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Ameren Missouri Program Year 2022 Annual EM&V Report

Volume 3: Business Portfolio Report

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1. Executive Summary

This volume presents the evaluation results of the Ameren Missouri PY2022 portfolio of business energy efficiency programs as described in Ameren Missouri's 2019–2021 Missouri Energy Efficiency Investment Act (MEEIA) Energy Efficiency Plan and the subsequent *Unanimous Stipulation and Agreement Regarding the Implementation of Certain MEEIA Programs Through Plan Year 2022* (Stipulation PY2022). Results for the Residential Portfolio and the Demand Response Portfolio are provided in separate volumes.

The following programs comprise the Business Portfolio:

- Standard Incentive Program
- Custom Incentive Program[1]
- Small Business Direct Install (SBDI) Program
- Retro-Commissioning (RCx) Program

In addition to these four programs, this volume also includes the Business Social Services (BSS) Program.[2] Collectively, the five programs are referred to as the "business programs" or the "BizSavers® Programs."

The following sections present overarching key evaluation findings for the business programs. Per the Stipulation PY2022, this evaluation focused on the assessment of gross impacts, with no process work and forthcoming net-to-gross (NTG) work, for potential prospective application, limited to the Standard and Custom Programs. The remainder of this volume is organized as follows:

- Chapter 2 presents the general evaluation approach for the business programs, including overarching evaluation objectives and an overview of the PY2022 evaluation activities and methodologies.
- Chapters 3–7 present evaluation results for the five BizSavers Programs.

The Appendix to Volume 3 contains additional detail on the methodology used in the Standard gross impact analysis as well as project-level summaries of our desk reviews and onsite visits, by program.

1.1 Portfolio Impact Results

The PY2022 Business Portfolio (not including the BSS Program) achieved 124,535 MWh of first year ex post gross energy savings and 38.78 MW of first year ex post gross demand savings, achieving 78% and 97%, respectively, of its goals (as outlined in the Stipulation PY2022). The savings-weighted portfolio-level gross realization rates (RRs) were 90.2% for energy savings and 85.3% for demand savings.

Table 1 summarizes first year annual gross savings for the Business Portfolio in PY2022.

[1] Includes new construction projects, which previously were completed through a stand-alone New Construction Program.

[2] While considered part of Ameren Missouri's low-income portfolio, the BSS Program is included in this volume because of implementation and evaluation similarities with the other business programs: (1) it is implemented by the same implementation contractor using similar program processes, and (2) it was evaluated using similar evaluation methods. As such, much of the overarching content in this volume is applicable to the BSS Program.

Table 1. PY2022 Business Portfolio Savings Summary

	Ex Ante Gross	Gross RR	Ex Post Gross	Goal Gross	% of Goal	NTGR [a]	Ex Post Net
Energy Savings (MWh)	138,112	90.2%	124,535	158,681	78%	82.5%	102,741
Demand Savings (MW)	45.47	85.3%	38.78	39.89	97%	82.5%	31.99

[a] In accordance with Stipulation PY2022, PY2022 NTGRs are deemed at 82.5% for the Business portfolio.

The Standard Program was the largest program in Ameren Missouri's PY2022 Business Portfolio, based on ex post gross energy savings, contributing 48% of first year ex post gross energy savings and 44% of first year ex post gross demand savings. The Standard Program exceeded its first year gross demand savings goal but fell just short of its energy savings goal. All other programs fell short of both energy and demand savings goals.

Portfolio-wide, the primary driver of low program-specific performance relative to gross savings goals was lack of participation. For all programs other than Standard and Custom (demand savings only), even gross ex ante savings are below goals (in some cases significantly), indicating that the shortfall was not primarily a result of low realization rates.

Table 2 summarizes annual gross savings for all programs in the PY2022 Business Portfolio.

Table 2. PY2022 Business Portfolio First Year Savings Summary by Program

Program	Ex Ante Gross	Gross RR	Ex Post Gross	Goal Gross	% of Goal	NTGR	Ex Post Net
First Year Energy Savings (MWh)							
Standard	61,344	97.6%	59,902	61,072	98%	82.5%	49,419
Custom	68,396	82.4%	56,375	77,722	73%	82.5%	46,509
SBDI	6,307	98.6%	6,216	11,777	53%	82.5%	5,128
RCx	2,066	98.8%	2,042	8,111	25%	82.5%	1,684
Total Business	**138,112**	**90.2%**	**124,535**	**158,681**	**78%**	**82.5%**	**102,741**
First Year Demand Savings (MW)							
Standard	16.63	103.7%	17.24	12.20	141%	82.5%	14.23
Custom	27.23	73.1%	19.92	22.60	88%	82.5%	16.43
SBDI	1.20	101.9%	1.22	2.12	58%	82.5%	1.01
RCx	0.41	96.7%	0.40	2.97	13%	82.5%	0.33
Total Business	**45.47**	**85.3%**	**38.78**	**39.89**	**97%**	**82.5%**	**31.99**

As noted above, this volume also includes the results of the BSS Program evaluation. Despite significant gains compared to PY2021, the BSS Program underperformed compared to goal in PY2022, achieving 47% of its first year gross energy savings goal and 38% of its first year gross demand savings goal. Table 3 summarizes annual gross savings for the BSS Program in PY2022.

