22.pdf

CSR Required Process Evaluations Questions	Findings
Are the communication channels and delivery mechanisms appropriate for the target market segment?	Yes, though adjustments could be made to better align the program with teachers' unique needs. The program provides teachers with teaching materials, student education worksheets, the kit materials, and installation instructions. Further, in PY2020 program staff developed specific digital instructional and take-home materials to aid in delivering the program's educational content when schools offered remote or hybrid learning.
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?	Based on responses to the PY2019 participant survey, some participating teachers/parents would appreciate an opt-in system, which could reduce waste and increase adoption rates—i.e., only providing kits to students whose parents opt-into the program.

7.1.4 Conclusions and Recommendations

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

- **Conclusion #1**: EEK Program staff successfully adjusted the program design in PY2020 to enable the distribution of both kit measures and the accompanying educational content regardless of whether schools offered in-person or remote learning.
  - Recommendation: Collect and analyze process evaluation data from teacher kits and student worksheets to determine changes in program perception as a result of the changed program delivery model.
  - Recommendation: Compare program delivery costs per kit from PY2019 to PY2020 to determine the effect on the bottom line and to determine if persistent savings can be achieved using the revised program delivery method.
- **Conclusion #2:** 17% of measures in the EEK Program were not distributed in PY2020 due to COVID-19 school closures.
  - Recommendation: To help the program team, the implementer should track kit distribution in the same dataset as values such as quantity and savings, such as a "Delivered to Students" column. This will allow for a clearer understanding of what measures should be included for the evaluation of each program year, ensuring a higher accuracy of evaluated savings and avoiding confusion about program participation.
- **Conclusion #3:** As with other programs in the residential portfolio, the implementation team used an older version of the Ameren Missouri TRM (v3.1) when developing ex ante savings estimates, while the evaluation team used v4.0 in developing ex post savings estimates. This was a main driver in gross realization rates that are unequal to 100% across most measures offered through the EEK Program.
  - Recommendation: To minimize discrepancies between ex ante and ex post savings, work to incorporate as many TRM updates as possible (e.g., adjustments based on evaluation results or

prior year participation data) early in the program year, and incorporate those adjustments into the program-tracking database and ex ante savings calculations.

7.2 Evaluation Methodology

The evaluation team performed both impact evaluation activities, and a limited set of process evaluation activities to assess the performance of the EEK Program in PY2020. In addition to the overarching research objectives outlined for the residential portfolio, the evaluation team explored the following EEK-specific objectives:

- Evaluate the effectiveness of classroom and/or kit educational materials and installation instructions; and
- Provide evaluation results that can be used to improve the design and implementation of the EEK Program.

The evaluation team addressed these research objectives by completing a review of program materials (implementation plans, teacher materials, and student take-home worksheets), interviewing the program manager and implementers, and reviewing the implementer's data-tracking system.

Table 65. provides an overview of the EEK Program evaluation activities. Following the table, we outline program-specific aspects of key evaluation methodologies.

Table 65. PY2020 Evaluation Activities for the EEK Program

Evaluation Activity	Description
Program Manager and Implementer Interviews	▪ Conducted two interviews: one with Ameren staff and another with implementer staff both towards the end of PY2020 to understand program staff's perspective on program performance.
Program Material Review	▪ Reviewed available program materials to inform evaluation activities.
Tracking System Review	▪ Reviewed implementer's tracking system to ensure that data required for the evaluation is being collected.
Engineering Analysis	▪ Reviewed program database to check that program data are complete and that program-installed measures meet all program requirements. ▪ Analyzed the program database to determine the kits distributed in 2020. ▪ Verified that ex ante savings use correct TRM values and algorithms. ▪ Developed ex post savings using TRM values and algorithms, program tracking data, and any updated evaluation-estimated parameters.

7.3 Evaluation Results

In the remainder of this section, we present the results of both impact and process evaluations.

7.3.1 Process Results

To complete the process evaluation of the EEK Program, we drew upon interviews with program administration and implementation staff, and a review of program tracking data.

The PY2020 program tracking data indicated that some schools and teachers are waiting to distribute their kits until Spring 2021. As a result of this, the evaluation team's analysis of gross impacts included 84% of the original total work orders tracked in the EEK program tracking database (see Table 66.). This table shows the total number of schools that received kits in PY2020, along with the associated work orders and measures, and the portion of those schools that plan to distribute kits to students in the spring of PY2021.

Table 66. Kits Not Distributed

Description	Sent in PY2020	Planned Distribution in Spring PY2021	Total Included in 2020 Analysis	Percentage
Schools	241	37	204	85%
Work Orders	474	75	399	84%
Total Measures	220,407	36,421	183,986	83%

Our review of program tracking data also found the following:

- **In PY2020 the implementation team added cases to the program-tracking data with negative quantity and savings values to reflect kits that were sent to schools but never distributed due to COVID-19 related pauses to in-person education.** For increased clarity, the evaluation team suggests including a note or some other field indicating the reason for the adjustment. This clarification will lead to less confusion and a higher accuracy of calculated ex post savings.
- **The implementation contractor included savings for units that had been distributed to the teachers; however, the teachers had not yet distributed the kits to the students.** Some teachers indicated they had to change when they were distributing kits to their students, and one school returned their kits entirely. This situation is mostly due to COVID-19 school closures. It is important to note that the implementation team and Ameren Missouri alerted the evaluation team to the inclusion of these kits in the tracking data at the close of the program year, but it was not clear which kits were being held until 2021. A field should be created with a status such as "not distributed" or "returned," and savings should be adjusted for those kits indicated for 2021 distribution.

7.3.2 Gross Impact Results

Measure In-Service Rates

The in-service rates for each measure in PY2020 were based on PY2019 research and are shown in Table 67..

Table 67. Measure Installation Rates

Measure Category	Measure ISR
Hot Water Pipe Insulation	56%
LED 10W	92%
Bathroom Faucet Aerator	48%
Kitchen Faucet Aerator	40%
Low-Flow Showerheads	54%
Dirty Filter Alarm	44%

Source: Ameren TRM Appendix F v4.0

Gross Impact Results

The PY2020 EE School Kits Program achieved 4,346 MWh and 0.81 MW in ex post gross savings (see Table 68.).

Table 68. PY2020 EEK Program Gross Impact Summary

	Ex Ante Gross	Gross Realization Rate	Ex Post Gross
First Year Savings			
Energy Savings (MWh)	5,429	105%	4,346
Demand Savings (MW)	0.98	95%	0.81
Last Year Demand Savings			
< 10 EUL			
10–14 EUL	0.71	84%	0.59
15+ EUL	0.28	80%	0.22

To determine the ex post savings shown above, the evaluation team completed a review of ex ante savings calculations for each of the six measures included in the EEK Program and updated inputs as required using Ameren TRM v4.0 as discussed above. At the measure-level, ex post realization rates for energy and demand savings ranged from 59% to 89% (see Table 69. and Table 70.).

Table 69. PY2020 EEK Program Annual First Year Gross Impacts

Measure Category	Energy Savings			Demand Savings		
	Ex Ante (MWh)	Gross Realization Rate	Ex post (MWh)	Ex Ante (MW)	Gross Realization Rate	Ex Post (MW)
LED 10W	1,848	80%	1,485	0.28	80%	0.22
Low-Flow Showerheads	1,348	89%	1,199	0.12	89%	0.11
Dirty Filter Alarm	1,031	87%	899	0.48	87%	0.42
Kitchen Faucet Aerator	843	59%	498	0.07	59%	0.04
Hot Water Pipe Insulation	199	82%	163	0.02	82%	0.01
Bathroom Faucet Aerator	161	64%	103	0.01	82%	0.01
Total or Weighted Average	**5,429**	**80%**	**4,346**	**0.98**	**83%**	**0.81**

Table 70. PY2020 EEK Program Annual Last Year Gross Demand Impacts

Measure Category	Ex Ante Gross Savings (MW)				Gross Realization Rate	Ex Post Gross Savings (MW)			
	<10	10–14	15+	Total		<10	10–14	15+	Total
LED 10W		-	0.28	0.28	80%	-	-	0.22	0.22
Low-Flow Showerheads		0.12		0.12	89%	-	0.11	-	0.11
Dirty Filter Alarm		0.48		0.48	87%	-	0.42	-	0.42
Kitchen Faucet Aerator		0.07		0.07	59%	-	0.04	-	0.04

Measure Category	Ex Ante Gross Savings (MW)				Gross Realization Rate	Ex Post Gross Savings (MW)			
	<10	10–14	15+	Total		<10	10–14	15+	Total
Hot Water Pipe Insulation		0.02		0.02	82%	-	0.01	-	0.01
Bathroom Faucet Aerator		0.01		0.01	64%	-	0.01	-	0.01
Total or Weighted Average		**0.71**	**0.28**	**0.98**	**83%**	-	**0.59**	**0.22**	**0.81**

The electric energy and demand realization rates for the PY2020 are driven by the following differences:

- **Low-Flow Showerheads**: The gross realization rate for low-flow showerheads is 89% because of the differences in ex post and ex ante savings inputs. These differing inputs are for the number of homes with electric hot water heaters, average number of household members, deemed value for showers per capita per day, deemed value for showers per household, installation rate, and leakage rate. Generally, every measure in offered through the program had a realization rate not equal to 100% because the ex ante estimates used savings inputs from the TRM v3.0 Appendix F, which differed from version 4.0 of Appendix F and I used in developing ex post estimates.
- **Hot Water Pipe Insulation**: The gross realization rate for pipe insulation wrap is 82% because of differing savings inputs between ex ante and ex post calculations. These differing inputs are for the installation rate, the leakage rate, and percent of homes with electric hot water heaters.
- **Bathroom Faucet Aerator:** The gross realization rate for bathroom faucet aerators is 64%. This is driven by the differences in ex ante and ex post savings inputs for homes with electric hot water heaters, average household members, the installation rate, and the leakage rate.
- **Kitchen Faucet Aerator:** While the gross realization rate for kitchen faucet aerators is 59%, there is a slight difference between ex ante and ex post gross savings inputs. As with bathroom faucet aerators, this is because of a difference in the values for homes with electric hot water heaters, average number of household members, the installation rate, and the leakage rate between the ex ante and ex post calculations.
- **Dirty Filter Alarm**: The gross realization rate for dirty filter alarms is 87% because the ex ante and ex post calculations use different input values for the installation rate and leakage rate. The ex ante used savings inputs from Ameren TRM v3.0 Appendix F, while the ex post used Ameren TRM v4.0 Appendix F and I.
- **LED 10W**: The gross realization rate for LED 10W is 80% due to differences between ex ante and ex post savings inputs. The differing inputs specifically are for the installation rate, leakage rate, and average hours of use per year.

7.3.3 Net Impact Results

Net-To-Gross Ratio Results

The evaluation team relied on NTGR values from surveys conducted in PY2019 for the PY2020 kit products (Table 71.).

Table 71. PY2020 EEK Program Net-to-Gross Ratio

Measure/Enduse	Free Ridership (FR)	Participant Spillover (PSO)	NTGR (1-FR+PSO)
LED Light Bulbs	63.64%		36.36%
Low-Flow Showerheads	32.02%	3.47%	71.46%
Dirty Filter Alarm	14.83%	3.47%	88.65%
Kitchen Faucet Aerators	19.22%	3.47%	84.25%
Pipe Insulation (Hot Water)	31.16%	3.47%	72.31%
Bathroom Faucet Aerators	21.55%	3.47%	81.92%
Overall Program Weighted Average	**38.2%**	**2.2%**	**64.0%**

Source: Ameren Missouri Program Year 2019 Annual EM&V Report. Volume 2: Residential Portfolio Report

Net Impacts

The evaluation team applied the researched NTGRs to determine net impacts for the EEK Program for PY2020. In 2020, the EEK Program saved 3,410MWh of net energy and 0.81 MW of net demand (see Table 72. and Table 73).

Table 72. PY2020 EEK Program Annual First Year Net Impacts

	Energy Savings			Demand Savings		
	Ex Post Gross Savings (MWh)	NTGR	Ex Post Net Savings (MWh)	Ex Post Gross (MW)	NTGR	Ex Post Net (MW)
Low-Flow Showerheads	1,199	71%	857	0.11	71%	0.08
LED 10W	1,485	36%	540	0.22	36%	0.08
Dirty Filter Alarm	899	89%	797	0.42	89%	0.37
Kitchen Faucet Aerator	498	84%	419	0.04	84%	0.04
Hot Water Pipe Insulation	163	72%	118	0.01	72%	0.01
Bathroom Faucet Aerator	103	82%	85	0.01	82%	0.01
Non-Participant Spillover			595			0.08
Total or Weighted Average	**5,694**	**80%**	**3,410**	**0.81**	**79%**	**0.65**

Table 73. PY2020 EEK Program Annual Last Year Net Demand Impacts

	Ex post Gross Savings (MW)				NTGR	Ex post Net Savings (MW)			
	<10	10–14	15+	Total		<10	10–14	15+	Total
Low-Flow Showerheads		0.11		0.11	71%		0.08		0.08
LED 10W		-	0.22	0.22	36%		-	0.08	0.08
Dirty Filter Alarm		0.42		0.42	89%		0.37		0.37
Kitchen Faucet Aerator		0.04		0.04	84%		0.04		0.04
Hot Water Pipe Insulation		0.01		0.01	72%		0.01		0.01
Bathroom Faucet Aerator		0.01		0.01	82%		0.01		0.01
Non-Participant Spillover						0.01	0.03	0.02	0.06

	Ex post Gross Savings (MW)				NTGR	Ex post Net Savings (MW)			
	<10	10–14	15+	Total		<10	10–14	15+	Total
Total or Weighted Average	-	0.71	0.22	0.93	79%	0.01	0.53	0.10	0.65

8. Multifamily Market Rate (MFMR)

This section presents the PY2020 evaluation summary, methodology, and results for the MFMR Program. Additional details on the methodology are presented in Appendix A.

8.1 Evaluation Summary

The MFMR Program is designed to deliver long-term energy savings and bill reductions to Ameren Missouri customers living in multifamily properties with three or more units. The program targets multifamily property managers and owners and provides a one-stop-shop approach to assist these customers in overcoming barriers to completing comprehensive retrofits.

ICAST is the primary implementer of the program. As part of the one-stop-shop approach, ICAST offers a suite of concierge-style services to assist participants in identifying and executing energy efficiency projects. ICAST Energy Advisors spearhead customer recruitment, assist with the application process, conduct energy assessments, recommend custom project scopes, estimate incentives, and assist participants in coordinating installations. Customers can contract the installation work to outside vendors, or they can work with ICAST's operations team. For projects that are limited to direct-install measures, ICAST has a group of subcontractors who complete the work. ICAST staff also conduct post-installation QA/QC activities, submit final project data to Franklin Energy for invoicing, and provide customers with their rebate at the conclusion of the project.

As part of the one-stop-shop approach to promote deeper savings, ICAST also implements a custom—rather than prescriptive—approach to recommending upgrades, calculating ex ante site savings, and providing customer incentives. Using this approach, ICAST calculates all measure savings and incentives against site-specific baselines. Eligible measures include lighting, advanced thermostats, domestic hot water, and HVAC measures.

Franklin Energy serves as the overall administrator of the program and leads the development of marketing collateral (in collaboration with Ameren Missouri and ICAST), provides engineering oversight, and processes incentive payments. Franklin Energy also facilitates communication between Ameren Missouri and the program implementation teams. In this role, Franklin Energy holds regular status updates with Ameren Missouri and is responsible for providing reports on program activity and forecasts of future activity.

Notably, Ameren Missouri halted program activity in March 2020 due to the COVID-19 pandemic. Implementation resumed in June, but the program design was altered to limit health risks for program staff and participants. These changes included prohibiting work in occupied units and offering virtual energy assessments and inspections. However, the program team still achieved 2,786 MWh of net electric savings in PY2020, accounting for 2% of the Residential Portfolio net energy savings.

8.1.1 Participation Summary

In PY2020, the program treated 1,664 premises across 14 unique properties (Table 74). These projects included more comprehensive efforts facilitated by ICAST's one-stop-shop approach, as well as trade ally facilitated projects that are typically more limited in scope.

Table 74. PY2020 Multifamily Market Rate Program Participation Summary by Property

Property ID	Participation Type	Project Type	Premises Treated
101	Trade Ally	Common Area	1
102	Trade Ally	Common Area	1
103	Trade Ally	Common Area	1
104	Trade Ally	Common Area	1
105	ICAST	Common Area and In-Unit	1,043
106	ICAST	Common Area and In-Unit	313
107	ICAST	Common Area	2
108	Trade Ally	Common Area	1
109	Trade Ally	Common Area and In-Unit	40
110	Trade Ally	Common Area	1
111	Trade Ally	Common Area	1
112	Trade Ally	Common Area	1
113	ICAST	Common Area and In-Unit	102
114	ICAST	Common Area and In-Unit	156

Note: Exterior/outdoor measures considered common area.

These projects resulted in the installation of 27,012 energy-efficient measures (Table 75).

Table 75. PY2020 Multifamily Market Rate Program Participation Summary by Measure

Enduse	Unique Premises		Measures		Ex Ante Savings	
	Number	%	Number	%	MWh	%
HeatCool	915	55%	915	3%	871	29%
Water Heating RES	1,335	80%	2,850	11%	808	27%
Lighting RES	1,582	95%	13,228	49%	325	11%
EXT Lighting BUS	7	0%	1,087	4%	255	8%
HVAC BUS	2	0%	2	<1%	226	7%
Cooling RES	1	0%	2	<1%	216	7%
Lighting BUS	10	1%	869	3%	192	6%
Appliances	40	2%	80	<1%	80	3%
Building Shell RES	40	2%	7,979	30%	49	2%
Total	**1,664**	**100%**	**27,012**	**100%**	**3,022**	**100%**

8.1.2 Key Impact Results

Table 76 presents annual gross and net electric energy and demand savings achieved in PY2020. The ex post savings are 98% and 99% of the ex ante savings for energy and peak demand, respectively. As shown, the program fell short compared to Ameren Missouri's net first year energy savings and first and last year demand savings goals and targets. Although the evaluated gross realization rates and net-to-gross (NTGR) values are high, the program achieved 85% of the net first year energy savings goal and 60% of the first and last year demand savings goal.