Table 3. PY2022 BSS Program Savings Summary

	Ex Ante Gross	Gross RR	Ex Post Gross	Goal Gross	% of Goal	NTGR [a]	Ex Post Net
Energy Savings (MWh)	2,699	102.5%	2,767	5,918	47%	100%	2,767
Demand Savings (MW)	0.513	103.5%	0.531	1.39	38%	100%	0.531

[a] Per industry standard practice, we assume a NTGR of 100% for the Income Eligible portfolio.

1.2 CSR Process Evaluation Requirements

The PY2022 evaluation did not include an assessment of BizSavers Program processes. However, findings from the following research activities and data sources can help inform the process evaluation requirements for Ameren Missouri's BizSavers Program:[3]

- PY2022 evaluation activities, including a survey with Standard and Custom Program participants and an interview with BizSavers Program staff; and
- The PY2022 program-tracking database.

Table 4 summarizes responses to the five CSR process evaluation questions.

Table 4. PY2022 CSR Process Questions

CSR Required Process Evaluations Questions	Findings
What are the primary market imperfections that are common to the target market segment?	▪ Based on PY2019 research, the primary market barriers to adoption of energy-efficient equipment in the business sector are lack of awareness of energy saving opportunities and programs, the high cost of energy efficiency equipment, access to financing or capital, and uncertainty about expected bill savings. ▪ In PY2021, business customers experienced different barriers as a result of the COVID-19 pandemic, including material shortages and difficulty hiring or maintaining staff, although the impacts of these barriers on planned capital projects appear limited. In PY2022, the vast majority (92%) of surveyed Standard and Custom participants indicated material shortages had not caused capital project delays or cancellations during 2022.
Is the target market segment appropriately defined, or should it be further subdivided or merged with other market segments?	▪ Ameren Missouri's BizSavers portfolio serves businesses of varying sizes and sectors. The SBDI Program recognizes the unique challenges of small businesses although small businesses can still participate in the Standard or Custom programs if the offerings are a better match to customer needs. The current target audience for the SBDI Program is commercial electric customers that are classified as Small General Service Rate 2(M). This covers a wide range of market segments. The SBDI Program is generally serving the majority of the market segments existing in the General Service Rate 2(M), although participation has been concentrated in a few segments (55% of PY2022 projects were completed in the office and retail segments, compared to 58% in PY2021). Savings realized through this program have decreased over the PY2019–PY2021 program cycle, likely due, in part, to the COVID-19 pandemic, but have rebounded in PY2022. ▪ The SBDI Program appears to have been less successful in serving renters, a frequently underserved market segment, than in prior program years. According to program-tracking data, renters accounted for 21% of PY2022 SBDI Program participants, compared to 25% in PY2021, and 54% in PY2020. According to market research in support of Ameren Missouri's 2019 potential study, 36% of Ameren Missouri's population of business customers are renters. ▪ The BSS Program, introduced in 2019, serves nonprofit organizations that provide services to the low-income public. The program is small in scope, completing between 12 and 67 projects annually. Notably, the PY2022 BSS Program supported more projects (67) and achieved higher ex ante energy savings (2,699 MWh) than the prior three years combined. The BizSavers team expects this

[3] The Missouri Code of State Regulations (20 CSR 4240-22.070(8), formerly 4 CSR 240-22.070(8)), 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.