Table 76. PY2020 Multifamily Market Rate Program Savings Summary

	Ex Ante Gross	Realization Rate	Ex Post Gross	NTGR	Ex Post Net	Goal/Target Net	% of Goal/Target
First Year Savings							
Energy Savings (MWh)	3,022	98%	2,964	94%	2,786	3,270	85%
Demand Savings (MW)	0.67	99%	0.67	94%	0.63	1.04	60%
Last Year Demand Savings							
< 10 EUL (MW)	0.04	100%	0.04	94%	0.03	0.19	18%
10–14 EUL (MW)	0.22	98%	0.21	94%	0.20	0.22	91%
15+ EUL (MW)	0.42	99%	0.42	94%	0.39	0.47	84%

8.1.3 Key Process Findings

Key process findings from the PY2020 MFMR Program include:

- **The COVID-19 pandemic presented significant challenges to the program's model for delivering comprehensive projects.** The program team demonstrated resilience and responsiveness to the circumstances; however, and adapted the program design to continue reaching customers by targeting properties with a portion of currently vacant units, as well as deploying virtual assessments and verification processes. Additionally, outside of the COVID-19 response, the team designed a new offering for gut rehabilitation projects to help address a growing trend in the multifamily market whereby existing non-residential properties are being converted to residential use by developers.
- **The current ICAST one-stop-shop program design aligns with the majority of the best practices for one-stop-shop multifamily programs including**: (1) offering a single point of contact (SPOC) for project development and technical assistance, (2) a streamlined application process with assistance from a SPOC, (3) comprehensive energy assessments to identify upgrade opportunities, (4) coordination of rebates, (5) assistance with identifying qualified contractors and soliciting, evaluating, and selecting bids, (6) coordination of installations, and (7) QA/QC inspections of each project. However, less than half of projects went through this channel in PY2020.
- **The program saw a mix of participation through both the ICAST one-stop-shop and trade ally channels over the course of PY2020 with over half of completed projects (64%) covering common area upgrades only (i.e., trade ally projects).** Among the comprehensive projects completed (36%), one project accounted for over half of premises treated.
- **The program team made changes to the program's incentive structure in PY2020 to encourage the installation of energy saving measures with long EULs (e.g., 15+ years).** In particular, the team simplified the incentive structure by removing a third tier available in PY2019 to cover HVAC-only projects, as well as a bundled rate which allowed participants to receive a higher rebate on measures included in a project with HVAC installations. These adjustments appear to have been successful; the program team achieved 0.42 MW of last year demand savings from measures with 15+ EULs in PY2020, compared to just 0.08 MW in PY2019.
- **Overall, participants are highly satisfied with the program. Interviewed property managers provided an average satisfaction rating of 9.8 out of 10 for the program (n=5), and respondents reported average satisfaction ratings above 9 for all individual program components. Finally**, all interviewees rated their

likelihood of recommending the program as a 10, on a scale from 0 to 10 where 10 meant "definitely would recommend" (n=4).[55]

Table 77 summarizes responses to the five process evaluation questions required by the Missouri CSR for demand-side evaluations.[56]

Table 77. 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?	Market imperfections specific to the multifamily sector include (1) the split incentive[57] for in-unit measures between property owners, managers, and residents, (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 a building including 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 tracking data indicates that 5 of the 14 properties treated through the program in PY2020 received both in-unit and common area upgrades. While COVID-19 impacted the range of projects that could be completed in PY2020, in future years the program team could increase the comprehensiveness of solutions offered to the target market segment by encouraging greater participation in the one-stop-shop channel.
Are the communication channels and delivery mechanisms appropriate for the target market segment?	The program uses a mix of communication channels including traditional channels such as e-mail blasts and distribution of collateral at industry events. The primary recruitment channel used is ICAST's existing relationships with larger property ownership and management companies. The program also leverages more tailored outreach to smaller scale property owners. 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?	As noted in PY2019, one potential strategy to overcome split incentive issues is the promotion of Green Leases.[58] 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.

[55] Note that the total number of participants interviewed may vary based on the questions asked given time constraints in conducting in-depth interviews and the emphasis placed on gathering NTG information.
[56] See note 8 above.
[57] 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.
[58] http://www.cbei.psu.edu/split-incentives-and-green-leases/index.html

CSR Required Process Evaluations Questions	Findings
	The other market imperfections outlined above are largely targeted by the program's one-stop-shop model. As such, increasing participation and/or the share of projects in the program utilizing those services should help to overcome imperfections more effectively such as lack of awareness and information, project costs, limited staff knowledge, and the time needed to plan efficiency projects.

8.1.4 Conclusions and Recommendations

The evaluation team offers the following conclusions and recommendations for the MFMR Program based on the results of the PY2020 evaluation:

- **Conclusion #1:** Current protocols that allow trade allies to deliver the program with nearly full autonomy hinder the program team's ability to manage the project pipeline and incentive budget. Trade ally projects also tend to be limited in scope, which impacts the ability of program staff to realize the program goals of delivering comprehensive projects and deeper savings to participating customers.
  - Recommendations #1: While the trade ally channel has brought eligible Ameren Missouri customers to the MFMR program particularly in PY2020, the program team, including Ameren Missouri, Franklin Energy, and ICAST, should consider the benefits and drawbacks of changing the process by which trade ally projects come through the program. For example, the program team could consider creating a more formal trade ally channel with a set budget that can be managed separately or adding further touchpoints between trade allies and the ICAST team to encourage more comprehensive project scopes. Potential strategies include requiring trade allies to conduct and share information from energy assessments.
- **Conclusion #2:** Although the implementation team has made significant improvements in the program-tracking database since PY2019, the evaluation team identified several data errors in the PY2020 data (e.g., incorrect tracked wattages and EULs). The evaluation team was able to resolve most of these issues through discussions and additional data requests to the implementation team.
  - Recommendation #2: Continue to improve data transcription and transfer methods and develop QAQC data checks to improve completeness and accuracy of data incorporated into the program-tracking database.
- **Conclusion #3:** Detailed project data, including algorithms and inputs used to estimate energy and demand savings, are stored in project-specific files ("Rebate Application Forms"), and only some of the key project and savings data are incorporated in the program-tracking database. Incorporating more key project and savings data into the database will improve the ability to track program activity and improve the efficiency of evaluation and other quality control measures.
  - Recommendation #3: For measures with standard methods for estimating energy savings (e.g., lighting, appliances, thermostats), perform a data review to identify and incorporate key parameters from the Rebate Approval Forms to include in the tracking database (e.g., kWhBase and kWhNew for refrigerators, which are included on the RAFs, but not in the database).
- **Conclusion #4:** Unlike other Ameren Missouri residential programs, which estimate energy and demand savings according to the methods and assumptions described in the Ameren Missouri TRM,

the MFMR program implementer uses a "custom" approach to estimate energy savings and deploys a mix of methods referencing different versions of the Ameren Missouri TRM, other regional TRMs, assumptions based on data from past projects, project-specific data, and other customized savings estimation methods.

- Recommendation #4: To improve the transparency of ex ante savings calculations, especially for new measures, provide documentation of the savings estimation methods and any key parameter assumptions used to estimate savings, including associated sources and/or justification when project-specific data or other customized methods are not available or used.

- **Conclusion #5:** Most discrepancies between ex ante and ex post savings are due to the ex post application of ISR values from Appendix F. The ex ante savings estimates do not include ISR values due to program implementation methods that include installation inspections. The Appendix F values are based on prior evaluation research that found a small fraction of measures were not installed and operating as expected.
  - Recommendation #5: As part of the TRM update process, review and consider updating the Appendix F ISR values for the MFMR program to reflect most recently available data and recent changes to the program design.

8.2 Evaluation Methodology

The evaluation team performed both impact and process evaluation activities to assess the performance of the MFMR Program in PY2020. In addition to the overarching research objectives outlined for the Residential portfolio, the evaluation team explored the following MFMR Program-specific objectives:

- Characterize program participation with respect to the number and characteristics of participants and installed measures;
- Measure customer satisfaction with program processes and implementers and motivations for participating;
- Identify opportunities for improvement in participant recruitment and customer experience;
- Provide recommendations that can be used to improve the design and implementation of the MFMR Program;
- Determine net-to-gross ratios (NTGR);
- Estimate the first year ex post gross and net energy (kWh) and demand (kW) savings; and
- Estimate last year ex post gross and net demand (kW) savings, by EUL category.

Table 78 provides an overview of the MFMR Program evaluation activities. Following the table, we outline program-specific aspects of key evaluation methodologies.

Table 78. PY2020 Evaluation Activities for the Multifamily Market Rate Program

Evaluation Activity	Description
Program Manager and Implementer Interviews	▪ Conducted interviews in the Fall of PY2020 to understand program staff's perspective on program performance.
Program Material Review	▪ Reviewed program materials to inform evaluation activities.

Evaluation Activity	Description
Property Manager/Owner Interviews	▪ Conducted interviews with participating property managers and owners to collect data to inform NTG (i.e., free ridership and participant spillover) and yield process-related insights.
Tracking System Review	▪ Reviewed implementer's tracking system to ensure that data required for the evaluation are being collected.
Database Review	▪ Reviewed program database to check that program data were complete.
Engineering Analysis	▪ Verified the methods, data inputs, and assumptions used to develop the ex ante savings and made evaluation adjustments to address accuracy of the calculations, gaps in data, and use of project-specific data. ▪ Developed ex post savings using appropriate engineering algorithms, site-specific parameters, other verified assumptions, and relevant evaluated parameters from the Ameren Missouri TRM.
NTGR/Net Impact Analysis	▪ Developed PY2020 estimates for free ridership and participant spillover. ▪ Estimated PY2020 net impacts.

8.2.1 Property Manager In-Depth Interviews

The evaluation team completed a total of six interviews with participating property managers and property association representatives. The primary objectives of the interviews were to assess the participant experience in the program, and to collect information to inform net-to-gross (NTG) calculations. We explored the customer decision-making process, discussed the influence of various program factors on project scope and timeline, and identified additional energy-related projects the participants completed that they did not fund through the MFMR Program. We also leveraged the interviews to gather information about program awareness, motivations and barriers to participation, and satisfaction with program processes.

The implementation team provided us with a sample frame of ten unique participants who completed a project through the program by November 11, 2020. We contacted all participants as part of a census attempt. Table 79 shows the total number of contacts in the sample compared to the total number of interviews we completed. The evaluation team contacted each participant at least four times through a combination of phone and e-mail outreach to schedule the interviews. We also enlisted ICAST's help to contact unresponsive participants to encourage their participation in an interview. Ultimately, we could not reach the remaining participants.

Table 79. MFMR Participant Interview Sample and Completed Interviews

Unique Contacts in Sample Frame	Completed Interviews
10	6

8.2.2 Attribution/Net Impact Analysis

The NTG analysis for the MFMR Program includes the consideration of FR and PSO. FR and PSO were estimated through the in-depth interviews with program participants and the NTGR for the MFMR Program is calculated as follows:

$$NTGR = 1 - FR + PSO$$

8.3 Evaluation Results

8.3.1 Process Results

The MFMR Program is designed to provide one-stop-shop services to assist owners and managers of multifamily properties with identifying and implementing comprehensive energy efficiency projects that result in deep savings and bill reductions for Ameren Missouri customers. To achieve this result, the program design includes various participation pathways, associated market actors, and points of intervention to meet customer's needs. Given the complexity and nuance of program delivery, the evaluation team's process reporting focuses on assessing how MFMR customers are treated by and experience the program both from the implementation and customer perspectives. This is particularly important given that not all participation scenarios facilitated the delivery of comprehensive service in PY2020 especially in light of the COVID-19 pandemic.

This section begins with a detailed summary of the program design and the challenges presented by the various participation pathways and is followed by a discussion of the challenges the program team experienced implementing the program, and changes the team made to the design to addresses these challenges.

Program Design Summary

As mentioned in the Evaluation Summary, Franklin Energy is the program administrator for the MFMR Program and ICAST leads program implementation. The two organizations work together to execute Ameren Missouri's goal for the program, which is to deliver long-term energy savings and bill reductions to customers in multifamily properties. The program team executes this vision by identifying and recruiting owners, operators, managers, and developers of multifamily properties for participation in the program within the framework of a one-stop-shop program model.

It is important to note that COVID-19 spurred adjustments to the program design. Following the suspension of program activity in March 2020, Ameren Missouri developed safety protocols for implementation teams to follow once program activity resumed, including restrictions against conducting work in occupied residences. For the MFMR Program, this meant the implementation team could no longer conduct work in occupied tenant units. This presented barriers to driving comprehensive projects because many of the measures that drive deeper savings are installed in tenant units. Typically, ICAST pairs direct-install measures, which have short payback periods, with deeper measures (e.g., HVAC, building shell) with longer payback periods to drive more expansive project scopes. As discussed in more detail below, given these constraints, the program team began to target larger properties with a subset of vacant units to drive program activity forward. The program team also focused on completing common area work where possible.

Outreach and Recruitment

ICAST leads recruitment efforts and leverages several strategies to drive participation in the program. The primary mode of recruitment is leveraging regional and national relationships with property ownership and management groups to identify organizations with properties in Ameren Missouri's service territory and educating them about the program. Once these customers participate and become comfortable with the program, ICAST focuses on turning these large customers into repeat participants, with the goal of treating their entire portfolio of properties in the service territory. Additionally, ICAST utilizes traditional forms of outreach to generate more local awareness of the program, including e-mail blasts and distribution of collateral at industry association events. Franklin Energy assists with these efforts by developing any collateral

that ICAST requests. Finally, ICAST executes a one-on-one outreach approach with smaller scale property owners to educate them on the program and the benefits of participation. Each form of outreach is designed to reach a different segment of the market and ICAST refines their outreach strategy throughout the year based on the types of projects or customers they need to target to hit the program's performance goals.

Notably, participating contractors in Ameren Missouri's Trade Ally network can also channel participants through the program. Oftentimes, property management staff at multifamily properties have close relationships with local vendors who they consistently enlist to help with energy-related projects. In these cases, the contractor may take on the responsibilities of reviewing existing equipment and developing a project scope. The contractor may also already be aware of the MFMR Program and take on the duties of enrolling the property in the program and coordinating with program staff. These projects require less involvement from program staff, but as a result, are also difficult for program staff to anticipate and plan for.

Project Development and Execution

As displayed in Figure 12, the role of program staff varies significantly between the one-stop-shop and trade ally pathways. For a one-stop-shop project, once a customer expresses interest in the program, the next step is for an ICAST Energy Advisor to complete an energy assessment.[59] The Energy Advisor, acting as an Ameren Missouri representative, walks the property with the customer and collects detailed information on the existing equipment. The custom nature of the program's energy saving calculations requires more detailed data collection than a prescriptive program. As such, Energy Advisors spend more time onsite and photograph as much of the existing equipment as possible to document information on nameplates and record serial numbers. In addition to data collection, the Energy Advisors focus on building a relationship with the customer; taking time to understand the customer's needs, what they are hoping to achieve through the program, and any constraints (e.g., budget, time, etc.) that exist to the project. The Energy Advisors also seek to create buy-in from key staff like maintenance managers and property managers. Engaging with these key staff and demonstrating expertise is critical to program success because the final decision-maker often asks these staff for input on whether to move forward with a project.

[59] Energy assessments are not required for participation in the MFMR Program. Many projects driven by trade allies do not include an energy assessment.

Figure 12. Overview of the Primary Multifamily Market Rate Participation Pathways

One-Stop-Shop Pathway

- **Energy Assessment**: ICAST Energy Advisor walks the property and collects information on existing equipment and customer goals for project.
- **Project scoping**: Energy Advisor uses information from energy assessment to recommend eligible upgrades and develop a project scope that best addresses the customer's needs.
- **Project approval**: ICAST submits proposed scope, equipment specifications, and estimated energy savings to Franklin Energy for approval.
- **Measure installation**: Depending on the participant's preference, ICAST either installs the equipment or assists the participant with soliciting and reviewing bids from installation contatractors and selecting a winner.
- **Post-installation verification:** ICAST either conducts onsite verificaiton activites or collects photo or video, documentation to verify proper installation.
- **Rebate payment:** Approved and processed by Franklin Energy.

Trade Ally Pathway

- **Energy Assessment**: N/A
- **Project scoping:** Trade ally or customer develops project scope.
- **Project approval:** Trade ally or customer provides necessary project documentation to ICAST, who reviews and passes on to Franklin Energy for approval.
- **Measure installation:** Trade ally coordinates the installations or property maintenance staff install equipment.
- **Post-installation verification**: ICAST either conducts onsite verification activites or collects photo or video, documentation to verify proper installation.
- **Rebate payment:** Approved and processed by Franklin Energy.

Following the energy assessment, the Energy Advisors use the information collected onsite to develop a suite of recommended upgrades. A primary goal of the program is to drive comprehensive projects, and as such, the Energy Advisor provides the customer with the full list of upgrades they are eligible to receive. However, the Energy Advisor will focus discussions on specific areas of interest mentioned by the customer to understand underlying motivations, identify opportunities to expand the project scope, and provide maximum value to the customer. Tailoring the program to provide the most value to the customer is a key tactic in driving repeat participation.

If the customer is interested in moving forward with some or all the recommendations, ICAST submits a rebate approval form on the customer's behalf to Franklin Energy. The submission includes measure-level energy savings calculations based on the existing equipment and proposed efficient installations. The Franklin Energy engineering team reviews the calculations, provides any feedback, and approves the project scope. Upon approval, ICAST generates an enrollment form for the customer which earmarks part of the program incentive budget for the project. Once the project is approved, the customer is free to solicit bids for the work and select vendors to install the equipment, or they can work with ICAST to perform the installations.

Conversely, most trade ally projects do not include a comprehensive, full site energy assessment. It is common for trade ally projects to originate based on a specific customer need and for the scope of the projects to remain focused on that need. While trade allies can utilize program staff to conduct many of the program implementation activities, such as conducting an energy assessment, they can also deliver the program with nearly 100% autonomy, according to program staff. The trade allies will often manage the enrollment process and work with program staff to gain project approval on behalf of their customer. In these cases, ICAST generates an incentive reservation form for the project, which requires less upfront documentation than the enrollment form generated through the one-stop-shop approach, to allocate part of the program incentive

budget for the project. The only information the trade allies are required to provide to program staff are details on the efficient equipment being installed. Program staff then do their best to collect the necessary information on existing equipment to estimate savings and incentives.

The ability of trade allies to deliver the program autonomously presents challenges for the program team, particularly ICAST, because they do not have control over the scope and timing of many of the projects that come through the program. While ICAST has effectively accommodated this aspect of the program design, the lack of control presents challenges to delivering on program goals, specifically when incentives are diverted to these projects and away from projects ICAST is forecasting. ICAST performs regular forecasting throughout the year to track toward their performance goals and earmark budgets for certain projects in their pipeline. When unexpected trade ally projects come through the program, it disrupts forecasting and can divert budgets toward less comprehensive projects. This makes it difficult to accurately forecast program performance and chart a course toward compliance. Additionally, trade ally projects are often limited in scope, which works counter to the stated program goal of driving comprehensive projects.

QA/QC Activities

Regardless of the participation pathway, ICAST staff perform post-installation QA/QC activities. ICAST typically has a site manager present onsite to perform real-time inspections of equipment as it is installed. The site manager moves through the property with installation crews, documenting installations and verifying the equipment is installed properly. This strategy ensures every job receives an inspection and final data are accurate. It also has customer service benefits because it eliminates the need to disrupt property managers and tenants a second time upon completion of the project. Program staff also accept photo and video documentation to satisfy post-installation inspection activities; commonly utilized on trade ally projects.

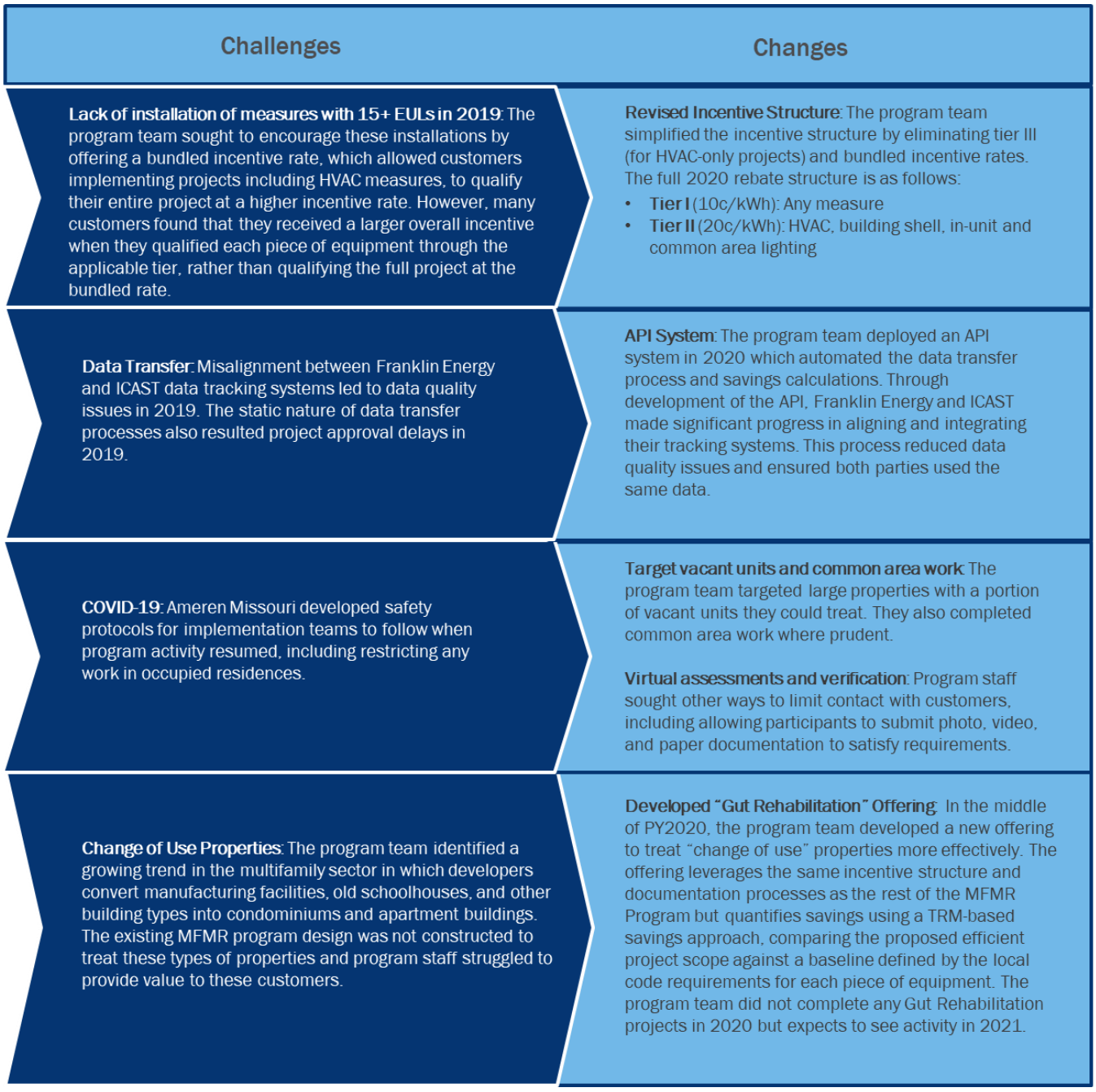
Project Closeout

After the installation and verification activities are complete, ICAST submits the final project information to Franklin Energy through an API for invoicing. The API automates the data transfer process, as well as the energy savings calculations used to calculate the final incentive amount. The program team has experienced issues with the API submissions so both ICAST and Franklin Energy QA/QC the API output before the invoice is moved to the batching process. Once both parties have reviewed and approved the data, the invoice moves through Franklin Energy's batching process where the incentives are approved and paid to ICAST. Ultimately, the incentive is passed on to the customer.