CSR Required Process Evaluations Questions	Findings
	program to grow in focus in PY2023. Still, given the historically small participation and targeted outreach strategy to date, insights into the reach of the program and appropriateness of market segmentation are still limited.
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?	▪ PY2019 evaluation research found that participants were relatively dissatisfied with the breadth of measure offerings. In some cases, participants and market partners were dissatisfied with the list of eligible measures; in other cases, they indicated low incentives rendered an officially eligible measure effectively ineligible. The most common suggestion was to add outdoor lighting to the list of available measures, which the program did for the Standard and SBDI Programs during PY2020, but then discontinued again for PY2021 and PY2022. ▪ In PY2019, the SBDI Program only provided incentives for lighting measures. For PY2020, the program added HVAC measures, increased incentive caps, and developed a simplified, stand-alone HVAC application form. Despite these changes, uptake of non-lighting measures in PY2020 was limited to 15 smart thermostats, accounting for 0.2% of program savings. There was no uptake of non-lighting measures in PY2021, and only a single non-lighting measure was incented in PY2022. ▪ While the BSS Program offers a range of measures across different technologies, the program was almost exclusively focused on lighting measures during the current program cycle. The PY2019 evaluation found that incentive levels for non-lighting equipment were insufficient to induce adoption in this market segment. While the program added a few new measures to the program in PY2020—including occupancy sensors, VFDs, and kitchen ventilation controls—incentive levels remained largely unchanged over the 3-year program cycle, save for the Business portfolio-wide increase to incentives implemented in September of 2022.
Are the communication channels and delivery mechanisms appropriate for the target market segment?	▪ According to market research in support of Ameren Missouri's 2019 potential study, awareness of Ameren Missouri BizSavers Programs is relatively low among the target market. Just over one-third of customers (36%) are aware of the programs offered. Medium and large businesses are much more likely to be aware of Ameren Missouri BizSavers Programs than small businesses (60% compared to 33%). These results suggest that additional communication or delivery of messages through alternative channels is needed for small businesses. ▪ Trade allies remain a key communication channel for the BizSavers Program and much of the program's outreach efforts are focused on them. Trade allies/contractors are still the primary source of information for program participants (reported by 62% of Standard and 57% of Custom PY2022 survey respondents), which is similar to the prior two years, although somewhat lower than in PY2019 (77% Standard and 83% Custom). Notably, over one-third (38%) of Standard/Custom participants prefer e-mail outreach or electronic newsletters as an information channel for energy efficiency opportunities. By program, Custom Program participants show a strong preference for outreach via Ameren Missouri or BizSavers representatives (29% of survey respondents) compared to Standard Program participants (13% of respondents). During PY2022, the BizSavers team also shifted back towards in-person events instead of virtual events. Participant survey results reflect this, with 7% of Standard/Custom Program participants reporting that they heard of the program through an in-person event compared to only 1% who heard about it through a virtual event. ▪ During PY2021, the Ameren Missouri and the BizSavers Program revised BSS Program processes to allow for Trade Allies to bring in their own leads. PY2022 was the first full year where this policy was in effect. In addition, the team created

CSR Required Process Evaluations Questions	Findings
	a BSS website to inform customers of the program and help Trade Allies generate leads. While these new communication strategies appear to be appropriate additions, their impact is difficult to isolate, given other program changes (most notably the increase budget).
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 PY2022 evaluation did not include process research designed to answer this question. The PY2019 evaluation provided the following recommendations, some of which were adapted in PY2020, PY2021, or PY2022: ▪ Continue to expand the slate of program-eligible measures. Outdoor lighting is the only one that arose as a specific recommendation, but others likely offer potential. ▪ The program added exterior lighting (offered in combination with interior lighting projects) in the summer of 2020 but discontinued the measure in PY2021. ▪ Other new measures introduced in PY2020 included occupancy sensors, VFDs for certain applications, kitchen ventilation controls, compressed air measures, and high-volume low-speed fans. ▪ In PY2022 the program introduced HVAC Chip technologies to the Custom Program. ▪ Revisit incentive levels to improve the uptake of non-lighting measures. ▪ In the spring of 2021, the program offered a temporary trade ally incentive to increase the uptake of HVAC measures. ▪ While the program offered a 15% bonus incentive for HVAC measures (compared to 10% for lighting measures) in PY2020, the only bonus incentive in PY2021 was for certain Standard lighting measures. ▪ Notably, the Standard Program saw a substantial increase in non-lighting projects and savings over the program cycle. Non-lighting measures collectively increased from 2.5% of Standard Program ex ante gross energy savings in PY2019 to 15% in PY2022. ▪ In PY2022, the BizSavers team increased incentives for most measures across all programs. ▪ Continue to expand the network of trade allies and Service Providers, focusing on increasing the diversity of services offered and market segments targeted. ▪ In light of the COVID-19 pandemic, the program undertook considerable effort re-engaging and supporting its trade ally network. However, any expansion of the network between PY2020 and PY2022 was limited.

1.3 Cost-Effectiveness Results

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

The evaluation team assessed the cost-effectiveness of each of the five BizSavers programs, using all five costs-effectiveness tests recommended by the California Standard Practice Manual and used in prior evaluations:[4]

[4] *California Standard Practice Manual: Economic Analysis of Demand-Side Programs and Projects*. October 2001.

- **Total Resource Cost (TRC) Test:** Perspective of all utility customers (participants and nonparticipants) in the utility service territory
- **Utility Cost Test (UCT):** Perspective of utility, government agency, or third-party program implementer
- **Ratepayer Impact Measure (RIM) Test:** Impact of efficiency measure on nonparticipating ratepayers overall
- **Participant Cost Test (PCT):** Perspective of the customers installing the measures
- **Societal Cost Test (SCT):** Perspective of all utility customers (participants and nonparticipants) in the utility service territory[5]

Table 5 summarizes the cost-effectiveness results for the six BizSavers programs. All six programs were cost-effective in PY2022 based on the TRC, UC, and PCT tests. The RIM test for all five programs resulted in cost-effectiveness ratios of less than 1.0.

Table 5. Summary of BizSavers Cost-Effectiveness Results

Program	TRC	UCT	RIM	PCT
Standard	3.22	3.97	0.79	6.24
Custom	1.55	3.60	0.92	1.86
RCx	2.61	2.53	0.65	6.09
SBDI	3.02	2.51	0.61	8.00
BSS	3.41	1.95	0.56	7.56

Cost-effectiveness results for the overall Business Portfolio—including the Business Demand Response Program but excluding the BSS Program—are presented in Volume 1.

[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.

2. Evaluation Approach

While the evaluation team conducted separate evaluations of each of the five BizSavers Programs, many research objectives and evaluation activities were common across all the programs. To reduce repetition, this chapter discusses overarching research objectives 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 Business Portfolio evaluation was designed to address numerous gross impact, net impact, and cost-effectiveness objectives. A fourth category of objectives is focused on responding to the five process-related research questions stipulated in 20 CSR 4240-22.070(8). This evaluation did not include any other process-related research objectives.

The PY2022 Business Portfolio evaluations address the following research objectives:

Gross Impact Objectives

- Verify program-tracking data.
- Verify measure installation (not applicable to all programs).
- Estimate the first year ex post gross energy (kWh) and demand (kW) savings.

Attribution/Net Impact Objectives

- Estimate the first year ex post net energy (kWh) and demand (kW) savings using a deemed NTG value of 82.5% (except for the BSS Program, which uses a deemed NTG value of 100%).
- Develop free ridership (FR) values for potential future application (Standard and Custom Programs; results are forthcoming).

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 PY2022 business evaluation results, Ameren Missouri's TRM,[6] and industry best practices.
- Provide total program benefits, costs, net benefits, and cost-effectiveness testing results.

[6] Our ex post evaluation relied on most recent TRM version available. Ameren Missouri revised the approved 2019–2021 MEEIA Cycle Appendix F (Deemed Savings Table) and Appendix H and I (TRM Volumes 2 and 3) in October 2022 (referred to as "Ameren Missouri TRM"). The referenced TRM versions, updated in October 2022, include Appendix H, Version 4.0 and Appendix F, Version 6.0.

CSR Mandated Research Objectives (20 CSR 4240-22.070(8))

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

2.2 Evaluation Activities and Methodologies

This section provides an overview of the evaluation activities undertaken as part of the PY2022 evaluation, including a high-level description of common methodologies. The combination of evaluation activities for each program was based on factors such as levels of program participation and the type and size of energy efficiency projects.

Table 6 summarizes the evaluation activities by program.

Table 6. PY2022 Evaluation Activities by Program

Evaluation Activity	Standard	Custom	SBDI	RCx	BSS
Program Manager and Implementer Interviews	✓	✓	✓	✓	✓
Program Material Review	✓	✓	✓	✓	✓
Participant and Market Actor Research					
Participant Survey	✓	✓	-	-	-
Gross Impact Analysis					
Database Review	✓	✓	✓	✓	✓
Engineering Analysis	✓	-	✓	-	✓
Desk Reviews	✓	✓	-	✓	-
Onsite Verification	✓	✓	-	✓	-
Attribution/Net Impact Analysis					
Free Ridership (for potential prospective application)	✓	✓	-	-	-

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

Program Manager and Implementer Interviews

We conducted two interviews with program and implementation staff to support the PY2022 evaluation of the BizSavers Program:

- The first interview was conducted in December 2021 as part of the PY2021 year-end interview. During this interview, we explored any planned changes to program design and implementation in PY2022 that might affect our evaluation approaches or priorities.
- The second interview was conducted following the end of the program year, on January 4, 2023. The objectives of this second interview were to understand the program team's perspective on program performance during PY2022, to assess program accomplishments and challenges, to clarify any outstanding questions about program design and implementation, and to gain an understanding of planned changes for PY2023.

Program Material Review

We reviewed available program materials, including program guidelines, marketing plans and activity summaries, application forms, and incentive brochures. This review served to familiarize the evaluation team with details of program design and implementation and changes made relative to the PY2021 programs.