Program Implementation Challenges and Changes

The program team made several changes to program design and delivery in PY2020 in response to their experience in PY2019, as well as the COVID-19 pandemic. Figure 13 summarizes the challenges and associated changes made by the program team to better serve participants, improve program performance, and respond to the COVID-19 pandemic.

Figure 13. Summary of Implementation Challenges and Changes



While essential, the COVID-19 protocols outlined above raised concerns within the program team about the viability of completing comprehensive projects during PY2020. This is due to the fact that common area work, particularly cost-effective common area lighting is often paired with longer payback measures, such as in-unit heat pumps, as a strategy for driving comprehensive project scopes. By completing the cost-effective common area work alone in PY2020, the program team felt they may be at the risk of reduced opportunities for more comprehensive projects in the future.

Participant Experience

Overall, participants are very satisfied with the MFMR Program. The flexibility of the program design allows customers with varying needs to successfully engage with the program. Customers who are looking for technical assistance developing expansive or complex project scopes can find the expertise and financial resources to do so. Concurrently, a customer interested in upgrading lighting in a parking garage or recreational space can also have their needs met. This versatility makes the MFMR Program approachable for all customers in the target market.

"THAT COMMUNICATION WITH ICAST.... WAS VERY INFLUENTIAL. I KNOW THESE THINGS ARE GOING TO HAVE TO GET DONE, BUT TO UNDERSTAND THE MATH BEHIND THE SAVINGS...I COULDN'T MAKE THE DECISION WITHOUT THE INFORMATION."

–PARTICIPANT

"TO GET THE ENERGY EFFICIENCY LEVELS THAT WE GOT, IT REQUIRED THE ADDITION OF ENERGY RECOVERY EQUIPMENT THAT HAD NOT PREVIOUSLY EXISTED [IN THE BUILDING]. SO [THE PROGRAM] SIGNIFICANTLY IMPACTED [THE EFFICIENCY] BY ALLOWING US THE MONETARY MEANS TO ADD THIS EQUIPMENT TO THIS PROJECT."

–PARTICIPANT

The evaluation team interviewed six participants representing 12 projects across nine properties. Three of the interviewees held community management positions at the treated property, two were board members of their property association, and one was a project manager for a large property management company. Only one interviewee completed a comprehensive project through the one-stop-shop pathway and the following results from the participant interviews should be interpreted as such.

Interviewees became aware of the program through two main sources: word of mouth referrals (n=4) and direct contact with Ameren Missouri (n=2). Four participants were referred to the program by contractors or vendors they engaged during the project development process. Two of these participants participated in Ameren Missouri energy efficiency programs in the past. The two property association members contacted Ameren Missouri directly to inquire about available programs relevant to their properties. Notably, both participants reported experiencing trouble identifying the right person to speak with related to the program. Both participants said their calls were routed to multiple Ameren Missouri representatives before they were put in touch with ICAST.

Five of the interviewees reported that financial criteria are critical considerations when contemplating energy-related projects at their properties. As such, the opportunity to reduce project costs and generate energy bill savings served as the primary motivations for participating in the MFMR Program. Additional motivations included environmental consciousness, equipment failure, increasing property values, and the ability to complete an expansive scope with demonstrable savings for residents.

Participants engaged with the program in a variety of ways which meant the program influenced their projects in diverse ways. The participant from the large property management company utilized the one-stop-shop offering and worked closely with ICAST to complete an energy assessment, identify improvement opportunities, develop the most valuable project scope, and install the equipment. In total, this participant enrolled five properties in the program in 2020. This interviewee described ICAST as a critical technical partner throughout the upgrade process. The other five participants either partnered with trade allies (n=3) to implement their projects or utilized internal maintenance staff (n=2) to install the equipment.

Participant Satisfaction

Program staff are delivering a high-quality experience to participating customers as indicated by customer satisfaction with various program components. Interviewees provided an average satisfaction rating of 9.8 out of 10, where 10 meant "very satisfied" (n=5) for the overall program. Respondents also reported average satisfaction ratings above 9 for all individual program components (Table 80). All five interviewees rated their likelihood of recommending the program as a 10, on a scale from 0 to 10 where 10 meant "definitely would recommend" (n=4).

Table 80. Participant Satisfaction with Program Processes

Program Component	n[a]	Average Rating
Enrollment process	4	9.3
Energy assessment	1	10.0
Equipment recommendations	3	9.3
Project approval timeline	5	9.2
Installation process	2	10.0
Incentive amount	4	9.8
Incentive processing timeline	3	9.0
Quality of installed equipment	4	9.8
Interactions with program staff	5	9.4
Interactions with installation crews	3	9.3
Tenant response to measures	2	9.5

[a] Some components did not apply to a participant's project. Additionally, in some cases, not all components could be covered due to limited interview time.

Notably, two participants expressed that the application and documentation process was time consuming; one of these respondents said more guidance through this process would have been helpful. One participant reported delays in the project approval process, and another reported a delay getting their rebate. Interestingly, only one interviewee reported that their participation process was impacted by COVID-19. The respondent noted that the project got off to a slow start and had to begin with vacant units, but eventually the pace increased, and all units were treated.

While not illustrated through participant interviews, program staff had concerns about the potential impact of pauses in program activity and restrictions on in-unit work caused by COVID-19 to customer satisfaction with the program. Given the often comprehensive approval processes that property managers must go through to procure the funding needed to complete large projects like those scoped in the MFMR Program, it can be difficult for property owners and managers to pivot large capital expenditures to different timelines.

8.3.2 Gross Impact Results

As presented in Table 81, the PY2020 MFMR program achieved 2,964 MWh and 0.67 MW in ex post gross savings, representing energy and demand savings greater than 98%.

Table 81. PY2020 Multifamily Market Rate Gross Impact Summary

	Ex Ante Gross	Gross Realization Rate	Ex Post Gross
First Year Savings			
Energy Savings (MWh)	3,022	98%	2,964
Demand Savings (MW)	0.67	99%	0.67
Last Year Demand Savings			
< 10 EUL (MW)	0.04	100%	0.04
10–14 EUL (MW)	0.22	98%	0.21
15+ EUL (MW)	0.42	99%	0.42

The evaluation team completed analysis on the following program measures: common area lighting (Lighting BUS), in-unit lighting (Lighting RES), exterior lighting (EXT Lighting BUS), advanced thermostats (HeatCool), heat pump water heaters, bathroom and kitchen faucet aerators and showerheads (Water Heating RES), clothes washers and clothes dryers (Appliances), windows and insulation (Building Shell RES), and custom projects (HVAC BUS and Cooling RES). The remainder of this section summarizes the evaluation team's ex post analysis. All calculation methodology, parameters, and assumptions are detailed in this section and sourced in Appendix A. Table 82 summarizes the total PY2020 MFMR Program ex ante and ex post energy savings and realization rates by enduse.

Table 82. PY2020 Multifamily Market Rate Annual First Year Gross Impacts by Enduse

Enduse	Energy Savings			Demand Savings		
	Ex Ante (MWh)	Realization Rate	Ex Post (MWh)	Ex Ante (MW)	Gross Realization Rate	Ex Post (MW)
HeatCool	871	100%	871	0.12	100%	0.12
Water Heating RES	808	95%	765	0.07	95%	0.07
Lighting RES	325	95%	309	0.05	95%	0.05
EXT Lighting BUS	255	100%	256	0.04	100%	0.04
HVAC BUS	226	100%	226	0.13	100%	0.13
Cooling RES	216	100%	216	0.20	100%	0.20
Lighting BUS	192	100%	192	0.04	100%	0.04
Appliances	80	100%	80	0.01	100%	0.01
Building Shell RES	49	100%	49	0.01	100%	0.01
Total	**3,022**	**98%**	**2,964**	**0.67**	**99%**	**0.67**

Table 83 summarizes the MFMR Program's total PY2020 last year ex ante and ex post electric demand savings and realization rates by enduse and EUL class. The total ex post last year demand savings are 99% of the ex ante last year demand savings.

Table 83. PY2020 Multifamily Market Rate Program Annual Last Year Gross Demand Impacts by Enduse

Enduse	Ex Ante (MW)				Realization Rate	Ex Post (MW)			
	<10	10–14	15+	Total		<10	10–14	15+	Total
Cooling RES	0.00	0.00	0.20	0.20	100%	0.00	0.00	0.20	0.20
HVAC BUS	0.00	0.00	0.13	0.13	100%	0.00	0.00	0.13	0.13

Enduse	Ex Ante (MW)				Realization Rate	Ex Post (MW)			
	<10	10–14	15+	Total		<10	10–14	15+	Total
HeatCool	0.00	0.12	0.00	0.12	100%	0.00	0.12	0.00	0.12
Water Heating RES	0.00	0.07	0.00	0.07	95%	0.00	0.07	0.00	0.07
Lighting RES	0.00	0.00	0.05	0.05	95%	0.00	0.00	0.05	0.05
EXT Lighting BUS	0.02	0.00	0.02	0.04	100%	0.02	0.00	0.02	0.04
Lighting BUS	0.02	0.01	0.01	0.04	100%	0.02	0.01	0.01	0.04
Building Shell RES	0.00	0.00	0.01	0.01	100%	0.00	0.00	0.01	0.01
Appliances	0.00	0.01	0.00	0.01	100%	0.00	0.01	0.00	0.01
Total	**0.04**	**0.22**	**0.42**	**0.67**	**99%**	**0.04**	**0.21**	**0.42**	**0.67**

Table 84 summarizes the MFMR Program's total PY2020 ex ante and ex post electric energy and demand savings and realization rates by measure category. The gross realization rates of 98% for electric energy savings and 99% for demand savings indicate the evaluated (ex post) gross savings achieved by the program are very similar to the program's tracked ex ante savings.

Table 84. PY2020 Multifamily Market Rate Electric Energy and Demand Savings by Measure Category

Measure Category	Quantity	Energy Savings			Demand Savings		
		Ex Ante (MWh)	Gross Realization Rate	Ex Post (MWh)	Ex Ante (MW)	Gross Realization Rate	Ex Post (MW)
Advanced Thermostat	915	871	100%	871	0.12	100%	0.12
Low-Flow Showerhead	1,135	476	91%	434	0.04	91%	0.04
In-Unit Lighting	13,228	325	95%	309	0.05	95%	0.05
Exterior Business Lighting	1,087	255	100%	256	0.04	100%	0.04
Custom HVAC	2	226	100%	226	0.13	100%	0.13
Custom Cooling	2	216	100%	216	0.20	100%	0.20
Business Lighting	869	192	100%	192	0.04	100%	0.04
Low-Flow Faucet Aerator	1,675	189	100%	189	0.02	100%	0.02
Heat Pump Water Heater	40	142	100%	142	0.01	100%	0.01
Clothes Dryer	40	51	100%	51	0.01	100%	0.01
Windows	160	34	100%	34	0.01	100%	0.01
Clothes Washer	40	29	100%	29	0.00	100%	0.00
Insulation	7,819	15	100%	15	0.01	100%	0.01
Total	**27,012**	**3,022**	**98%**	**2,964**	**0.67**	**99%**	**0.67**

Discrepancies between ex ante savings and ex post savings primarily stem from one source: the ex post application of ISR values as documented in Appendix F (v3.1).

The following list highlights the largest contributors to differences between ex ante and ex post savings:

- **Low-Flow Showerhead:** The gross realization rate for Low-Flow Showerheads was 91% for both energy and demand savings.

- Ex ante applied an ISR of 100% for all showerhead records. The evaluation team, in accordance with both the most recent version (v4.0) and older versions of Appendix F, applied an ISR of 91%. This decreased ex post savings and accounted for 100% of the discrepancies between ex ante and ex post.

- **Lighting RES:** The gross realization rate for residential lighting measures was 95% for both energy and demand savings.
  - Ex ante applied an ISR of 100% for all residential lighting records. The evaluation team, in accordance with both the most recent version (v4.0) and older versions of Appendix F, applied an ISR of 95.12%, This decreased ex post savings and accounted for 100% of the discrepancies between ex ante and ex post.

Several program-tracking data errors resulted in some very small discrepancies at the measure level but did not have an impact on the gross realization rates.

8.3.3 Net Impact Results

Net-To-Gross Ratio Results

The evaluation team developed project-level FR and PSO scores based on responses provided in the in-depth interviews. Table 85 presents the results of our NTG analysis.

Table 85. PY2020 Multifamily Market Rate Program NTGR

Program	Free Ridership (FR)	Participant Spillover (PSO)	NTGR (1-FR+PSO)
MFMR Program	0.06	0.00	0.94

Overall, the program played a key role in allowing respondents to expand the scope of their projects. Five participants noted they expanded the scope of their project as a result of engagement with the program; some added additional equipment to their project scope while others expanded the amount of equipment installed or treated more areas of the property. Additionally, three participants mentioned the program influenced the timing of their project by allowing them to replace many pieces of equipment at once, rather than through a piecemeal approach over several months or years. Lastly, two respondents reported the program influenced the efficiency level of the equipment they installed by freeing up necessary capital to select efficient technologies that are more expensive.

Based on the results of the interviews, we did not identify any respondents who installed measures that qualified for PSO.

Net Impacts

The evaluation team applied the NTGR developed through in-depth interviews with program participants. In 2020, the MFMR Program saved 2,786 MWh and 0.63 MW of net energy and demand (Table 86).

Table 86. PY2020 Multifamily Market Rate Net Savings Summary

	Ex Ante Gross	Realization Rate	Ex Post Gross	NTGR	Ex Post Net	Goal/Target Net	% of Goal/Target
First Year Savings							
Energy Savings (MWh)	3,022	98%	2,964	94%	2,786	3,270	85%
Demand Savings (MW)	0.67	99%	0.67	94%	0.63	1.04	60%
Last Year Demand Savings							
< 10 EUL	0.04	100%	0.04	94%	0.03	0.19	18%
10-14 EUL	0.22	98%	0.21	94%	0.20	0.22	91%
15+ EUL	0.42	99%	0.42	94%	0.39	0.47	84%

Table 87 and Table 88 present the net impacts for the PY2020 MFMR Program by Enduse and by EUL class.

Table 87. PY2020 Multifamily Market Rate Annual First Year Net Impacts by Enduse

Enduse	Energy Savings			Demand Savings		
	Ex post Gross Savings (MWh)	NTGR	Ex post Net Savings (MWh)	Ex post Gross Savings (MW)	NTGR	Ex post Net (MW)
Cooling RES	216	94%	203	0.20	94%	0.19
HVAC BUS	226	94%	212	0.13	94%	0.12
HeatCool	871	94%	818	0.12	94%	0.11
Water Heating RES	765	94%	719	0.07	94%	0.06
Lighting RES	309	94%	291	0.05	94%	0.04
EXT Lighting BUS	256	94%	240	0.04	94%	0.03
Lighting BUS	192	94%	180	0.04	94%	0.03
Building Shell RES	49	94%	46	0.01	94%	0.01
Appliances	80	94%	75	0.01	94%	0.01
Total	**2,964**	**94%**	**2,786**	**0.67**	**94%**	**0.63**

Table 88 shows the last year demand savings by measure by EUL class. The PY2020 MFMR Program delivered 0.63 MW of total last year ex post net demand savings.

Table 88. PY2020 Multifamily Market Rate Last Year Net Demand Impacts by Enduse

Enduse	Ex Post Gross Savings (MW)				NTGR	Ex Post Net Savings (MW)			
	<10	10-14	15+	Total		<10	10-14	15+	Total
Cooling RES	0.00	0.00	0.20	0.20	94%	0.00	0.00	0.19	0.19
HVAC BUS	0.00	0.00	0.13	0.13	94%	0.00	0.00	0.12	0.12
HeatCool	0.00	0.12	0.00	0.12	94%	0.00	0.11	0.00	0.11
Water Heating RES	0.00	0.07	0.00	0.07	94%	0.00	0.06	0.00	0.06
Lighting RES	0.00	0.00	0.05	0.05	94%	0.00	0.00	0.04	0.04
EXT Lighting BUS	0.02	0.00	0.02	0.04	94%	0.02	0.00	0.02	0.03
Lighting BUS	0.02	0.01	0.01	0.04	94%	0.02	0.01	0.01	0.03

Enduse	Ex Post Gross Savings (MW)				NTGR	Ex Post Net Savings (MW)			
	<10	10-14	15+	Total		<10	10-14	15+	Total
Building Shell RES	0.00	0.00	0.01	0.01	94%	0.00	0.00	0.01	0.01
Appliances	0.00	0.01	0.00	0.01	94%	0.00	0.01	0.00	0.01
Total	**0.04**	**0.21**	**0.42**	**0.67**	**94%**	**0.03**	**0.20**	**0.39**	**0.63**

9. Appliance Recycling (RAR)

This section summarizes the PY2020 evaluation methodology and results for the Residential Appliance Recycling Program (RAR). Additional details on the methodology are presented in Appendix A.

9.1 Evaluation Summary

The primary goal of the Residential Appliance Recycling (RAR) Program is to promote the retirement and recycling of inefficient refrigerators, freezers, dehumidifiers, and room air conditioners from households by offering turn-in incentives, free pick-up for electric customers with working refrigerators, freezers, dehumidifiers, or room air conditioners. The focus of the program is on refrigerators and freezers, and the program also includes pick-up of working dehumidifiers and room air conditioners with the pick-up of a larger appliance.

The program also provides participants with energy-efficient kits that contain LED lamps and domestic hot water measures, such as faucet aerators and low-flow showerheads. Ameren Missouri outsources kit implementation to a turnkey service provider that manages processes from eligibility verification to proper disposal or recycling of turned-in appliances and contributes to developing and implementing the program's marketing strategy.

The program emphasizes the savings associated with retiring older, less efficient appliances as well as the benefits of proper disposal/recycling of those appliances.

9.1.1 Participation Summary

In PY2020 a total of 800 unique customers recycled appliances through the Ameren Missouri RAR Program. Out of these customers, 796 participants received Energy Efficiency Kits. Table 89 shows the total kits and measures distributed.