Participant Research

The participant research consisted of a quantitative online survey for the Standard and Custom Programs, which focused on questions to determine FR for potential future application but also included limited questions to inform responses to the five CSR process evaluation questions. Details of this primary research—including population sizes, sampling approaches, response rates, and the final data collection instrument—are presented in Appendix G of the Appendix accompanying this volume.

Gross Impact Analysis

The gross impact analysis developed first year ex post gross energy and demand savings and gross energy and demand realization rates. The methods varied by program and included desk reviews and onsite visits (Standard, Custom, and RCx) and lighting measure engineering analysis (Standard, SBDI, and BSS). To optimize evaluation budgets, we applied PY2020 gross realization rates for Custom Motors and Custom Other[7] measures and applied PY2021 gross realization results for Custom Compressed Air measures.[8] We also passed through, at 100%, ex ante savings for Standard Refrigeration, Compressed Air, Cooking, and Water Heating measures (which collectively account for <0.2% of Standard Program ex ante gross savings) and for SBDI and BSS non-lighting measures (which account for less than 0.1% of ex ante gross program savings each).

Table 7 summarizes the PY2022 gross impact approaches used for the various BizSavers programs and enduse categories.

[7] Custom refrigeration, process, and miscellaneous measures are grouped together as "other" enduses for evaluation purposes.
[8] All enduse categories account for a relatively small share (6% or less) of PY2022 Custom Program ex ante gross energy savings, and the historical evaluation results showed good precision (achieving 10% relative precision or better at a 90% confidence level).

Table 7. PY2022 Gross Impact Approaches by Program

Gross Impact Approach	Program / Enduse
Desk Review & Onsite Visit	▪ Standard (HVAC, Motors) ▪ Custom (HVAC, Lighting, Indoor Ag) ▪ RCx
Engineering Analysis	▪ Standard (Lighting) ▪ SBDI (Lighting) ▪ BSS (Lighting)
PY2021 RR	▪ Custom Compressed Air
PY2020 RR	▪ Custom (Motors, Other) [A]
Pass Through 100%	▪ Standard (Refrigeration, Compressed Air, Cooking, Water Heating) [B] ▪ SBDI (Non-lighting) [C] ▪ BSS (Non-Lighting) [C]

[A] For the Custom Program, the enduse category is based on the enduse assigned in the tracking data and the measure description. The Custom "Other" enduse includes the following enduse categories: Process, Refrigeration, and Miscellaneous.
[B] Collectively less than 0.2% of ex ante gross program savings.
[C] Less than 0.1% of ex ante gross program savings.

The following should be noted:

- For lighting measures, ex post energy savings reflect a heating penalty for applicable lighting measures that were installed in electrically heated spaces.
- We applied deemed enduse-specific coincidence factors (CFs) from Ameren Missouri's TRM to ex post energy savings to calculate ex post demand savings. For lighting measures, CFs are applied to ex post gross savings net of any heating penalty. As such, program-level ex post demand savings may not equal the product of ex post gross savings and the CF.

Database Review

We reviewed the program-tracking database to check that project data was recorded fully and correctly, and that the database contained all needed deemed measure information to (1) verify estimation of ex ante savings and (2) inform savings inputs for the ex post analysis. We also used the program-tracking database to develop desk review and onsite samples for the Standard, Custom, and RCx Programs.

Engineering Analysis

We conducted an engineering analysis to estimate PY2022 ex post gross savings for lighting measures in the Standard, SBDI, and BSS Programs. We leveraged project-specific information reported in the program-tracking database in conjunction with Ameren Missouri TRM algorithms and assumptions to estimate ex post gross savings.

Baseline Research

Authorized by Stipulation PY2023, we also conducted a review of baseline assumptions for key projects or building types.

Between May and October 2022, the evaluation team led an effort to document and align the determination of appropriate baseline assumptions for Custom Program measures. The goal was to develop clear and

transparent evaluation protocols to help minimize discrepancies between ex ante and ex post results. The result of this process was a memo finalized in October 2022, which is included in the supporting documentation submitted with this volume.

We also conducted focused baseline research on indoor cultivation facilities. This research consisted of a secondary literature review and interviews with market actors active in Missouri. Additional details on this research are available in Appendix E.

Engineering Desk Reviews

We conducted engineering desk reviews for a sample of projects from the Standard, Custom, and RCx Programs to verify information in the program-tracking database, including baseline and installed equipment types, efficiencies, quantities, hours of operation, and other information needed to validate ex ante savings estimates and determine ex post gross savings. For the sampled projects, we reviewed all available project documentation, including project application materials, project planning documentation (e.g., project narratives, electrical and mechanical drawings, and equipment schedules), invoices, and equipment specification sheets. In some cases, we contacted project representatives to collect or clarify additional information, such as ex ante calculation workbooks, building simulation model files and assumptions, current occupancy or operating schedules, and baseline assumptions.

Our sampling approach for each program was based on the number, type, and size of projects completed in PY2022, targeting 10% relative precision at the 90% confidence level (90/10), where possible. We used a stratified random sampling approach, stratifying by enduse and project size.[9]

Onsite Verification

Onsite verification involved in-person visits to the site of measure installation, conducted for a subset of the Standard, Custom, and RCx projects that received an engineering desk review. Onsite visits provided additional rigor to the verification process through visual inspections of the installed equipment and operating characteristics, collection of trend and other performance data, and deeper engagement with project or facility personnel to confirm that baseline conditions, equipment characteristics, and building characteristics are consistent with project documents and program implementer assumptions.

We tailored the scope of each onsite visit to the specific project and the measure(s) installed at the site, based on the in-depth engineering desk review of the site's project files. The engineer performed the following actions during the onsite visits:

- Verified that the incented measures were installed and functioning, and that the quantity and equipment specifications (e.g., model number, capacity, and efficiency) was consistent with the information in the project application form, the program-tracking database, and the basis for ex ante savings.
- Collected additional physical data to further analyze and determine the energy savings resulting from the incented measure(s). Such onsite data included identification of facility HVAC systems, collection of equipment nameplate information, verification of controls equipment and programming, direct measurement of floor areas, and historical operational data from site monitoring systems.

[9] The enduse classification used for the evaluation's gross impact analysis differs slightly from that in the program-tracking database: For evaluation purposes, all variable frequency drive (VFD) and motors measures are classified as "Motors;" "Cooling" measures (other than VFDs and motors) are classified as "HVAC;" "Miscellaneous" measures that are lighting are classified as "Lighting;" and Building Shell, Process, Refrigeration, Cooking and Water Heating are grouped into the "Other" enduse category.

- Conducted interviews with facility staff to verify current and typical equipment operating schedules and other baseline building and equipment conditions.

Program-Level Gross Impacts

For each BizSavers Program, we developed enduse and/or program-level realization rates for first year energy and demand savings. For programs with sample-based gross impact approaches, we developed these by aggregating the project-level results from the desk reviews and/or onsite visits, applying weights that reflect (1) the relative size of each project within the sample and (2) the probability of each project to be sampled. The enduse and/or program-level realization rates were then used to adjust the ex ante savings for the population of program projects.

Attribution/Net Impact Analysis

Per the Stipulation PY2022, "[t]he throughput disincentive for the PY2022 year will utilize an 82.5% NTG factor with no true-up."[10] As such, this evaluation did not include NTG research for application in PY2022, and the impact results presented in this volume focus on gross savings. The Executive Summary and Volume 1, however, present net savings for the Standard, Custom, RCx, and SBDI Programs, calculated using the following formula:

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

As described in the PY2022 Evaluation Plan, we assume that customers served by the BSS Program would not make energy-efficient improvements on their own due to the cost. Therefore, we assume an NTG value of 1.0 when estimating net savings for this program. As such, the deemed net-to-gross ratio (NTGR) of 0.825 specified in the PY2022 stipulation agreement does not apply to the BSS Program.

This evaluation did include NTG research with PY2022 participants in the Standard and Custom Programs for potential future application. This research and the associated analyses will be completed in the spring of 2022 and will be submitted as a standalone memorandum.

[10] *Unanimous Stipulation and Agreement Regarding the Implementation of Certain MEEIA Programs Through Plan Year 2022*, p. 6.

3. Standard Incentive Program

This chapter summarizes the PY2022 evaluation methodology and results for the Standard Incentive Program. The PY2022 evaluation of the Standard Incentive Program included an engineering analysis of lighting measures and desk reviews and onsite visits for a sample of Standard HVAC and motors projects. The evaluation did not include an assessment of program processes but did include a new assessment of FR (forthcoming) for potential prospective application.[11] We present additional details on the evaluation methodology in Chapter 2, Appendix A, and Appendix B.

The Standard Incentive Program is the largest program in Ameren Missouri's PY2022 business portfolio, by ex post gross savings. Within the BizSavers portfolio, the Standard Incentive Program accounts for 48% and 44% of ex post gross energy and demand savings, respectively.