Table 89 presents participation in the RAR Program during PY2020.

Table 89. PY2020 Appliance Recycling Program Participation Summary

Measure/Enduse	Participants		Measures Ex Ante Savings			
	Number	%	Number	%	MWh	%
Bathroom Faucet Aerator	796	14.1%	796	8.3%	8	1.0%
Dirty Filter Alarm	796	14.1%	796	8.3%	49	5.9%
Kitchen Faucet Aerator	796	14.1%	796	8.3%	42	5.1%
LED 10W [a]	796	14.1%	3,184	33.1%	88	10.6%
Low-Flow Showerheads	796	14.1%	796	8.3%	68	8.2%
Hot Water Pipe Insulation [b]	796	14.1%	2,388	24.8%	10	1.2%
Refrigerator Recycling (post-1990)	587	10.4%	587	6.1%	307	37.2%
Refrigerator Recycling (pre-1990)	136	2.4%	136	1.4%	138	16.7%
Freezer Recycling	126	2.2%	126	1.3%	112	13.6%
Dehumidifier Recycling	14	0.2%	14	0.1%	2	0.2%
Room Air Conditioner Recycling	10	0.2%	10	0.1%	3	0.4%

[a] Kits with LEDs include four bulbs per kit.

[b] Measure quantity represents total footage of pipe insulation at three feet per kit.

9.1.2 Key Impact Results

The RAR Program implementers used a regression-based analysis to calculate the total PY2020 ex post gross savings. The methodology and equations can be found in the Ameren Missouri TRM v4.0.[60] The evaluation team conducted a participant survey in PY2019, and sourced survey respondent reported values to update the following savings equation inputs: part use factor, installation rates, net-to-gross ratio, kit units per home, occupants per home, and percentage of homes with electric water heaters.

Upon review of the program database and included savings values, the evaluation team traced ex ante savings inputs to the Ameren TRM v3.0.[61] In PY2019 the evaluation team conducted a participant survey to collect self-reported values to update the following savings equation inputs for the kit measures: in-service rates, household occupancy, percentage of homes with electric hot water heaters, and leakage out of the Ameren Missouri territory. These updates were adopted in the Ameren TRM v4.0 and is the basis for the evaluation ex post savings estimates. The implementer provided savings inputs to the evaluation team that indicate Ameren TRM v3.0 was used for the ex ante savings calculations. The data consistency issues directly correlate to the gross realization rates presented in Table 90 below.

Table 90 presents annual savings achieved in PY2020. As shown, the program achieved 16% of Ameren Missouri's net energy savings goal for RAR.

Table 90. PY2020 Appliance Recycling Program Impacts Summary

	Ex Ante Gross	Realization Rate	Ex Post Gross	NTGR	Ex Post Net	Goal/Target Net	% of Goal/Target
First Year Savings							
Energy Savings (MWh)	826	108%	888	60.5%	537	3,333	16%
Demand Savings (MW)	0.13	99%	0.13	55.2%	0.07	0.47	15%
Last Year Demand Savings							
< 10 EUL (MW)	0.08	129%	0.10	44.5%	0.05	0.34	13%
10–14 EUL (MW)	0.03	27%	0.01	135.1%	0.01	0	
15+ EUL (MW)	0.01	107%	0.01	83.7%	0.01	0	

[a] Gross Realization Rate = Ex Post/Ex ante.

[b] Ex Post Net = Ex Post x NTGR

[c] Source: Ameren Missouri Appendix A - Portfolio and Program Summary

[d] % Goal/Target = Ex Post Net/Goal Net

Overall, the RAR Program was the seventh-largest program in the PY2020 Residential portfolio, accounting for 0.3% of ex post net residential portfolio energy savings and 0.1% of ex post net Residential portfolio demand savings.

60 The ex post savings were based on the Ameren TRM Appendix F - Deemed Savings Table_Clean_2020_10_16.xlsx, and the Appendix I - TRM-Vol 3_Res_2020_10_16.docx

61 The ex ante savings were based on the Ameren TRM Appendix F - Deemed_Savings_Table_Clean_2019_11_07.xlsx.

9.1.3 Key Process Findings

The evaluation team identified the following key process findings based on the PY2020 evaluation:

- **COVID-19 resulted in several program design changes from PY2019 to PY2020. First, program operating protocols changed from in-home to contactless customer appliance pick-ups.** Additionally, customers are now required to specify unit details and must provide access to the unit outside the home. The program implementer added detailed guidance for participants before the participation process to manage customer expectations about where units can be placed and making sure the unit is safe for the collection team to access. This approach allowed for the safe continuation of program operations.
- **Aside from COVID-19-related changes, the key program change over the past year was the addition of a second field team to conduct appliance pick-ups.** This second field team allowed the program to continue tracking towards its collection goals following the termination of a vendor contracted by the implementor.

To meet the requirements of Missouri Code of State Regulations (CSR) for demand-side process evaluations, we provide responses to the five required process evaluation questions in Table 91.

Table 91. 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?	The primary market imperfection that the program addresses is residential customers' low impetus to remove old, inefficient refrigerators and freezers from the grid. Often customers will keep a spare refrigerator or freezer for secondary use or dispose of it in a way that it continues to be used as opposed to disposing of the appliance permanently.
Is the target market segment appropriately defined, or should it be further subdivided or merged with other market segments?	Yes. The evaluation team conducted a residential baseline study in 2019 that found that 37% of residents have a secondary refrigerator, an additional 8% have a third refrigerator, and 39% report the presence of a stand-alone freezer.[62] This indicates ample opportunity to achieve savings by removing these additional appliances from the grid. Participant survey responses indicate 29% of recycled appliances were primary units, which, in the absence of the program, a customer might retain for secondary use. Regarding appliance age, baseline data indicates that there are very few existing appliances of vintages earlier than 1990 (1% of primary refrigerators, 10% of secondary refrigerators, and 12% of secondary freezers). Participant survey data indicate that 36% of recycled units are of vintages earlier than 1990. Thus, the program is successfully motivating the recycling of these units.
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 allows refrigerators or freezers to be recycled, along with window air conditioners and/or dehumidifiers at the same time. In PY2020, 3% of recycled appliances were dehumidifiers and room air conditioners, demonstrating there is a market, albeit small, for these additional measures to be recycled. During the PY2019 RAR participant survey, customers did not mention requests for additional measures to be included in the program.

[62] The evaluation team conducted a survey with 1,395 residential customers between July 31 and August 24, 2019 and in-home audits with a subsample of 120 baseline survey respondents between August 14 and September 25, 2019.

CSR Required Process Evaluations Questions	Findings
Are the communication channels and delivery mechanisms appropriate for the target market segment?	Yes. Ameren Missouri primarily advertises this program through bill inserts and direct e-mail campaigns. Based on PY2019 RAR participant survey responses, physical collateral is the primary mechanism responding participants report hearing about the program.
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?	Ameren Missouri can annually revisit program assumptions regarding the percent of equipment in residential use that was manufactured prior to 1990, the percent of equipment recycled that is primary versus secondary, and the size of freezers recycled through the program.

9.1.4 Conclusions and Recommendations

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

- **Conclusion #1:** As with other programs in the residential portfolio, the implementation team used an older version of the Ameren Missouri TRM (v3.1) when developing ex ante savings estimates, while the evaluation team used v4.0 in developing ex post savings estimates. This was a main driver in gross realization rates that are unequal to 100% across all measures offered through the RAR Program.
  - Recommendation: To minimize discrepancies between ex ante and ex post savings, work to incorporate as many TRM updates as possible (e.g., adjustments based on evaluation results or prior year participation data) early in the program year, and incorporate those adjustments into the program-tracking database and ex ante savings calculations.
- **Conclusion #2:** The Appliance Recycling program data was not always clear whether a customer's appliance was the primary or secondary appliance, and if the space the appliance was in was conditioned or unconditioned.
  - Recommendation: The implementer should clearly mark primary or secondary and conditioned or unconditioned in the program database to avoid any confusion during impact analysis. Also, the meaning of 'CustNA' as a data input needs to be clarified.

9.2 Evaluation Methodology

The evaluation team performed both impact evaluation activities, and a limited set of process evaluation activities to assess the performance of the RAR Program in PY2020. In addition to the overarching research objectives outlined for the Residential portfolio, the evaluation team explored the following RAR specific objectives:

- Characterize program participation based on products recycled and distributed through the program by type and by distribution channel; and

- Provide evaluation results that can be used to improve the design and implementation of the RAR Program.

Table 92 provides an overview of the RAR Program evaluation activities. Following Table 92, we outline program-specific aspects of key evaluation methodologies.

Table 92. PY2020 Evaluation Activities for the Residential Appliance Recycling Program

Evaluation Activity	Description
Program Manager and Implementer Interviews	▪ Conducted interviews with program administration and implementation staff during Q3 of PY2020.
Program Material Review	▪ Reviewed available program materials to inform evaluation activities.
Tracking System Review	▪ Reviewed implementer's tracking system to ensure that data required for the evaluation is being collected.
Database Review	▪ Reviewed program database to check that program data are complete and that program-installed measures meet all program requirements.
Engineering Analysis	▪ Verified that ex ante savings use correct TRM values and algorithms. ▪ Developed overall and measure-level ex post savings using TRM values and algorithms, program-tracking data, and any updated evaluation-estimated parameters.
Attribution / Net Impact Analysis	▪ Applied PY2019 free ridership and participant spillover. ▪ Applied portfolio-level non-participant spillover. ▪ Estimated PY2020 net impacts.

9.3 Evaluation Results

9.3.1 Process Results

The evaluation team's process includes findings from in-depth interviews with program administration and implementation staff, and a review of program-tracking data. Most importantly, COVID-19 resulted in key program design changes from PY2019 to PY2020. In prior program years implementer staff would enter participant homes to collect qualifying appliances; PY2020 procedures resulted in additional customer communication prior to collection which allowed contactless customer appliance pick-ups. This change was facilitated by implementor staff making additional scheduling calls to participants after applying and on the collection date, as well as through increased email communication with appliance placement and collection requirements. Consequently, customers are now required to specify and confirm appliance details prior to collection and must provide access to the eligible equipment from outside the home. These changes ensure the safety of the collection team and reduce the likelihood of arriving to find ineligible equipment. This approach allowed for the safe continuation of program operations.

9.3.2 Gross Impact Results

Measure In-Service Rates

The evaluation team leveraged PY2019 RAR participant survey responses to calculate ISRs for RAR kits measures (Table 93).

Table 93. Installation Rate Appliance Recycling Kits

Measure/Enduse	RAR Kits ISR
Bathroom Faucet Aerator	24%
Dirty Filter Alarm	9%
Kitchen Faucet Aerator	20%
LED 10W Light Bulbs	88%
Low-Flow Showerheads	24%
Hot Water Pipe Insulation Wrap	41%

Source: Ameren TRM Appendix F v4.0

Gross Impact Results

Table 94 presents the RAR Program's annual savings achieved in PY2020; 888 MWh and 0.13 MW in ex post gross savings.

Table 94. PY2020 Appliance Recycling Program Gross Impact Summary

	Ex Ante	Realization Rate	Ex post
First Year Savings			
Energy Savings (MWh)	826	108%	888
Demand Savings (MW)	0.13	99%	0.13
Last Year Demand Savings			
< 10 EUL (MW)	0.08	129%	0.10
10–14 EUL (MW)	0.03	27%	0.01
15+ EUL (MW)	0.01	107%	0.01

Table 95 and Table 96 present the RAR Program's annual savings achieved in PY2020 by measure category. The PY2020 RAR Program is comprised of 10 unique measures.

Table 95. PY2020 Appliance Recycling Program Annual First Year Gross Impacts

Measure/Enduse	Energy Savings			Demand Savings		
	Ex Ante (MWh)	Realization Rate	Ex Post (MWh)	Ex Ante (MW)	Realization Rate	Ex Post (MW)
Refrigerator Recycling (post-1990)	307	154%	474	0.04	154%	0.06
Refrigerator Recycling (pre-1990)	138	115%	159	0.02	115%	0.02
Freezer Recycling	112	93%	104	0.02	93%	0.02
LED 10W	88	107%	94	0.01	107%	0.01
Low-Flow Showerheads	68	32%	22	0.01	32%	0.00
Dirty Filter Alarm	49	25%	12	0.02	25%	0.01
Kitchen Faucet Aerator	42	24%	10	0.00	24%	0.00
Hot Water Pipe Insulation	10	63%	6	0.00	63%	0.00
Bathroom Faucet Aerator	8	26%	2	0.00	26%	0.00
Room Air Conditioner Recycling	3	100%	3	0.00	100%	0.00
Dehumidifier Recycling	2	100%	2	0.00	100%	0.00
Total or Weighted Average	**826**	**108%**	**888**	**0.13**	**99%**	**0.13**

Table 96. PY2020 Residential Appliance Recycling Program Annual Last Year Gross Demand Impacts

Measure/Enduse	Ex Ante Gross Savings (MW)[a]				Gross Realization Rate	Ex post Gross Savings (MW)			
	<10	10–14	15+	Total		<10	10–14	15+	Total
Refrigerator Recycling (post-1990)	0.04	0.00	0.00	0.04	154%	0.06	0.00	0.00	0.06
Refrigerator Recycling (pre-1990)	0.02	0.00	0.00	0.02	115%	0.02	0.00	0.00	0.02
Freezer Recycling	0.02	0.00	0.00	0.02	93%	0.02	0.00	0.00	0.02
LED 10W	0.00	0.00	0.01	0.01	107%	0.00	0.00	0.01	0.01
Low-Flow Showerheads	0.00	0.01	0.00	0.01	32%	0.00	0.00	0.00	0.00
Dirty Filter Alarm	0.00	0.02	0.00	0.02	25%	0.00	0.01	0.00	0.01
Kitchen Faucet Aerator	0.00	0.00	0.00	0.00	24%	0.00	0.00	0.00	0.00
Hot Water Pipe Insulation	0.00	0.00	0.00	0.00	63%	0.00	0.00	0.00	0.00
Bathroom Faucet Aerator	0.00	0.00	0.00	0.00	26%	0.00	0.00	0.00	0.00
Room Air Conditioner Recycling	0.00	0.00	0.00	0.00	100%	0.00	0.00	0.00	0.00
Dehumidifier Recycling	0.00	0.00	0.00	0.00	100%	0.00	0.00	0.00	0.00
Total or Weighted Average	**0.08**	**0.03**	**0.01**	**0.13**	**99%**	**0.10**	**0.01**	**0.01**	**0.13**

[a] Some values are too small to be shown in this table in megawatts, values do exist in kilowatts.

The electric energy and demand realization rates for the PY2020 are driven by the following differences:

- **Refrigerator Recycling:**
  - The gross realization rate for **Refrigerator Recycling (post-1990)** is 154% because there are four measures that have ex ante deemed savings equal to that of a pre-1990 refrigerator measure instead of post-1990. Additionally, ex ante savings are deemed in the TRM while ex post savings

use actual inputs from the program dataset. Generally, across the measures, the ex ante used savings inputs from the TRM Appendix F v v3.1 which differed from ex post usage of the TRM Appendix F v4.0.

- The realization rate for **Refrigerator Recycling (pre-1990)** is 115% for two reasons. First, there are four measures that have ex ante deemed savings equal to that of a post-1990 refrigerator measure instead of pre-1990. Second, the ex ante savings use a TRM deemed input which differed from the actual inputs in the dataset used in the ex post savings calculation.

- **LED 10W**: The LED 10W gross realization rate is 107% because the ex ante and ex post savings input values were different for efficient wattage, average hours of use per year, installation rate, and leakage rate.
- **Freezer Recycling**: The program database did not contain any size data for the freezer measure (see Appendix A), so the evaluation applied TRM deemed savings value. The gross realization rate is 93% because the ex ante and ex post savings inputs differed in value for the deemed savings values, due to different TRM documents used. Similarly, as the TRM only contained a single value for freezer sizes, the evaluation team did not estimate savings separately for freezers built before and after 1990.
- **Hot Water Pipe Insulation**: The pipe insulation gross realization rate is 63% because installation rate and leakage rate values are not the same in ex ante and ex post calculations due to different TRM versions for the ex ante and ex post savings.
- **Low Flow Showerheads**: The gross realization rate for low flow showerheads is 32% because, like the aerators, ex post used a leakage rate for non-school kits, however other deemed savings inputs use values of school kits. Additionally, ex ante and ex post savings input values were not in agreement for the value of electric homes with hot water heaters, showers per capita per day, number of showerheads per household, the installation rate, and leakage rate.
- **Bathroom Faucet Aerator:** The gross realization rate for bathroom faucet aerators is 26% because ex ante and ex post savings inputs differ from one another. This happens specifically in the percentage of households with electric hot water heaters, average number of people in a household, installation rate, and leakage rate. The ex post leakage rate is for non-school kits, however other deemed savings inputs use values of school kits.
- **Dirty Filter Alarm**: The gross realization rate was 25% for dirty filter alarms because installation rate and leakage rate values differed between ex ante and ex post calculations due to different TRM versions as described above.
- **Kitchen Faucet Aerator:** The gross realization rate for kitchen faucet aerators is 24% for reasons like the bathroom aerator. The values for percentage of households with electric hot water heaters, average number of people in a household, installation rate, and leakage rate were different in ex ante and ex post calculations. Here the ex post leakage rate is for non-school kits as well, where other deemed savings inputs use values of school kits.

9.3.3 Net-To-Gross Ratio Results

The evaluation team relied on NTGR values from PY2019 for the PY2020 net savings estimations. No new research was conducted in PY2020. Table 97 presents the results of our NTG analysis from PY2019.

Table 97. PY2020 Residential Appliance Recycling Program Measure-Level Net-to-Gross Ratio

Measure/Enduse	Measure-level Respondents	Free Ridership	Participant Spillover	NTGR
		(FR)	(PSO)	(1-FR+PSO)
Freezer	46	58.1%	4.4%	46.9%
Refrigerator	143	62.6%	4.4%	42.3%
Room Air Conditioners and Dehumidifiers (Ex post savings weighted appliance value)		61.3%	4.4%	43.6%
Bathroom Faucet Aerators	149	21.6%	1.2%	79.6%
Dirty Filter Alarm	149	15.7%	1.2%	85.5%
Kitchen Faucet Aerators	149	21.4%	1.2%	79.8%
Low-Flow Showerheads	149	28.0%	1.2%	73.2%
Pipe Insulation (Hot Water)	149	34.1%	1.2%	67.1%
Overall Program	**338**	**56.5%**	**3.8%**	**47.7%**

Source: Ameren Missouri Program Year 2019 Annual EM&V Report. Volume 2: Residential Portfolio Report

Net Impacts

The evaluation team applied the 2019 NTGRs to determine net impacts for the PY2020 Appliance Recycling Program (Table 98 and Table 99).

Table 98. PY2020 Residential Appliance Recycling Program Annual First Year Net Impacts

Measure/Enduse	Energy Savings			Demand Savings		
	Ex post Gross Savings (MWh)	NTGR	Ex post Net Savings (MWh)	Ex post Gross Savings (MW)	NTGR	Ex post Net (MW)
Refrigerator Recycling (post-1990)	474	42%	201	0.06	42%	0.03
Refrigerator Recycling (pre-1990)	159	42%	67	0.02	42%	0.01
Freezer Recycling	104	47%	49	0.02	47%	0.01
LED 10W	94	60%	56	0.01	60%	0.01
Low-Flow Showerheads	22	73%	16	0.00	73%	0.00
Dirty Filter Alarm	12	86%	10	0.01	86%	0.00
Kitchen Faucet Aerator	10	80%	8	0.00	80%	0.00
Hot Water Pipe Insulation	6	67%	4	0.00	67%	0.00
Room Air Conditioner Recycling	3	44%	1	0.00	44%	0.00
Bathroom Faucet Aerator	2	80%	2	0.00	80%	0.00
Dehumidifier Recycling	2	44%	1	0.00	44%	0.00
Non-Participant Spillover			122			0.01
Total or Weighted Average	**888**	**60%**	**537**	**0.13**	**55%**	**0.07**

Table 99. PY2020 Residential Appliance Recycling Program Last Year Net Demand Impacts

Measure/Enduse	Ex Post Gross Savings (MW)				NTGR	Ex Post Net Savings (MW)			
	<10	10–14	15+	Total		<10	10–14	15+	Total
Refrigerator Recycling (post-1990)	0.06	-	-	0.06	42%	0.03	-	-	0.03
Refrigerator Recycling (pre-1990)	0.02	-	-	0.02	42%	0.01	-	-	0.01
Freezer Recycling	0.02	-	-	0.02	47%	0.01	-	-	0.01
LED 10W	-	-	0.01	0.01	60%	-	-	0.01	0.01
Low-Flow Showerheads	-	0.00	-	0.00	73%	-	0.00	-	0.00
Dirty Filter Alarm	-	0.01	-	0.01	86%	-	0.00	-	0.00
Kitchen Faucet Aerator	-	0.00	-	0.00	80%	-	0.00	-	0.00
Hot Water Pipe Insulation	-	0.00	-	0.00	67%	-	0.00	-	0.00
Room Air Conditioner Recycling	0.00	-	-	0.00	44%	0.00	-	-	0.00
Bathroom Faucet Aerator	-	0.00	-	0.00	80%	-	0.00	-	0.00
Dehumidifier Recycling	0.00	-	-	0.00	44%	0.00	-	-	0.00
Non-Participant Spillover						0.001	0.005	0.003	0.01
Total or Weighted Average	**0.10**	**0.01**	**0.01**	**0.13**	**55%**	**0.046**	**0.01**	**0.01**	**0.07**

10. Single Family Income-Eligible (SFIE)

This section summarizes the PY2020 evaluation methodology and results for the Residential SFIE Program. Additional details on the methodology are presented in Appendix A. Evaluation Summary.

The Single Family Income-Eligible Program, known to customers as the CommunitySavers Single Family Program, is designed to provide whole-home energy efficiency upgrades to income eligible Ameren Missouri customers living in single family properties, including mobile homes and duplexes.[63] The program has historically leveraged three participation channels to achieve this goal: (1) the Single Family channel; (2) the Mobile Homes channel; and (3) the Grant channel. Each channel is designed to reach income eligible customers in different ways that collectively overcome barriers to energy efficiency among this segment.

The Single Family and Mobile Homes channels typically deploy a neighborhood-canvass recruitment approach to schedule home energy assessments with interested customers and identify comprehensive retrofit opportunities. This recruitment approach includes direct customer outreach and partnerships with trusted community groups to encourage participation. Due to the health risks associated with COVID-19, however, the program team temporarily modified the channel design for PY2020 with the goal of delivering energy savings to income eligible customers while limiting contact between customers and implementation staff. As part of these adjustments, the program team merged the Single Family and Mobile Homes channels to streamline implementation efforts. Notably, the program team did not treat any mobile home residents in 2020 as none of the housing organizations that program staff worked with to recruit participants had mobile home residences in their portfolios (see Section 10.3.1). The new design included a multi-pronged approach:

- **Contactless tune-up and energy efficiency kit offering**: The implementation team visited homes to conduct contactless CAC and ASHP tune-ups on exterior units and replace inefficient exterior lighting with LEDs. The implementation team also gave the customer an energy efficiency kit containing four LEDs, two faucet aerators (bathroom and kitchen), one low-flow showerhead, one dirty filter alarm, one advanced Tier 2 power strip, and hot water pipe insulation with installation instructions, educational materials, and cross-promotional collateral for other Ameren Missouri programs. While these measures were left behind by contractors in PY2020, in a typical program year measures would be directly installed by contractors.
- **Traditional delivery at vacant properties**: The implementation team identified temporarily vacant properties (e.g., due to tenant turnover) and treated these properties consistent with the comprehensive design delivered in PY2019. Energy advisors conducted energy assessments, performed direct installation of energy-saving measures, identified opportunities for deeper savings measures (e.g., building shell improvements or HVAC replacements), and scheduled follow-up installations.
- **HVAC system replacements**: Program staff utilized data collected on participant HVAC systems during the contactless tune-ups to identify CACs and ASHPs eligible for replacement under the SFIE criteria (condensing unit is 10 SEER or less). Implementation crews returned to some of these homes to replace the existing systems and install smart thermostats. Additionally, Spire and Ameren Missouri natural gas customers also received a furnace check and clean. Contractors also installed efficient ECM fan on natural gas furnaces where applicable.[64]

[63] In PY2020, Ameren Missouri approved the treatment of one to four family homes through this program.
[64] The SFIE program has co-delivery agreements with Spire Gas and Ameren Missouri Gas.

The program team also altered their outreach strategy; opting to recruit participation through housing organizations with large portfolios of properties rather than direct customer outreach. While the channel design differed significantly from PY2019, the roles and responsibilities of Franklin Energy (Program Administrator) and Resource Innovations (Program Implementer) remained the same. Resource Innovations led customer recruitment efforts, managed sub-contractors, collected program-tracking data, and transferred data to Franklin Energy using an Application Programming Interface (API) which automated the data transfer process from Resource Innovations' database to Franklin Energy's database and calculated energy savings using programmed calculations. Franklin Energy was responsible for reviewing the data submissions and savings calculations, batching invoices, and processing incentives. Franklin Energy also aggregated program-tracking data and provided regular reports on program activity to Ameren Missouri.

Franklin Energy also administered and implemented the Grant channel which remained largely unchanged from PY2019. Ameren Missouri designed the Grant channel to reach additional income eligible customers and provide them with energy efficiency measures through community-based organizations (CBOs). Eligible CBOs must serve Ameren Missouri residential electric customers who reside in single family homes and have an annual family income at or below 80% of Area Median Income (AMI). Interested CBOs must apply through Franklin Energy. Once enrolled, CBOs can order measures through a web-based portal or by contacting Franklin Energy directly. CBOs can participate in one or both of the following capacities:

- Measure distribution: CBOs receive measures at no cost and distribute them to customers who visit the CBO. Eligible measures include LED bulbs, room air conditioners, and an energy efficiency kits that includes: a four-pack of LEDs, a dirty filter alarm, two faucet aerators, hot water pipe insulation, and a low-flow showerhead. CBOs are required to verify recipients' eligibility before distributing measures. Due to COVID-19, the program team advised CBOs to conduct contactless distributions. Some CBOs dropped measures off directly at customers' homes. Other CBOs had already modified their typical operations to reduce customer contact (e.g., drive-through food distributions) and thus distributed measures consistent with these protocols.
- Measure installation: CBOs arrange for the installation of energy-saving measures in the homes of qualified customers. CBOs can install LED bulbs, energy efficiency kits, smart thermostats, and room air conditioners at no out-of-pocket expense to the participant. Larger energy-saving measures including refrigerators, CACs, fan blower motors, heat pump water heaters, ASHPs, and ductless ASHPs are also eligible for installation, but CBOs must procure the equipment through traditional means and apply for a reimbursement after the installation.[65] Notably, Ameren Missouri restricted program staff from entering occupied residences due to COVID-19. As such, Franklin Energy authorized contractors or CBOs to install measures in unoccupied homes only.

[65] CBOs can pair the Grant reimbursement with incentives from the HVAC and Efficient Products programs. In these cases, Ameren Missouri does not claim the savings through the SFIE Program and instead claims them under the applicable other program.

10.1.1 Participation Summary

The program team treated 1,605 participants through the Single Family channel in PY2020. Overall, the Single Family channel accounted for 24% of program ex ante savings. The Grant channel accounted for the remaining 76% of program ex ante savings. Participating CBOs installed or distributed 318,379 measures, which accounted for 93% of the total measures provided to customers through the SFIE Program.

Table 100 presents participation in the SFIE Program during PY2020 by channel.

Table 100. PY2020 SFIE Program Participation Summary

Channel	Participants		Measures		Ex Ante Savings	
	Number	%	Number	%	MWh	%
Single Family	1,605[a]	100%	25,895[b]	7%	2,310	24%
Grant			318,379	93%	7,165	76%
Total	**1,605**	**100%**	**344,274**	**100%**	**9,475**	**100%**

Note: CBOs that distribute measures through the Grant Channel do not track individual participants.

[a] Includes 32 participants with zero ex ante savings. These participants only received health and safety and gas-only measures for which the program does not claim savings.

[b] Includes 6,750 health and safety and gas-only measures with zero ex ante savings.

Table 101 presents PY2020 participation in the Grant channel by organization. Cool Down St. Louis, Energycare Inc., and Community Action Agency of St. Louis County also participated in PY2019.

Table 101. PY2020 Grant Participation by Organization

Organization	Measures		Ex Ante Savings	
	Number	%	MWh	%
Urban League of Metro St. Louis	168,048	53%	3,549	50%
St. Louis Area Foodbank	71,136	22%	1,502	21%
Buchanan Foundation	29,245	9%	849	12%
Ameren Missouri[a]	18,762	6%	446	6%
People's Community Action Corporation – North City Office	14,724	5%	341	5%
Stafford Foundation	2,400	1%	51	1%
Food Outreach Inc.	2,016	1%	43	1%
East Missouri Action Agency	2,016	1%	43	1%
CareSTL Health	1,532	1%	42	1%
St. Vincent de Paul Food Pantry	1,532	1%	42	1%
Ozark Food Pantry	1,366	<1%	34	<1%
Peace Pantry	1,202	<1%	28	<1%
Cool Down St. Louis	1,000	<1%	77	1%
Respond AI	1,000	<1%	37	1%
Energycare Inc.	980	<1%	45	1%
Northeast Community Action Center	886	<1%	24	<1%
Circle of Light Associates	432	<1%	9	<1%
KingsVille Neighborhood Association	120	<1%	3	<1%

Organization	Measures		Ex Ante Savings	
	Number	%	MWh	%
Community Action Agency of St. Louis County	2	<1%	<1	<1%
Total	**318,379**	**100%**	**7,165**	**100%**

[a] Ameren Missouri distributed measures to local fire departments, police departments, and community governments. These organizations then distributed measures to income eligible customers.

10.1.2 Key Impact Results

Table 102 presents the annual savings achieved in PY2020. As shown, the program (including all distribution channels) achieved 84% of Ameren Missouri's net energy savings goal and 104% of the net demand savings goal for the SFIE Program.

Table 102. PY2020 SFIE Program Impact Summary

	Ex Ante Gross	Realization Rate	Ex Post Gross	NTGR	Ex Post Net	Goal/Target Net	% of Goal/Target
First Year Savings							
Energy Savings (MWh)	9,475	92%	8,748	100%	8,748	10,415	84%
Demand Savings (MW)	2.67	91%	2.43	100%	2.43	2.34	104%
Last Year Demand Savings							
< 10 EUL (MW)	0.95	102%	0.96	100%	0.96	0.57	170%
10–14 EUL (MW)	0.32	87%	0.28	100%	0.28	0.08	362%
15+ EUL (MW)	1.12	92%	1.04	100%	1.04	1.65	63%

The primary performance metric for the SFIE Program is the average percent energy savings per participating property in the Single Family channel. This performance metric is meant to encourage the pursuit of deeper savings per property and to provide a holistic assessment of the program's impact. The program team has a goal of achieving an average 10% energy savings per property across the channel. Table 103 summarizes the key inputs to calculating the average percent energy savings according to 2019–21 MEEIA Energy Efficiency Plan guidance.[66] We calculated average percent energy savings per property as total ex post energy savings from the Single Family channel divided by the total billed energy consumption at the 1,605 participating properties. Ex post savings—which are based on engineering approaches documented in the Ameren Missouri TRM along with some project-specific data—equate to 16% of the recorded baseline energy use.

Table 103. PY2020 SFIE Program Average Percent Energy Savings Per Property

Metric	Value
Ex post gross energy savings (kWh) [A]	1,903,293
Total billed pre-participation energy consumption (kWh) [B]	12,011,576
Average percent energy savings per property [A/B]	16%

Overall, the SFIE Program was the largest program in the PY2020 low-income portfolio, accounting for 70% of ex post net low-income portfolio energy savings and 80% of ex post net low-income portfolio demand savings.

10.1.3 Key Process Findings

[66] 2019–21 MEEIA Energy Efficiency Plan, p. 53.

Key process findings for the PY2020 SFIE Program include:

- **The Grant channel was critical to meeting customer needs in PY2020. The difficulties faced by many communicates throughout Ameren Missouri's service territory in PY2020, lead to an increase in the demand for CBOs services.** This phenomenon, along with an increase in the investment in the Grant channel, allowed the program team to reach far more customers through measure distribution events. The program team improved many of the Grant channel processes in PY2020, including launching a portal which allowed CBOs to order measures online as opposed to contacting Franklin Energy directly and expanding QA/QC protocols for deeper savings measures provided through the Grant channel (e.g., smart thermostats, room air conditioners).
- **The program team successfully adapted their outreach strategy to drive participation through housing authorities with many properties, rather than direct customer outreach.** As a result, the program more than tripled the number of customers treated through the Single Family channel in PY2020 (1,605) when compared to PY2019 (487). None of the participating organizations had mobile homes in their portfolio of properties; however, and as such, the program team did not treat any mobile home customers in PY2020. While the change in outreach strategy was necessary to drive the participation needed to hit program goals, the program team was unable to reach this key market segment.

Overall, the program is well-designed to overcome most of the primary market imperfections in the single family income eligible market. To meet the requirements of the Missouri CSR[67] for demand-side process evaluations, we provide responses to the five required process evaluation questions in Table 104.

Table 104. 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 either through Ameren Missouri programs or outside of them. Market imperfections include ▪ the high upfront cost of energy-efficient products relative to household capital and available credit, even when accounting for 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 occupants of single family housing who live 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. Additionally, the program's typical community-driven channels each target a specific housing stock subsegment (single family and mobile homes). This helps to target community and measure selection, as well as audits and measure installation assumptions. But the program team should consider that the program is set up to serve one type of housing at a time. Implementation experience shows many neighborhoods have mixed housing stock (including single family, small multifamily, and mobile homes). Notably, Ameren Missouri gained approval through the 11-step stakeholder process to change program eligibility to

[67] See note 8 above.

CSR Required Process Evaluations Questions	Findings
	allow the program team to serve attached dwellings of four or fewer units in addition to detached homes and duplexes. In future years, when the program team can return to the original program design, this change will help the program serve a larger share of homes per neighborhood.
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?	Opinion Dynamics' recent baseline study of residential Ameren Missouri customers shows that income eligible households tend to have lower-efficiency products in their home compared to their non-income eligible counterparts, including efficient lighting. These results are consistent with findings from around the United States. The program's mix of enduse measures appropriately reflects these needs. 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. Additionally, the program cross-promotes opportunities for additional savings through the Ameren Missouri HVAC Program. However, the program team had to adjust the measure offerings for PY2020 due to COVID-19. The program team made an effort to cover as many enduses as possible in the revised offering. Vacant properties received the full suite of measures, while occupied residences received lighting, domestic hot water, and HVAC measures.
Are the communication channels and delivery mechanisms appropriate for the target market segment?	The program team's typical communication and delivery channels are appropriate to the target market segment. Staff use a variety of community-centric approaches to promote the program, including through community groups and mobile home park owners; conducting direct outreach to residents through neighborhood canvassing; holding meet-and-greet events with community leaders in popular community gathering places like restaurants; and working with Ameren Missouri to identify community non-profits serving income eligible areas who 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. In PY2020, the program team adapted their approach due to COVID-19. The program team targeted housing organizations with large portfolios of properties rather than contacting customers directly. This streamlined outreach strategy allowed the program team to treat many more properties in PY2020 compared to PY2019. However, the program did not reach any mobile home residents through this approach. Notably, program delivery was also limited in terms of the measures implemented at each property. For the Grant channel, the program is targeting CBOs that are prepared to distribute and install energy efficiency measures outside of the Single Family channel. However, most of the measures distributed or installed through this channel in PY2020 went through CBOs in and around St. Louis. Notably, the share of measures delivered through St. Louis-based CBOs decreased from PY2019 to PY2020 (from 99% to 75%) and the number of participating CBOs in the channel increased from 6 to 19. This indicates the program team is expanding the reach of the channel and providing access to more customers outside of the St. Louis metropolitan area. The program team should continue to focus on CBO recruitment in 2021 with the goals of expanding the number of actively participating CBOs, enrolling CBOs specifically prepared to complete eligible direct installation (such as more Community Action Agencies), and enrolling CBOs serving rural communities.
What can be done to more effectively overcome the identified market imperfections and to	The program team can increase the rate of customer acceptance by continuing to expand the network of participating CBOs in the Grant channel. This channel offers the opportunity to engage with many Ameren Missouri customers across the service territory. The

CSR Required Process Evaluations Questions	Findings
increase the rate of customer acceptance and implementation for select enduses/measure groups included in the Program?	distribution and installation arms of the channel offer opportunities for participants to install measures across a range of enduses. Per our recommendation in the PY2019 evaluation, once the program returns to its original design, the program team may consider methods to achieving more savings per community by overcoming split incentives in single family rental housing (to serve more homes) and should continue to validate the match between measure eligibility criteria by carefully observing on-the-ground housing stock (to provide more savings per home).

10.1.4 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:** Though PY2020 presented unique challenges for program administration and implementation, the program team successfully adapted the program design to address the health risks of COVID-19. Despite the shortened program year and having to implement a continuously changing program design, the program team achieved 84% of their net MWh goal and 104% of their net MW goal. Additionally, households that participated in the Single Family channel saved 16% of their baseline usage on average after participating in the program.
  - Recommendation #1: While the evaluation team acknowledges that these design changes were necessary, we recommend re-visiting program budgets and updating them to reflect the current design if these changes are expected to persist.
- **Conclusion #2:** The Grant channel is a viable option for expanding the influence of the SFIE Program and reaching customers in the target market beyond the Single Family channel.
  - Recommendation #2a: The program team should continue to develop this channel in 2021 with the goals of expanding the number of actively participating CBOs, enrolling CBOs specifically prepared to complete eligible direct installation (such as more Community Action Agencies), and enrolling CBOs serving rural communities.
  - Recommendation 2b: While the program team made strides to improve data collection and QA/QC processes, staff should continue to improve in these areas beyond PY2020. The program team implemented expanded data collection efforts for in-home installations in PY2020, however, the information was captured in PDF documents and photographs, and often lacked sufficient detail to be used in ex post savings calculations. If the Grant channel continues to be a major component of the SFIE Program, these additional data will aid in program planning and improving the accuracy of savings estimation.
- **Conclusion #3:** The ex post gross savings are 92.3% of the ex ante gross energy savings and 91.0% of the ex ante gross demand savings (Table 102), indicating that the tracked ex ante savings slight overstate the program's energy and demand savings. The discrepancy between ex ante and ex post savings is driven by two issues: (1) The ex ante savings are based on Ameren Missouri TRM Appendix F (v3.1), dated March 2020, and the ex post savings are based on the more recent Appendix F (v4.0), dated October 2020; and (2) ex ante savings did not incorporate project-specific data when available, instead relying on Appendix F deemed savings values for all measures.

- Recommendation #3a: To minimize discrepancies between ex ante and ex post savings, work to incorporate as many TRM updates as possible (e.g., adjustments based on evaluation results or prior year participation data) early in the program year, and incorporate those adjustments into the program-tracking database and ex ante savings calculations.
- Recommendation #3b: Update ex ante savings algorithms to use actual tracked parameter values (such as equipment capacities and efficiencies) to calculate ex ante savings wherever possible. At a minimum, ensure the Appendix F measure reference IDs assigned to measures accurately represent the other information collected for that record, including housing type, delivery method (direct install or kit), and existing equipment and fuel type.

10.2 Evaluation Methodology

The evaluation team focused PY2020 evaluation efforts on impact evaluation activities to assess the performance of the SFIE Program. In addition to the overarching research objectives outlined for the Low-Income Portfolio, the evaluation team explored the following program-specific objectives:

- Obtain information on program design and planned implementation with a focus on differences from PY2019;
- Understand program staff and implementer perceptions, experiences, and expected program impacts;
- Estimate the first year ex post gross average percent energy (kWh) savings per property that participated in the Single Family channel; and
- Estimate the first year ex post net energy (kWh) and demand (kW) savings, and last year demand savings.