The Standard Program promotes energy awareness and installation of energy-efficient technologies or services by providing incentives to offset the higher cost associated with completing these projects. The program encourages customer participation through simple and streamlined participation processes and focuses on technologies that include lighting, motors, controls, HVAC, and refrigeration. In PY2022, the only participation channel for the Standard Program was application-based and supported by a network of registered Trade Allies and other, non-registered Market Partners (including contractors, distributors, wholesale retailers, and, where applicable, local economic development and professional associations). The target market for the Standard Program includes commercial, industrial, and institutional customers and excludes multifamily and low-income customers, who are served by the residential programs.

The PY2022 Standard Program is an ongoing program from the previous MEEIA cycle, and implementation has remained largely unchanged from previous years. Notable changes compared to PY2022 include the following:

- Temporarily suspending fast track lighting incentives on May 1, 2022.
- Temporarily increasing incentives in September.

3.1 Participation Summary

During PY2022, Ameren Missouri business customers implemented 1,339 projects through the Standard Program, resulting in 61,344 MWh of ex ante gross energy savings. This represents a decrease in participation and savings compared to previous years. In PY2021, the Standard Program served 2,200 projects, resulting in 82,335 MWh of ex ante gross energy savings. In PY2020, the Standard Program served 2,008 projects, resulting in 85,129 MWh in ex ante gross savings.

Similar to previous years, the Standard Program was heavily focused on lighting (86% of ex ante gross energy savings). However, in the HVAC enduse—a priority enduse for the implementation team in PY2022—the program achieved ex ante gross energy savings of 6,190 MWh, which is comparable to PY2021 (6,901 MWh in ex ante gross HVAC savings) and represent an increase relative to PY2020 (4,425 MWh in ex ante gross HVAC savings). Table 8 summarizes PY2022 participation in the Standard Program, including the number of projects and ex ante gross savings, by enduse.

[11] The results of the FR analysis will be provided in a standalone memorandum.

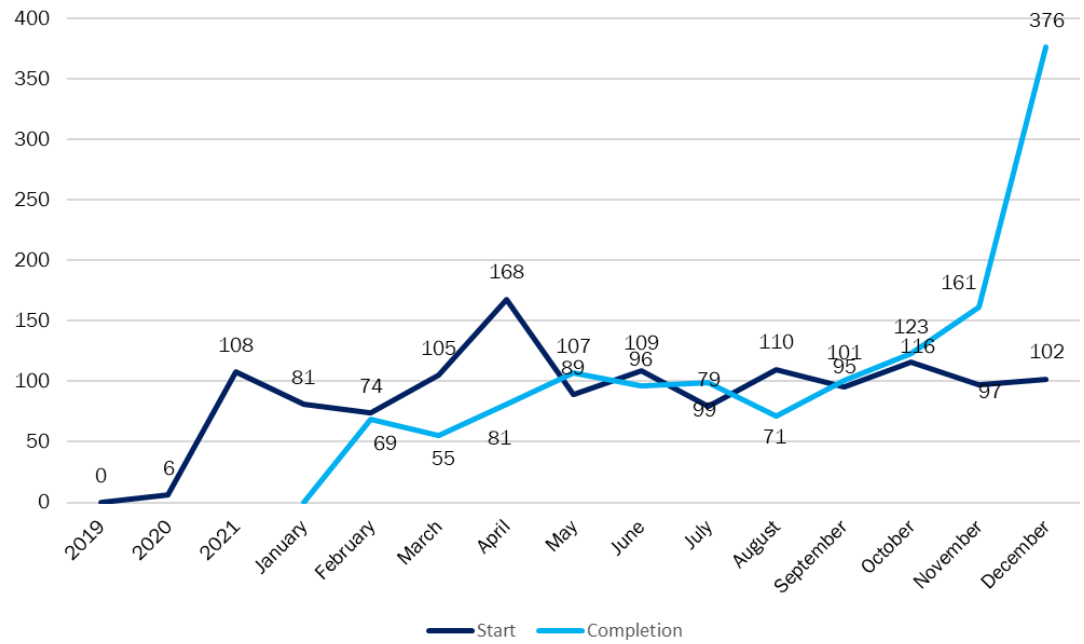
Table 8. PY2022 Standard Program Participation Summary

Enduse	Projects		Ex Ante Gross Savings	
	Number [A]	%	MWh	%
Lighting	1,155	86%	52,031	85%
HVAC	172	13%	6,190	10%
Motors	30	2%	3,013	5%
Refrigeration	6	<1%	16	<1%
Compressed Air	3	<1%	62	<1%
Cooking	2	<1%	12	<1%
Water Heating	1	<1%	21	<1%
Total	**1,339**	**100%**	**61,344**	**100%**

[A] The number of projects by enduse sum to more than the totals shown due to some projects containing more than one enduse.