Table 105 provides an overview of the SFIE evaluation activities.

Table 105. PY2020 Evaluation Activities for the SFIE Program

Evaluation Activity	Description
Program Manager and Implementer Interviews	▪ Conducted interviews in the Fall of PY2020 to understand program staff's perspective on program performance.
Program Material Review	▪ Reviewed available program materials to inform evaluation activities.
Tracking System Review	▪ Reviewed the tracking system to ensure the implementer was collecting the data required to support evaluation efforts.
Engineering Analysis	▪ Verified that ex ante savings used correct TRM values and algorithms. ▪ Estimated overall and measure-level ex post gross impacts using TRM algorithms, deemed savings assumptions, program-tracking data, and PY2019 evaluation-estimated parameters.

10.3 Evaluation Results

10.3.1 Process Results: Single Family Channel

We present findings related to the Single Family channel in the following sections.

Performance

The program team effectively adapted the channel design to deliver energy-saving measures to income-eligible customers amid COVID-19. Restrictions against treating occupied residences drastically reduced the number of energy assessments and associated deep energy retrofits the program team could complete. Most participants received an abbreviated treatment consisting of an HVAC system tune-up, exterior lighting replacements, and energy efficiency kit containing LEDs, faucet aerators, an efficient showerhead, a dirty filter alarm, advanced power strips, and pipe insulation. To deliver on program savings and spending goals, the program team partnered with housing organizations to continue to attract participants without leveraging the full suite of outreach strategies typically employed through the program's neighborhood canvassing approach. Unfortunately, none of the participating organizations had mobile home properties in their portfolios, so the program team was unable to treat customers in this segment in PY2020. However, the mix of shorter treatment times per household due to reduced offerings and an established participant pipeline allowed the program team to reach more customers than would have been possible through the traditional design. Table 106 includes a summary of Single Family channel activity by measure. Notably, the Single Family and Mobile Homes channels reached 487 participants in PY2019. In PY2020, the program team treated 1,605 customers.

Table 106. PY2020 Single Family Activity by Measure

Measure	Number of Participants	Percent of Unique Participants (N=1,605)
Filter alarm	1,424	89%
Faucet aerator	1,419	88%
LEDs	1,398	87%
Tune-up	1,396	87%
Low-flow showerhead	1,388	86%
Pipe insulation	1,334	83%
Advanced tier 2 power strips	1,234	77%
Advanced thermostat	250	16%
Central air conditioner	185	12%
ECM auto fan	56	3%
Programmable thermostat	36	2%
Refrigerator	35	2%
Air Sealing	29	2%
Air source heat pump	22	1%
Ceiling insulation	21	1%
Room air conditioner	12	1%
Duct insulation	1	<1%

Design Changes

At the start of PY2020, the program teams implemented the Single Family channel as originally designed. As previously noted, however, the program team drastically modified the design of the Single Family channel in March 2020 due to COVID-19. Implementation crews spent much of the first quarter of the year completing follow-up work for PY2019 participants, including HVAC system replacements, building shell improvements, refrigerator replacements, smart thermostat installations, etc. The program team also selected the next wave

of communities to target through the neighborhood-canvass implementation approach—including communities in Moberly, Brookfield, St. Louis City, and St. Louis County—and began developing relationships with CBOs and key community members in these areas. In March, the program team sent out its first wave of customer mailers. Shortly after, however, Ameren Missouri paused all channel activity due to COVID-19.

During this pause in activity, the program team paused all implementation and worked collaboratively with Ameren Missouri to develop a re-entry strategy (e.g., timeline, approach, participation forecasts). Notably, the program team continued its outreach to CBOs under the assumption the channel would eventually resume activity under the existing implementation strategy. In late May, however, Ameren Missouri leadership communicated to the program team that implementation crews were restricted from entering occupied residences through the end of PY2020. Leadership also presented a two-pronged approach for re-entering the field:

- **Contactless tune-up and energy efficiency kit offering**: The implementation team would visit homes to conduct contactless CAC and ASHP tune-ups on exterior units, replace inefficient exterior lighting with LEDs, and leave behind an energy efficiency kit containing four LEDs, two faucet aerators (bathroom and kitchen), one low-flow showerhead, one dirty filter alarm, one advanced Tier 2 power strip, and pipe insulation. The kits would also include installation instructions, educational materials, and cross-promotional collateral for other Ameren Missouri programs.
- **Traditional delivery at vacant properties**: The implementation team would identify temporarily vacant properties (e.g., tenant turnover) and treat the properties consistent with the comprehensive design delivered in PY2019, including energy assessments, direct installation of energy-saving measures, and follow-up installations of deeper savings measures (e.g., building shell, HVAC).

In early June 2020, Ameren Missouri presented the revised channel design to the Missouri Public Service Commission (PSC) and gained approval to amend their original MEEA filing. Program goals remained unchanged, but the program team received authorization to alter the customer recruitment strategy from direct customer outreach to leveraging relationships with income eligible housing organizations; allowing the team to coordinate with a handful of housing organizations rather than thousands of customers. Additionally, the program team combined the Single Family and Mobile Homes channels into a single channel.

On July 1, 2020, the Single Family channel officially resumed activity. The program team began recruiting housing organizations in the same communities they planned to target through the neighborhood-canvassing approach. The program team asked interested organizations to submit a list of their eligible properties (i.e., income-eligible, four-units or less). The team then mapped out an implementation schedule and sent the housing organizations collateral to distribute to tenants notifying them of a three-day period in which a contractor would stop by to tune up HVAC systems, replace inefficient exterior lighting, and drop off energy-saving measures. The program team also worked with organizations to schedule energy assessments at properties the organizations expected to turnover during the year.

As the cooling season ended, the program team altered their approach in an attempt to capitalize on other potential savings opportunities. Based on a precedent set in the MFIE Program, the team proposed offering participants a $100 relocation incentive to vacate their property so implementation crews could conduct in-home work. The program team proposed using the data collected on participant HVAC systems during the tune-up visits to identify systems eligible for replacement (10 SEER or less). The team partnered with three housing organizations they had worked with during the tune-up offering to deliver this new implementation phase: the St. Louis City Housing Authority, Beyond Housing in the City and County of St. Louis, and Brookfield Village—a rural, all electric community. Ameren Missouri approved the proposal in the beginning of August 2020, and implementation crews completed the first system replacements at the end of September 2020.

Customers in St. Louis City and County received new CACs and smart thermostats. Customers with Spire or Ameren Missouri natural gas also received a furnace clean-and-check and, if eligible, an efficient ECM fan motor was installed on their existing furnace. All the Brookfield Village residents had existing ASHPs, so implementation crews replaced these systems and installed smart thermostats.

Implementation Challenges

Although the program team successfully met several performance goals for the channel, the sudden overhaul of the channel design resulted in several implementation challenges. Implementing the revised design required considerable effort on the part of the program team, none of which was originally included in the PY2020 scope of work or budget. Program staff also struggled to administer the co-delivery portion of the program because of the channel modifications. The co-delivery offering does not include an incentive for energy efficiency kits; therefore, the program team could not claim any therm savings from the kits or count any of the incentive spend toward co-delivery budgets.

The revised implementation approach also made it challenging to satisfy performance requirements. The restrictions against in-home work made it difficult for the program team to implement the comprehensive projects and deep energy saving measures central to the channel's design. Most participants received a reduced treatment including a tune-up, exterior lighting replacements, and energy efficiency kit. Therefore, PY2020 per participant savings were much smaller than originally forecasted, which presented some challenges to achieving the 12.5% savings per home target. Additionally, the modified program design resulted in a significantly lower incentive spend per participant. This meant the program team had to recruit significantly greater participation than was originally planned to hit budget spend goals.

10.3.2 Process Results: Grant Channel

We present findings related to the Grant channel in the following sections.

Performance

The difficulties faced by many communicates throughout Ameren Missouri's service territory in PY2020, led to an increase in the demand for CBOs services. This phenomenon, along with an increase in the investment in the Grant channel, allowed the program team to reach far more customers through measure distribution events. The program team distributed 318,379 measures in PY2020, compared with 23,871 measures distributed in PY2019. Additionally, the program team increased the number of CBOs it engaged through the channel. In PY2019, six CBOs participated in the channel. In PY2020, 19 CBOs participated. Similar to PY2019, most of the participating CBOs in PY2020 were St. Louis-based. However, the program team did expand their footprint into suburban and rural communities. Table 107 includes a summary of the CBOs that participated in the channel in PY2020. Due to the increased activity, the implementation team exceeded their initial budget spend target and received approval from Ameren Missouri to spend additional resources on this delivery channel.

Table 107. Participating Organizations in the Grant Channel

Organization	City	Measures
Urban League of Metro St. Louis	St. Louis	168,048
St. Louis Area Foodbank	Bridgeton	71,136
Buchanan Foundation	St. Louis	29,245
Ameren Missouri[a]	St. Louis	18,762
People's Community Action Corporation – North City Office	St. Louis	14,724
Stafford Foundation	Maryland Heights	2,400
Food Outreach Inc.	St. Louis	2,016
East Missouri Action Agency	Park Hills	2,016
CareSTL Health	St. Louis	1,532
St. Vincent de Paul Food Pantry	Dardenne Prairie	1,532
Ozark Food Pantry	Festus	1,366
Peace Pantry	Cedar Hill	1,202
Cool Down St. Louis	St. Louis	1,000
Respond AI	St. Louis	1,000
Energycare Inc.	St. Louis	980
Northeast Community Action Center	Bowling Green	886
Circle of Light Associates	St. Louis	432
KingsVille Neighborhood Association	St. Louis	120
Community Action Agency of St. Louis County	Overland	2

[a] Ameren Missouri distributed measures to local fire departments, police departments, and community governments. These organizations then distributed measures to income eligible customers.

Implementation Challenges and Design Changes

Despite the success of the channel, the program team experienced several challenges throughout PY2020 which led to channel design changes. First, due to health risks from COVID-19, Ameren Missouri restricted CBO staff from entering participant homes. This resulted in very few in-home installations of deeper savings measures like smart thermostats and refrigerators. The program team added room air conditioners to the list of eligible distribution measures which helped get these measures to more customers; however, the program team had to rely on customer installations. To try and ensure these installations occurred, the program team generated an agreement form which customers signed stating they would install the measure in their home. Additionally, due to the COVID-19 restrictions, program staff could not conduct QA/QC activities at distribution events. Notably, many CBOs employed contactless distributions, either by dropping measures off at people's homes or conducting drive-through events where they placed measures in people's trunks. Some CBOs struggled to participate in the channel because they did not have enough space to store measures. Due to high customer needs from COVID-19, all space had to be saved for dedicated assistance activities (e.g., food). In some cases, rather than shipping measures to major hubs with limited space (e.g., a large food bank that services local food banks), the program team shipped measures and collateral directly to smaller distribution sites.

The program team also experienced several challenges that did not result from COVID-19; primarily related to QA/QC. First, the program team identified two instances where participants tried to resell room air conditioners through online marketplaces. In both cases, the program team contacted the distributing CBOs who contacted the customer to remove the posting. As a result, the program team updated QA/QC protocols for larger, more

expensive measures, including room air conditioners and smart thermostats. The team added stickers with unique identifiers to each unit and updated reporting forms so participating CBOs could record the identifier for each unit they distributed or installed.[68] During QA/QC calls,[69] representatives asked customers to read the identifier off the back of the unit to confirm the equipment was present and operating in their home. Notably, the program team identified cases where CBOs made errors recording the identifiers, which led to challenges with these verification activities. Lastly, the program team identified a case where one CBO mistakenly distributed measures to customers outside the service territory. As a result, the program team developed and conducted trainings on best practices for distributing measures and answered any questions CBOs had about program processes. The trainings also included reminders on new procedures, particularly related to ordering measures and properly reporting information back to Franklin Energy. The program team plans to continue delivering these trainings moving forward.

10.3.3 Gross Impact Results

Measure-Level In-Service Rates

In-service rates indicate the percentage of program measures that are installed and in use and vary based on measure type and distribution approach. For example, HVAC equipment is likely to be installed and in use, while an LED bulb may remain on a participant's shelf rather than in use. For Direct Install distribution methods, ISRs are typically close to 100% because a qualified program contractor directly installed the measure at the participant location.

Conversely, a "giveaway" distribution approach—such as those used in the Grant channel—will tend to have a lower ISRs because the participant may not install the collected item for various reasons. The evaluation team leveraged PY2019 participant survey responses to calculate ISRs for LEDs (100%), advanced power strips (95%), showerheads (94%), and aerators (89%) that were installed through the Single Family channel. For LED, aerator, and showerhead measures distributed through the Grant channel "giveaway" methods, we applied the ISRs used for similar measures distributed through the RAR Program. All other ISRs were taken from the TRM. Note that the TRM algorithms for some measures do not include an ISR term and thus implicitly deem the ISR at 100%. We present all ISRs used for the PY2020 evaluation as part of our Detailed Impact Analysis Methodology for the SFIE Program (Appendix A). We applied the ISR values to each measure in the ex post analysis to calculate the PY2020 gross savings.

Gross Impact Results

As presented in Table 108, the PY2020 SFIE Program achieved 8,748 MWh and 2.43 MW in ex post gross savings, resulting in 92.3% and 91.0% realization rates, respectively.

Table 108. PY2020 SFIE Gross Impact Summary

	Ex Ante	Realization Rate	Ex Post
First Year Savings			
Energy Savings (MWh)	9,475	92.3%	8,748
Demand Savings (MW)	2.67	91.0%	2.43

[68] Reporting for the distribution of LEDs and energy efficiency kits was not changed. CBOs only recorded identifiers and customer information for room air conditioner distributions and in-home installations.
[69] The program team conducted QA/QC calls with 10% of customers that received larger measures (i.e., measures other than energy efficiency kits or packs of LEDs).

	Ex Ante	Realization Rate	Ex Post
Last Year Demand Savings			
< 10 EUL (MW)	0.95	101.6%	0.96
10–14 EUL (MW)	0.32	86.8%	0.28
15+ EUL (MW)	1.12	92.3%	1.04

Table 109 shows the ex ante, ex post, and gross realization rates for first year electric energy and demand savings, by measure. Although the realization rates range from a low of 14% (for duct insulation) up to 228% (for air sealing), most measure categories contribute a small percentage of overall program savings and do not significantly impact the overall program realization rate. Lighting (71%) and tune-up (9%) measures contributed the majority (80%) of program ex ante energy savings, with gross realization rates of 94.7% and 100.0%, respectively. CAC (4%), ASHP (3%), and low-flow showerhead (3%) measures were the next largest contributors to ex ante energy savings. Low-flow faucet aerators, dirty filter alarms, Tier 2 advanced power strips, and room air conditioners each contributed 2% to ex ante program savings, with the rest of the program measures combined contributing the remaining 2%.

Table 109. PY2020 SFIE Annual First Year Gross Impacts

Measure Category	Energy Savings			Demand Savings		
	Ex Ante (MWh)	Realization Rate	Ex Post (MWh)	Ex Ante (MW)	Realization Rate	Ex Post (MW)
Lighting	6,764	94.7%	6,405	1.01	94.7%	0.96
Tune-Up	856	100.0%	856	0.79	100.0%	0.79
Dirty Filter Alarm	208	141.8%	294	0.10	141.8%	0.14
Central Air Conditioner	348	62.5%	217	0.33	62.5%	0.21
Tier 2 Advanced Power Strip	201	95.0%	191	0.02	95.0%	0.02
Room Air Conditioner	165	97.6%	161	0.16	97.6%	0.15
Air Source Heat Pump	274	57.3%	157	0.04	44.7%	0.02
Low-Flow Showerhead	255	58.7%	150	0.05	25.6%	0.01
Learning Thermostat	103	111.2%	114	0.08	115.5%	0.09
Low-Flow Faucet Aerator	189	52.5%	99	0.06	15.8%	0.01
ECM Auto Fan	33	116.1%	38	0.02	116.1%	0.02
Pipe Insulation	37	64.2%	23	0.00	64.2%	0.00
Refrigerator	20	100.0%	20	0.00	100.0%	0.00
Setback Thermostat	17	70.1%	12	0.01	60.8%	0.01
Air Sealing	3	227.6%	6	0.00	227.8%	0.00
Ceiling Insulation	3	104.3%	4	0.00	104.6%	0.00
Duct Insulation	0	14.3%	0	0.00	14.3%	0.00
Total	**9,475**	**92.3%**	**8,748**	**2.67**	**91.0%**	**2.43**

Table 110 presents the total PY2020 last year ex ante and ex post electric demand savings and realization rates by measure by EUL class. The total ex post gross last year demand savings are 95.2% of the ex ante gross last year demand savings. Lighting (42%) and tune-up (33%) measures contributed the majority (75%) of the program's ex ante last year gross demand savings, followed by room air conditioner (7%), dirty filter alarm (4%), CAC (4%), and learning thermostat (3%) measures. Low-flow showerhead and low-flow faucet

aerator measures contributed 2% each to ex ante demand savings, with the remaining nine measures each contributing 1% or less to ex ante gross demand savings.

Table 110. PY2020 SFIE Annual Last Year Gross Demand Impacts

Measure Category	Ex Ante (MW)				Realization Rate	Ex Post (MW)			
	<10	10–14	15+	Total		<10	10–14	15+	Total
Lighting	0.00	0.00	1.00	1.00	95.1%	0.00	0.00	0.96	0.96
Tune-Up	0.79	0.00	0.00	0.79	100.0%	0.79	0.00	0.00	0.79
Room Air Conditioner	0.16	0.00	0.00	0.16	97.6%	0.15	0.00	0.00	0.15
Dirty Filter Alarm	0.00	0.10	0.00	0.10	141.8%	0.00	0.14	0.00	0.14
Learning Thermostat	0.00	0.08	0.00	0.08	115.5%	0.00	0.09	0.00	0.09
Central Air Conditioner	0.00	0.00	0.09	0.09	78.6%	0.00	0.00	0.07	0.07
Tier 2 Advanced Power Strip	0.00	0.02	0.00	0.02	95.0%	0.00	0.02	0.00	0.02
ECM Auto Fan	0.00	0.00	0.02	0.02	116.1%	0.02	0.00	0.00	0.02
Low-Flow Showerhead	0.00	0.05	0.00	0.05	25.6%	0.00	0.01	0.00	0.01
Low-Flow Faucet Aerator	0.00	0.06	0.00	0.06	15.8%	0.00	0.01	0.00	0.01
Setback Thermostat	0.00	0.01	0.00	0.01	60.8%	0.00	0.01	0.00	0.01
Air Source Heat Pump	0.00	0.00	0.01	0.01	67.0%	0.00	0.00	0.01	0.01
Air Sealing	0.00	0.00	0.00	0.00	113.9%	0.00	0.00	0.00	0.00
Pipe Insulation	0.00	0.00	0.00	0.00	64.2%	0.00	0.00	0.00	0.00
Ceiling Insulation	0.00	0.00	0.00	0.00	52.3%	0.00	0.00	0.00	0.00
Refrigerator	0.00	0.00	0.00	0.00	100.0%	0.00	0.00	0.00	0.00
Duct Insulation	0.00	0.00	0.00	0.00	7.1%	0.00	0.00	0.00	0.00
Total	**0.95**	**0.32**	**1.12**	**2.40**	**95.2%**	**0.96**	**0.28**	**1.04**	**2.28**

Overall, the 2020 SFIE Program achieved 92.3% and 91.0% gross realization rates for first year electric energy and electric demand, respectively. Discrepancies between ex ante saving and ex post savings are primarily driven by parameter values updated in the most recent TRM (v 4.0, updated October 2020), and the use of participant-specific information, where available, in ex post calculations instead of TRM default values.

We describe the key drivers of differences between ex ante and ex post savings for measures that contributed at least 1% of ex ante savings below.

- **Lighting:** The gross realization rate for lighting is 94.7% for electric energy and demand savings.
  - Ex ante applied deemed default savings values from Appendix F (v3.1) for all measures, by measure reference ID. Although ex ante correctly applied Appendix F (v3.1) values, the evaluation team adjusted the ISRs to account for the program's changes to the delivery methods, necessitated by COVID-19. The ex ante and Appendix F ISRs were based on the delivery channel: 98.18% for direct-install measures through the neighborhoods channel and 90% for the measures delivered through the Grant channel. Since the program adjustments for contactless program delivery involved delivering many measures that would normally be direct-installed as kits, the ex post analysis applied ISRs by distribution method, based on PY2019 evaluation research (100% for direct install or 87.95% for kits). Additionally, the evaluation team applied the SFIE-specific

leakage rate (0%) to all measures. This is the primary driver of lower ex post gross energy and demand savings.

  - Four records have a negative savings and positive quantity, or positive savings and negative quantity, in the tracking database. Ex ante savings for these four records would sum to zero based on quantity and measure code, but ex ante applies Appendix F savings for the wrong measure code for one of these records. This discrepancy had a negligible impact on the realization rate for lighting measures.

- **Dirty Filter Alarm:** The gross realization rate for dirty filter alarms is 141.8% for electric energy and demand savings.
  - Ex ante applies defaults from Appendix F (v3.1) for all measures, based on measure reference ID. The ex post analysis applied the income eligible-specific ISR (57.89%) to all measures, per the updated Appendix F (v4.0) defaults for SFIE direct install and kits channels. This raised ex post savings, driving all discrepancy between ex ante and ex post.
- **Central Air Conditioner:** The gross realization rate for CACs is 62.5% for electric energy and demand savings.
  - Ex ante applies deemed default savings values from Appendix F (v3.1) for all measures and does not incorporate any tracked project-specific information such as the equipment capacity and efficiency. The evaluation team applied actual existing SEER values from the program-tracking database. In cases where a participant did not receive a tune-up on the existing equipment earlier in the year, the evaluation team de-rated the tracked existing SEER value by the age of the existing equipment, or otherwise by a default of 12 years, to account for the degradation of the performance of the existing equipment over time. When the participant did receive a tune-up on the existing equipment earlier in the year, the evaluation team applied the tracked existing nameplate SEER to ex post calculations, with no de-rating. On average, the existing SEER value applied to ex post calculations was higher than the default value provided in Appendix F, resulting in lower ex post savings and driving discrepancies between ex ante and ex post.
  - Ex ante assumes all measures are for single family homes. Ex post applied actual building type data (single family or multifamily) to determine appropriate capacity assumptions for all measures, contributing to decreased ex post savings.
- **Tier 2 Advanced Power Strip:** The gross realization rate for power strips is 95.0% for electric energy and demand savings.
  - Appendix F (v4.0) updated the ISR for SFIE power strips to 95%. While ex ante correctly applied Appendix F (v3.1), the evaluation team relied on inputs from the most recent version (v4.0) driving all discrepancy between ex ante and ex post savings.
- **Room Air Conditioner:** The gross realization rate for room air conditioners is 97.6% for electric energy and demand savings.
  - While ex ante correctly applied Appendix F (v3.1), the Appendix F algorithm does not incorporate the deemed SFIE ISR value (97.6%). The evaluation team applied the deemed ISR to all measures, driving all discrepancy between ex ante and ex post savings.
- **Air Source Heat Pump:** The gross realization rate for ASHPs is 57.3% for electric energy and 44.7% for electric demand savings.

- Ex ante assumes all measures are for single family homes. Ex post applies actual building type data to determine appropriate household factor parameter assumptions (100% for single family and 65% for multifamily households). As 91% of records have a multifamily building type in the program-tracking data, this is the primary contributor to lower ex post savings. Treating all records as single family raises the gross electric energy realization rate to 84%.
- Ex ante applies deemed default savings values from Appendix F (v3.1) for all ASHP measures. The evaluation team applied actual existing SEER values from the program-tracking database. In cases where a participant did not receive a tune-up on the existing equipment earlier in the year, the evaluation team de-rated the tracked existing SEER value by the age of the existing equipment, or otherwise by a default of 12 years, to account for the degradation of the performance of the existing equipment over time. When the participant did receive a tune-up on the existing equipment earlier in the year, the evaluation team applied the tracked existing nameplate SEER to ex post calculations, with no de-rating. On average, the existing SEER value applied to ex post calculations was higher than the default value provided in Appendix F, contributing to lower ex post savings.

- **Low-Flow Showerhead:** The gross realization rate for low-flow showerheads is 58.7% for electric energy savings and 25.6% for electric demand savings.
  - The October 2020 Appendix F update included new measure codes specific to SFIE kit showerheads. While ex ante correctly applied the school kits deemed savings from an older version of Appendix F (v3.1), the evaluation team relied on SFIE kit-specific inputs from the most recent version (v4.0). This is the largest source of discrepancy between ex ante and ex post savings.
  - For demand savings, one large Grant channel record (Quantity = 289) applied the deemed value for the parameter EPGelectric from Appendix F (v3.1), instead of the deemed value for demand savings, resulting in a demand realization rate of 4.2% for that record. This is the driver of the lower demand realization rate compared to the energy realization rate.
- **Learning Thermostat:** The gross realization rate for learning thermostats is 111.2% for electric energy and 115.5% for electric demand savings.
  - Ex post applied actual household type, existing equipment type, heating fuel type, and SEER efficiency values from the program-tracking database when available, whereas ex ante applied defaults from Appendix F (v3.1). This is the driver of all discrepancy between ex ante and ex post savings.
- **Low-Flow Faucet Aerator:** The gross realization rate for low-flow faucet aerators is 52.5% for electric energy and 15.8% for electric demand savings.
  - The October 2020 Appendix F update included new measure codes specific to SFIE kit aerators. While ex ante correctly applied the school kits deemed savings from an older version of Appendix F (v3.1), the evaluation team relied on SFIE kit-specific inputs from the most recent version (v4.0). This is the largest source of discrepancy between ex ante and ex post savings.
  - For demand savings, two large Grant channel records (Quantity = 289 each) applied the deemed value for the parameter EPGelectric from Appendix F (v3.1), instead of the deemed value for demand savings, resulting in demand realization rates of 1.3% and 2.8% for those records. This is the driver of the lower demand realization rate compared to the energy realization rate.

10.3.4 Net Impact Results

Because the SFIE Program falls under the umbrella of income eligible programs, we applied a default NTGR of 1.0, assuming that both FR and SO are zero. As such, net impacts for the SFIE Program are equal to the gross impacts presented in the section above.

11. Multifamily Income Eligible (MFIE)

This section presents the PY2020 evaluation summary, methodology, and results for the MFIE Program. Additional details on the methodology are presented in Appendix A.

11.1 Evaluation Summary

The MFIE Program, known to customers as the CommunitySavers Multifamily Program, is designed to deliver long-term energy savings and bill reduction opportunities to income eligible Ameren Missouri customers living in multifamily properties. The target market for the program includes property owners and managers of multifamily properties with three or more units, and high populations of low-income residents. Approved participants must meet one of the following income requirements:

- Reside in a federal, state, or local subsidized housing property and fall within that program's income guidelines;
- Reside in non-subsidized housing and provide proof of income levels at or below 80% of area median income (AMI); or
- 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 non-qualifying tenants can qualify the entire property if at least 50% of the tenants meet the income-eligibility requirements.

Consistent with the delivery approach for the MFMR Program, the MFIE Program provides a one-stop-shop approach to assist property owners and managers in overcoming barriers to completing comprehensive retrofits. As part of this one-stop-shop approach, ICAST, the program implementer, offers a suite of concierge-style services to assist participants in identifying and executing energy efficiency projects. ICAST Energy Advisors spearhead customer recruitment, assist with the application process, conduct energy assessments, recommend custom project scopes, estimate incentives, and assist participants in coordinating installations. Customers can contract the installation work to outside vendors, or they can work with ICAST's operations team. For projects that are limited to direct-install measures, ICAST has a group of subcontractors who complete the work. ICAST staff also conduct post-installation QA/QC activities, submit final project data to Franklin Energy for invoicing, and provide customers with their rebate at the conclusion of the project.

As part of the one-stop-shop approach to promote deeper savings, ICAST also implements a custom—rather than prescriptive—approach to recommending upgrades, calculating ex ante site savings, and providing customer incentives. In this approach, ICAST calculates all measure savings and incentives against site-specific baselines. Eligible measures include lighting, HVAC, building shell, domestic hot water, and refrigeration measures.

Franklin Energy administers the program and leads the development of marketing collateral (in collaboration with Ameren Missouri and ICAST), provides engineering oversight, and processes incentive payments. Franklin Energy also facilitates communication between Ameren Missouri and program implementation teams. In this role, Franklin Energy holds regular status updates with Ameren Missouri and is responsible for providing reports on program activity and forecasts of future activity.

Notably, Ameren Missouri halted program activity in March 2020 due to the COVID-19 pandemic. Implementation resumed in June, but the program design was altered to limit health risks for program staff and participants. These changes included prohibiting work in occupied units, providing a relocation incentive

to tenants, and offering virtual energy assessments and inspections (see Program Implementation Challenges and Changes Section). However, the program team still achieved 3,243 MWh of net electric savings in PY2020, accounting for 26% of the Income Eligible Portfolio energy savings.

11.1.1 Participation Summary

In PY2020, the program treated 692 premises across 15 unique properties. These projects resulted in the installations of 11,004 energy-efficient measures (Table 111).

Table 111. PY2020 Multifamily Income Eligible Program Participation Summary

Enduse	Unique Premises		Measures		Ex Ante Savings	
	Number	%	Number	%	MWh	%
Ductless Air Conditioner	232	34%	249	2%	1,376	42%
HeatCool	505	73%	567	5%	751	23%
Water Heating RES	472	68%	1,494	14%	324	10%
Lighting BUS	170	25%	2,236	20%	247	8%
Building Shell RES	55	8%	1,511	14%	225	7%
EXT Lighting BUS	7	1%	274	2%	140	4%
Lighting RES	569	82%	4,534	41%	114	4%
Refrigeration RES	93	13%	93	1%	60	2%
Tune-Up	35	5%	36	0%	22	1%
Cooling RES	10	1%	10	0%	1	0%
Total	**692**	**100%**	**11,004**	**100%**	**3,260**	**100%**

11.1.2 Key Impact Results

Table 112 presents annual savings achieved in PY2020. The ex post savings are 99% and 100% of the ex ante savings for energy and peak demand, respectively. As shown, the program achieved 197% of Ameren Missouri's net first year energy savings goal but fell short compared to first and last year demand savings goals and targets.

Table 112. PY2020 Multifamily Income Eligible Program Impact Summary

	Ex Ante Gross	Realization Rate	Ex Post Gross	NTGR	Ex Post Net	Goal/Target Net	% of Goal/Target
First Year Savings							
Energy Savings (MWh)	3,260	99%	3,243	100%	3,243	1,650	197%
Demand Savings (MW)	0.50	100%	0.49	100%	0.49	0.73	68%
Last Year Demand Savings							
< 10 EUL (MW)	0.06	100%	0.06	100%	0.06	-	-
10-14 EUL (MW)	0.10	99%	0.10	100%	0.10	-	-
15+ EUL (MW)	0.34	100%	0.34	100%	0.34	0.73	47%

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 to provide a holistic assessment of the program's impact. The program team has a goal of achieving an average

15% energy savings per property across the channel. Table 113 summarizes the key inputs to calculating the average percent energy savings according to 2019–21 MEEIA Energy Efficiency Plan guidance. We calculated average percent energy savings per property as total ex post energy savings divided by the total billed energy consumption at participating properties. Ex post savings—which are based on engineering approaches using the Ameren Missouri TRM—equate to 30% of the recorded baseline energy use. These results are driven by increased savings across many of the measure categories compared to PY2019 and indicate that despite challenges to program implementation in PY2020, the program team was successful in delivering comprehensive projects to participants.

Table 113. PY2020 Multifamily Income Eligible Program Average Percent Energy Savings Per Property

Metric	Value
Ex post gross energy savings (kWh) [A]	3,220,595
Total billed pre-participation energy consumption (kWh) [B]	10,572,895
Average percent energy savings per property [A/B]	30%

11.1.3 Key Process Findings

The PY2020 evaluation did not include an in-depth assessment of MFIE program processes. Findings from interviews with program staff, as well as information from the program-tracking database, however, helped inform the process evaluation requirements for Ameren Missouri's MFIE program.[70] Below, we summarize key findings from these activities following which Table 114 summarizes responses to the five CSR process evaluation questions.

Key process findings from the PY2020 MFIE Program include:

- **As echoed in the MFMR Program evaluation, the COVID-19 pandemic presented significant challenges to the program's model for delivering comprehensive projects.** The program team demonstrated resilience and responsiveness to the circumstances, however, and adapted the program design to continue reaching customers by providing relocation incentives to participants to temporarily vacate their premise, as well as deploying virtual assessments and verification processes. Additionally, outside of the COVID-19 response, the team designed a new offering for gut rehabilitation projects to help address a growing trend in the multifamily market whereby existing non-residential properties are being converted to residential use by developers.
- **The current ICAST one-stop-shop program design aligns with the majority of the best practices for one-stop-shop multifamily programs including:** (1) offering a single point of contact (SPOC) for project development and technical assistance, (2) a streamlined application process with assistance from a SPOC, (3) comprehensive energy assessments to identify upgrade opportunities, (4) coordination of rebates, (5) assistance with identifying qualified contractors and soliciting, evaluating, and selecting bids, (6) coordination of installations, and (7) QA/QC inspections of each project. This model positions the program well to be able to effectively overcome barriers to participation and market imperfections for this portion of the multifamily segment.
- **The program team made changes to the program's incentive structure in PY2020 to encourage the installation of energy saving measures with long EULs (e.g., 15+ years).** In particular, the team simplified the incentive structure by removing a third tier available in PY2019 to cover HVAC-only

[70] See note 8 above.

projects, as well as a bundled rate which allowed participants to receive a higher rebate on measures included in a project with HVAC installations.

- **Current protocols that allow trade allies to deliver the program (both MFIE and MFMR) with nearly full autonomy complicate the program team's ability to manage the project pipeline and incentive budget.** Within the context of the MFIE Program, there are more touchpoints between the implementation team and trade allies given that energy assessments are required and conducted by ICAST. The autonomy of trade allies and their customers to determine project scope and timeline after the energy assessment is complete, however, limits the implementation team's visibility into these potential projects and their status.

Table 114. 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?	Market imperfections specific to the multifamily sector include (1) the split incentive[a] for in-unit measures between property owners, managers, and residents, (2) awareness of 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 tracking data indicates that 7 of the 15 properties treated through the program received both tenant and common area upgrades. While COVID-19 impacted the range of projects that could be completed in PY2020, in future years the program team could increase the comprehensiveness of solutions offered to the target market segment by encouraging greater participation in the one-stop-shop channel.
Are the communication channels and delivery mechanisms appropriate for the target market segment?	The program uses a mix of communication channels including traditional channels such as e-mail blasts and distribution of collateral at industry events. The primary recruitment channel used is ICAST's existing relationships with larger property ownership and management companies. The program also leverages more tailored outreach to smaller scale property owners. 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?	As noted in PY2019, 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. The other market imperfections outlined above are largely targeted by the program's one-stop-shop model. As such, increasing participation and/or the share of projects in the program utilizing those services should help to more effectively overcome imperfections such as lack of awareness and information, project costs, limited staff knowledge, and the time needed to plan 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] http://www.cbei.psu.edu/split-incentives-and-green-leases/index.html

11.1.4 Conclusions and Recommendations

Based on the results of this evaluation, the evaluation team offers key conclusions and recommendations for the MFIE Program moving forward. For a more detailed explanation, please see the Gross Impact Results section.

- **Conclusion #1:** Although the implementation team has made significant improvements in the program-tracking database since PY2019, the evaluation team identified several data errors in the PY2020 data (e.g., incorrect tracked wattages and EULs). The evaluation team was able to resolve most of these issues through discussions and additional data requests to the implementation team.
  - Recommendation #1: Continue to improve data transcription and transfer methods and develop QA/QC data checks to improve completeness and accuracy of data incorporated into the program-tracking database.
- **Conclusion #2:** Detailed project data, including algorithms and inputs used to estimate energy and demand savings, are stored in project-specific files ("Rebate Approval Forms"), and only some of the key project and savings data are incorporated in the program-tracking database. Incorporating more key project and savings data into the database will improve the ability to track program activity and improve the efficiency of evaluation and other quality control measures.
  - Recommendation #2: For measures with standard methods for estimating energy savings (e.g., lighting, appliances, thermostats), perform a data review to identify and incorporate key parameters from the Rebate Approval Forms (RAFs) to include in the tracking database (e.g., kWhBase and kWhNew for refrigerators, which are included on the RAFs, but not in the database).
- **Conclusion #3:** Unlike other Ameren Missouri residential programs, which estimate energy and demand savings according to the methods and assumptions described in the Ameren Missouri TRM, the MFIE program implementer uses a "custom" approach to estimate energy savings and deploys a mix of methods referencing different versions of the Ameren Missouri TRM, other regional TRMs, assumptions based on data from past projects, project-specific data, and other customized savings estimation methods.
  - Recommendation #3: To improve the transparency of ex ante savings calculations, especially for new measures, provide documentation of the savings estimation methods and any key parameter assumptions used to estimate savings, including associated sources and/or justification when project-specific data or other customized methods are not available or used.
- **Conclusion #4:** Most discrepancies between ex ante and ex post savings are due to the ex post application of ISR values from Appendix F. The ex ante savings estimates do not include ISR values due to program implementation methods that include installation inspections.
  - Recommendation #4: As part of the TRM update process, review and consider updating the Appendix F ISR values for the MFMR program to reflect most recently available data and recent changes to the program design.

11.2 Evaluation Methodology

The PY2020 evaluation was mostly limited to impact evaluation activities to assess the performance of the MFIE Program. However, the evaluation team documented some process-related insights through interviews with program staff. The evaluation team explored the following MFIE Program objectives:

- Obtain information on program design and planned implementation with a focus on differences from PY2019;
- Understand program staff and implementer perceptions, experiences, and expected program impacts;
- Estimate the first year ex post gross average percent energy (kWh) savings per participating property; and
- Estimate the first year ex post gross and net energy (kWh) and demand (kW) savings.

Table 115 provides an overview of the MFIE Program evaluation activities.

Table 115. PY2020 Evaluation Activities for the Multifamily Income Eligible Program

Evaluation Activity	Description
Program Manager and Implementer Interviews	▪ Conducted interviews in the Fall of PY2020 to understand program staff's perspective on program performance.
Program Material Review	▪ Reviewed program materials to inform evaluation activities.
Tracking System Review	▪ Reviewed implementer's tracking system to ensure that data required for the evaluation are being collected.
Database Review	▪ Reviewed program database to check that program data were complete.
Engineering Analysis	▪ Verified the methods, data inputs, and assumptions used to develop the ex ante savings and made evaluation adjustments to address accuracy of the calculations, gaps in data, and use of project-specific data. ▪ Developed ex post savings using appropriate engineering algorithms, site-specific parameters, other verified assumptions, and relevant evaluated parameters from the Ameren Missouri TRM.
Net Impact Analysis	▪ Estimated PY2020 net impacts.

11.3 Evaluation Results

11.3.1 Process Results

The MFIE Program is designed 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. To achieve this result, the program design includes various participation pathways, associated market actors, and points of intervention to meet customer's needs. Given the complexity and nuance of program delivery, the evaluation team's process reporting focuses on assessing how MFIE customers are treated by the program from the implementation perspective.

This section begins with a detailed summary of the program design and the challenges presented by the various participation pathways and is followed by a discussion of the challenges the program team experienced implementing the program and the changes the team made to the design to addresses these challenges.

Program Design Summary

As mentioned in the Evaluation Summary, Franklin Energy is the program administrator for the MFIE Program and ICAST leads program implementation. The two organizations work together to execute Ameren Missouri's goal for the program, which is to deliver long-term energy savings and bill reductions to income eligible customers in multifamily properties. The program team executes this vision by identifying and recruiting owners, operators, managers, and developers of multifamily properties with high populations of income eligible customers for participation in the program within the framework of a one-stop-shop program model.

It is important to note that COVID-19 spurred adjustments to the program design. Following the suspension of program activity in March 2020, Ameren Missouri developed safety protocols for implementation teams to follow once program activity resumed, including restrictions against conducting work in occupied residences. For the MFIE Program, this meant the implementation team could no longer conduct work in occupied tenant units. This presented barriers to driving comprehensive projects because many of the measures that drive deeper savings are installed in tenant units. Typically, ICAST pairs direct-install measures, which have short payback periods, with deeper measures (e.g., HVAC, building shell) with longer payback periods to drive more expansive project scopes. As discussed in more detail below, given these constraints, the program team negotiated changes to the implementation contract which allowed the implementation team to use program funding to pay customers a relocation incentive to temporarily vacate their premise while implementation crews installed measures. This innovation allowed the program team to complete more in-unit work and deliver more of the comprehensive projects the program is designed to target.

Outreach and Recruitment

ICAST leads recruitment efforts and leverages several strategies to drive participation in the program. The primary mode of recruitment is leveraging regional and national relationships with property ownership and management groups to identify organizations with properties in Ameren Missouri's service territory and educating them about the program. Once these customers participate and become comfortable with the program, ICAST focuses on turning these large customers into repeat participants, with the goal of treating their entire portfolio of properties in the service territory. Additionally, ICAST utilizes traditional forms of outreach to generate more local awareness of the program, including e-mail blasts and distribution of collateral at industry association events. Franklin Energy assists with these efforts by developing any collateral that ICAST requests. Finally, ICAST executes a one-on-one outreach approach with smaller scale property owners to educate them on the program and the benefits of participation. This segment of property owners is particularly important to reach when attempting to treat income eligible customers. Overall, each form of outreach is designed to reach a different segment of the market and ICAST refines their outreach strategy throughout the year based on the types of projects or customers they need to target to hit the program's performance goals.

Participating contractors in Ameren Missouri's Trade Ally network can also channel participants through the program. Oftentimes, project management staff at multifamily properties have close relationships with local vendors who they consistently enlist to help with energy-related projects. In these cases, the contractor may already be aware of the MFIE Program and take on the duties of enrolling the property in the program and coordinating with program staff. The contractor will also typically play a key role in developing the project

scope. These projects require less involvement from program staff, but as a result, are also difficult for program staff to anticipate and plan for.

Project Development and Execution

As displayed in Figure 14, the role of program staff varies between projects completed through the one-stop-shop pathway and those completed through trade allies. Unlike the MFMR Program, all participants in the MFIE Program are required to receive a complete energy assessment. The Energy Advisor, acting as an Ameren Missouri representative, walks the property with the customer and collects detailed information on the existing equipment. The custom nature of the program's energy saving calculations requires more detailed data collection than a prescriptive program. As such, Energy Advisors spend more time onsite and photograph as much of the existing equipment as possible to document information on nameplates and record serial numbers. The Energy Advisors will also gather documentation to verify the property meets the program's income criteria.[71] In addition to data collection, the Energy Advisors focus on building a relationship with the customer; taking time to understand the customer's needs, what they are hoping to achieve through the program, and any constraints (e.g., budget, time, etc.) that exist to the project. The Energy Advisors also seek to create buy-in from key staff like maintenance managers and property managers. Engaging with these key staff and demonstrating expertise is critical to program success because the final decision-maker often asks these staff for input on whether to move forward with a project.

[71] This verification of eligibility sometimes occurs prior to the energy assessment.

Figure 14. Primary Participation Pathways Through the Multifamily Income Eligible Program

One-Stop-Shop Pathway

- **Eligibility Verification**: ICAST Energy Advisors use census tract data, rent subsidation information, or documentation submitted for other income-eligible programs to verify the property satisfies the program's income criteria.
- **Energy Assessment**: ICAST Energy Advisor walks the property and collects information on existing equipment and customer goals for project.
- **Project scoping**: Energy Advisor uses information from energy assessment to recommend eligible upgrades and develop a project scope that best addresses the customer's needs.
- **Project approval**: ICAST submits proposed scope, equipment specifications, and estimated energy savings to Franklin Energy for approval.
- **Measure installation**: Depending on the participant's preference, ICAST either installs the equipment or assists the participant with soliciting and reviewing bids from installation contatractors and selecting a winner.
- **Post-installation verification:** ICAST either conducts onsite verification activites or collects photo or video, documentation to verify proper installation.
- **Rebate payment:** Approved and processed by Franklin Energy.

Trade Ally Pathway

- **Eligibility Verification**: ICAST Energy Advisors use census tract data, rent subsidation information, or documentation submitted for other income-eligible programs to verify the property satisfies the program's income criteria.
- **Energy Assessment**: ICAST Energy Advisor walks the property and collects information on existing equipment and customer goals for project.
- **Project scoping:** Trade ally or customer develops project scope.
- **Project approval:** Trade ally or customer provides necessary project documentation to ICAST, who reviews and passes on to Franklin Energy for approval.
- **Measure installation:** Trade ally coordinates the installations or property maintenance staff install equipment.
- **Post-installation verification**: ICAST either conducts onsite verificaiton activites or collects photo or video, documentation to verify proper installation.
- **Rebate payment:** Approved and processed by Franklin Energy.

The Energy Advisors use the information collected onsite to develop a suite of recommended upgrades. A primary goal of the program is to drive comprehensive projects, and as such, the Energy Advisor provides the customer with the full list of upgrades they are eligible to receive. However, the Energy Advisor will focus discussions on specific areas of interest mentioned by the customer to understand underlying motivations and identify opportunities to expand the project scope and provide maximum value to the customer. Tailoring the program to provide the most value to the customer is a key tactic in driving repeat participation.

If the customer is interested in moving forward with some or all the recommendations, ICAST submits a rebate approval form on the customer's behalf to Franklin Energy. The submission includes measure-level energy savings calculations based on the existing equipment and proposed efficient installations. The Franklin Energy engineering team reviews the calculations, provides any feedback, and approves the project scope. Upon approval, ICAST generates an enrollment form for the customer which earmarks part of the program incentive budget for the project. Once the project is approved, the customer is free to solicit bids for the work and select vendors to install the equipment, or they can work with ICAST to perform the installations.

Conversely, for trade ally projects, the involvement of program staff often diminishes following the energy assessment. The Energy Advisors use the information collected onsite to develop upgrade recommendations, however, the trade allies often play a key role in delivering the results of the assessment to the customer and developing the project scope. It is common for trade ally projects to originate based on a specific customer need and for the scope of the projects to remain focused on that need. While trade allies can utilize program

staff throughout the implementation process, they can also deliver the program with nearly 100% autonomy, following the assessment. The trade allies will often take ownership over the project scoping process and manage communications with program staff to gain project approval and ensure the customer receives the incentive.

The ability of trade allies to deliver the program autonomously presents challenges for the program team, particularly ICAST, because they do not have control over the scope and timing of many of the projects that come through the program. While ICAST has effectively accommodated this aspect of the program design, the lack of control presents challenges to delivering on program goals, specifically when incentives are diverted to these projects and away from projects ICAST is forecasting. ICAST performs regular forecasting throughout the year to track toward their performance goals and earmark budgets for certain projects in their pipeline. When unexpected trade ally projects come through the program, it disrupts forecasting and can divert budgets toward less comprehensive projects. This makes it difficult to accurately forecast program performance and chart a course toward compliance. Additionally, trade ally projects are often limited in scope, which works counter to the stated program goal of driving comprehensive projects and impacts the percent of site savings performance requirements of the program, which ICAST is responsible for achieving.

QA/QC Activities

Regardless of the participation pathway, ICAST staff perform post-installation QA/QC activities. ICAST typically has a site manager present onsite to perform real-time inspections of equipment as it is installed. The site manager moves through the property with installation crews, documenting installations and verifying the equipment is installed properly. This strategy ensures every job receives an inspection and final data are accurate. It also has customer service benefits because it eliminates the need to disrupt property managers and tenants a second time upon completion of the project. Program staff also accept photo and video documentation to satisfy post-installation inspection activities; commonly utilized on trade ally projects.

Project Closeout

After the installation and verification activities are complete, ICAST submits the final project information to Franklin Energy through an API for invoicing. The API automates the data transfer process, as well as the energy savings calculations used to calculate the final incentive amount. The program team has experienced issues with the API submissions so both ICAST and Franklin Energy QA/QC the API output before the invoice is moved to the batching process. Once both parties have reviewed and approved the data, the invoice moves through Franklin Energy's batching process where the incentives are approved and paid to ICAST. Ultimately, the incentive is passed on to the customer.

Program Implementation Challenges and Changes

The program team made several changes to program design and delivery in PY2020 in response to their experience in PY2019, as well as the COVID-19 pandemic. Figure 15 summarizes the challenges and associated changes made by the program team to better serve participants, improve program performance, and respond to the COVID-19 pandemic.

Figure 15. Summary of Implementation Challenges and Changes

Challenges	Changes
Lack of installation of measures with 15+ EULs in 2019: The program team sought to encourage these installations by offering a bundled incentive rate, which allowed customers implementing projects including HVAC measures, to qualify their entire project at a higher incentive rate. However, many customers found that they received a larger overall incentive when they qualified each piece of equipment through the applicable tier, rather than qualifying the full project at the bundled rate.	**Revised Incentive Structure**: The program team simplified the incentive structure by eliminating tier III (for HVAC-only projects) and bundled incentive rates. The full 2020 rebate structure is as follows: • **Tier I** (40c/kWh): Any measure • **Tier II** (60c/kWh): HVAC only
Data Transfer: Misalignment between Franklin Energy and ICAST data tracking systems led to data quality issues in 2019. The static nature of data transfer processes also resulted project approval delays in 2019.	**API System**: The program team deployed an API system in 2020 which automated the data transfer process and savings calculations. Through development of the API, Franklin Energy and ICAST made significant progress in aligning and integrating their tracking systems. This process reduced data quality issues and ensured both parties used the same data.
Co-delivery: In 2019, the program team could not install natural gas saving measures. This limited opportunities to deliver comprehensive project scopes to Spire and Ameren Missouri natural gas customers.	**Co-delivery**: In 2020, program obtained approval to add a co-delivery component to the program which allowed the implementation team to include gas-saving measures in proposed work scopes for Spire and Ameren Missouri natural gas customers.
COVID-19: Ameren Missouri developed safety protocols for implementation teams to follow when program activity resumed, including restricting any work in occupied residences.	**Relocation incentive**: The program team implemented a "relocation incentive" which provided tenants $100 a day for up to two days to leave the premise while program staff installed their equipment. **Virtual assessments and verification**: Program staff sought other ways to limit contact with customers, including allowing participants to submit photo, video, and paper documentation to satisfy requirements.
Change of Use Properties: The program team identified a growing trend in the multifamily sector in which developers convert manufacturing facilities, old schoolhouses, and other building types into condominiums and apartment buildings. The existing MFIE program design was not constructed to treat these types of properties and program staff struggled to provide value to these customers.	**Developed "Gut Rehabilitation" Offering**: In the middle of PY2020, the program team developed a new offering to treat "change of use" properties more effectively. The offering leverages the same incentive structure and documentation processes as the rest of the MFIE Program but quantifies savings using a TRM-based savings approach, comparing the proposed efficient project scope against a baseline defined by the local code requirements for each piece of equipment. The program team did not complete any Gut Rehabilitation projects in 2020 but expects to see activity in 2021.

11.3.2 Gross Impact Results

As presented in Table 116, the PY2020 MFIE program achieved 3,243 MWh and 0.49 MW in ex post gross savings, representing energy and demand savings realization rates greater than 99%.

Table 116. PY2020 Multifamily Income Eligible Gross Impact Summary

	Ex Ante Gross	Gross Realization Rate	Ex Post Gross
First Year Savings			
Energy Savings (MWh)	3,260	99%	3,243
Demand Savings (MW)	0.50	100%	0.49
Last Year Demand Savings			
< 10 EUL (MW)	0.06	100%	0.06
10–14 EUL (MW)	0.10	99%	0.10
15+ EUL (MW)	0.34	100%	0.34

The evaluation team completed analysis on the following program measures: air conditioner tune-ups (AC TuneUp); common area lighting (Lighting BUS), in-unit lighting (Lighting RES), and exterior lighting (EXT Lighting BUS) upgrades; ASHPs; advanced and programmable thermostats (HeatCool); bathroom and kitchen faucet aerators and showerheads (Water Heating Res); ductless minisplit heat pumps (Ductless AC); refrigerators (Refrigerator); windows (Building Shell RES), and custom projects (Cooling RES). The remainder of this section summarizes the evaluation team's ex post analysis. All calculation methodology, parameters, and assumptions are detailed in this section and sourced in Appendix A.

Table 117 summarizes the total PY2020 MFIE Program ex ante and ex post energy savings and realization rates by enduse.

Table 117. PY2020 Multifamily Income Eligible Annual First Year Gross Impacts

Enduse	Energy Savings			Demand Savings		
	Ex Ante (MWh)	Realization Rate	Ex Post (MWh)	Ex Ante (MW)	Realization Rate	Ex Post (MW)
Ductless AC	1,376	100%	1,372	0.20	100%	0.20
HeatCool	751	100%	751	0.11	100%	0.11
Water Heating RES	324	96%	311	0.03	96%	0.03
Lighting BUS	247	101%	248	0.05	101%	0.05
Building Shell RES	225	100%	225	0.07	100%	0.07
EXT Lighting BUS	140	100%	140	0.00	84%	0.00
Lighting RES	114	98%	112	0.02	96%	0.02
Refrigeration RES	60	100%	60	0.01	100%	0.01
Tune-Up	22	100%	22	0.02	100%	0.02
Cooling RES	1	100%	1	0.00	100%	0.00
Total	**3,260**	**99%**	**3,243**	**0.495**	**100%**	**0.49**

Table 118 summarizes the MFIE Program's total PY2020 last year ex ante and ex post electric demand savings and realization rates by enduse and EUL class.

Table 118. PY2020 Multifamily Income Eligible Annual Last Year Gross Demand Impacts

Enduse	Ex Ante (MW)				Realization Rate	Ex Post (MW)			
	<10	10-14	15+	Total		<10	10-14	15+	Total
Ductless AC	0.00	0.00	0.20	0.20	100%	0.00	0.00	0.20	0.20
HeatCool	0.00	0.07	0.04	0.11	100%	0.00	0.07	0.04	0.11
Building Shell RES	0.00	0.00	0.07	0.07	100%	0.00	0.00	0.07	0.07
Lighting BUS	0.04	0.01	0.00	0.05	101%	0.03	0.00	0.01	0.05
Water Heating RES	0.00	0.03	0.00	0.03	96%	0.00	0.03	0.00	0.03
Tune-Up	0.02	0.00	0.00	0.02	100%	0.02	0.00	0.00	0.02
Lighting RES	0.00	0.00	0.02	0.02	96%	0.00	0.00	0.02	0.02
Refrigeration RES	0.00	0.00	0.01	0.01	100%	0.00	0.00	0.01	0.01
EXT Lighting BUS	0.00	0.00	0.00	0.00	84%	0.00	0.00	0.00	0.00
Cooling RES	0.00	0.00	0.00	0.00	100%	0.00	0.00	0.00	0.00
Total	**0.06**	**0.10**	**0.33**	**0.50**	**100%**	**0.06**	**0.10**	**0.34**	**0.49**

Table 119 summarizes the MFIE Program's total PY2020 last year ex ante and ex post electric energy and demand savings and realization rates by measure category.

Table 119. PY2020 Multifamily Income Eligible Electric Energy and Demand Savings by Measure Category

Measure Category	Quantity	Energy Savings			Demand Savings		
		Ex Ante (MWh)	Gross Realization Rate	Ex Post (MWh)	Ex Ante (MW)	Gross Realization Rate	Ex Post (MW)
Ductless Mini-Split Heat Pump	249	1,376	100%	1,372	0.20	100%	0.20
Air Source Heat Pump	42	370	100%	370	0.04	100%	0.04
Advanced Thermostat	494	377	100%	377	0.06	100%	0.06
Business Lighting	2236	247	101%	248	0.05	101%	0.05
Windows	1511	225	100%	225	0.07	100%	0.07
Low-Flow Showerhead	532	229	96%	221	0.02	96%	0.02
Exterior Business Lighting	274	140	100%	140	0.00	84%	0.00
In-Unit Lighting	4534	114	98%	112	0.02	96%	0.02
Low-Flow Faucet Aerator	962	95	95%	90	0.01	95%	0.01
Refrigerator	93	60	100%	60	0.01	100%	0.01
Air Conditioner Tune-Up	36	22	100%	22	0.02	100%	0.02
Programmable Thermostat	31	4	100%	4	0.00	100%	0.00
Custom HVAC	10	1	100%	1	0.00	100%	0.00
Total	**11,004**	**3,260**	**99%**	**3,243**	**0.50**	**100%**	**0.49**

The gross realization rates of 99% for electric energy savings and 100% for demand savings indicate the evaluated (ex post) gross savings achieved by the program are similar to the total tracked ex ante savings.

Discrepancies between ex ante savings and ex post savings stem from one source: deviations from Appendix F (v4.0) default ISR.[72] Because custom values from the rebate approval forms were applied in addition to the tracking database for most measures, the evaluation team could not always recreate ex ante parameter assumptions and identify all differences between ex ante and ex post.

The following list highlights the largest contributors to differences between ex ante and ex post savings on a measure-level basis:

- **Lighting RES:** The gross realization rate for residential lighting was 98% for energy savings and 96% for demand savings.
  - The reduced energy and demand savings for residential lighting measures were caused by the evaluation team's application of Appendix F (v4.0) default ISR (98.18%). Ex ante applied an ISR of 100% for all records.
  - The evaluation team was unable to recreate ex ante savings for 22 records (1.2%) using parameter values from the rebate approval forms provided by the implementer. For these records, the evaluation team applied Appendix F (v4.0) defaults and tracking database.
- **Lighting BUS:** The gross realization rate for business lighting was 101% for energy and demand savings.
  - The evaluation team was unable to recreate ex ante savings for one record (0.4%) with a quantity of 22 using parameter values from the rebate approval forms provided by the implementer. The evaluation team applied Appendix F (v4.0) defaults and tracking database for this record.
- **EXT Lighting BUS:** The gross realization rate for external business lighting was 100% for energy and 84% for demand savings.
  - The reduced demand savings were a result of ex ante applying an incorrect coincidence factor (CF) for one record (11.1%). Although this was an exterior lighting measure, ex ante applied the "Lighting BUS" CF value for interior common area lighting. The evaluation team applied the "EXT Lighting BUS" CF value for exterior lighting.
- **Low-Flow Showerhead:** The gross realization rate for low-flow showerheads was 96% for energy and demand savings.
  - The reduced energy and demand savings for low-flow showerheads was caused by the evaluation team's application of Appendix F (v4.0) default ISR (96.4%). Ex ante applied an ISR of 100% for all records.
- **Low-Flow Faucet Aerator:** The gross realization rate for low flow faucet aerators was 95% for energy and demand savings.
  - The reduced energy and demand savings for low flow showerheads was caused by the evaluation team's application of Appendix F (v4.0) default ISR (95%). Ex ante applied an ISR of 100% for all records.

[72] While not a significant contributor to discrepancies between ex ante and ex post savings, the evaluation team noted contradictions between the TRM measure descriptions and space type fields in the tracking data for lighting measures. In some cases, this presented challenges to determining the appropriate enduse designation and corresponding coincidence factors to use in savings calculations.

11.3.3 Net Impact Results

Because the MFIE Program falls under the umbrella of Income Eligible programs, we applied a default NTGR of 1.0, assuming that both FR and SO are zero. As such, net impacts for the MFIE Program are equal to the gross impacts presented in the section above.

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