Standard Program project starts were relatively steady over the program year (see Figure 1), averaging 102 projects started per month, with a spike in April. The increase in April may be related to participants rushing to submit projects before the fast-track lighting incentives were suspended on May 1 for the remainder of PY2022. Nine percent of Standard Program projects completed in PY2022 started in 2020 or 2021. Project completions also remained steady over the first nine months of the program year before they increased for the final quarter of the year, especially in December. The Standard Program achieved over one-third (36%) of ex ante gross savings in the final month of the program year.

Figure 1. PY2022 Standard Program Monthly Project Starts and Completions



Based on the participant survey, almost one-half of Standard Program participants (44%) are repeat participants—i.e., their company had received incentives from Ameren Missouri's BizSavers Program in prior program years.

3.2 Evaluation Methodology

Table 9 provides an overview of the PY2022 evaluation activities for the Standard Program. Most of these activities are similar across the various business programs and described in Chapter 2. The sections following the table highlight program-specific aspects of key evaluation activities.

Table 9. PY2022 Evaluation Activities for the Standard Incentive Program

Evaluation Activity	Description
Program Manager and Implementer Interviews	▪ Conducted interviews in December 2021 to inform evaluation planning and in January 2023 to understand program staff's perspective on program performance.
Program Material Review	▪ Reviewed program materials to understand program changes relative to PY2021.
Engineering Analysis (Lighting Measures)	▪ Verified that ex ante savings use correct TRM algorithms and project-specific values or TRM assumptions. ▪ Developed ex post savings using TRM algorithms, site-specific parameters, and deemed savings assumptions.
Engineering Desk Reviews & Onsite Verification (Select Enduses)	▪ Reviewed supporting project documentation for a sample of projects to ensure that original data were correctly entered from invoices and other documentation. ▪ Performed onsite verification visits for a sample of projects to confirm quantity and continued operation of incented measures, collect additional data to develop energy savings, and verify other parameters through staff interviews. ▪ Collected additional data and confirmed key analysis parameters through direct outreach to participants. ▪ Collected pre/post facility consumption data, when possible, to validate the overall savings impact. ▪ Developed ex post savings for the sample and the population.
Prospective Attribution Analysis (Forthcoming)	▪ Conducted cognitive interviews to inform updates to FR questions and algorithm. ▪ Conducted participant survey to collect FR algorithm inputs and related information. ▪ Developing new estimates of FR for prospective application.

3.2.1 Engineering Analysis

We conducted an engineering analysis of all Standard Incentive Program lighting measures to estimate ex post gross program savings. We first reviewed program-tracking data to verify that ex ante savings calculations used correct TRM algorithms and savings assumptions. We then calculated ex post savings using Ameren Missouri TRM algorithms, site-specific parameters from the program-tracking database, and deemed savings assumptions (including application of hours of use [HOU] and in-service rate [ISR] adjustment factors).

3.2.2 Engineering Desk Reviews and Onsite Visits

We conducted engineering desk reviews for a stratified random sample of 21 Standard Program projects to review and verify project documentation and savings assumptions. The main purpose of the desk reviews was to verify that the program-tracking database correctly reflected the installed measure(s), including equipment types, efficiencies, quantities, hours of operation, and other information needed to verify project installation and estimate gross energy savings. Where possible, we confirmed or updated key analysis inputs through direct outreach to participants. Wherever needed and possible, we leveraged phone and e-mail communication with site contacts to verify measure installation and operation, including timing of the installation, and key parameters affecting savings for equipment (e.g., occupancy schedules, system setpoints, HOU, and operating strategies). To support the desk review data collection, site contacts provided

photographs of installed equipment (e.g., equipment nameplates), screenshots from the building automation systems, and trend data showing historical performance.

In most cases, the evaluation team updated ex ante savings estimates based on project documentation, review of facility consumption data, publicly available information (e.g., building size), review of additional project details collected during the evaluation, or other post-installation information. For some projects, the evaluation team developed project-specific calculations as a more accurate method of quantifying ex post energy savings. We conducted onsite visits for a subset of four of the 21 projects, for which key project details or parameters could not be verified through the desk reviews and customer outreach. Onsite visits provided additional rigor to the verification process by confirming through visual inspection that the incented measures were still installed and operational, and that the baseline conditions, equipment characteristics, and building characteristics were consistent with project documents and the program implementer's assumptions.

Table 10 summarizes the final sample for the desk reviews and onsite visits for the PY2022 Standard Program.

Table 10. Standard Program Gross Impact Sampling Summary

Enduse & Size Stratum	Number of Projects [A]		
	Population	Desk Reviews	Onsite Visits
HVAC	**172**	**15**	**3**
Stratum 3 (Large)	7	3	2
Stratum 2 (Medium)	21	3	1
Stratum 1 (Small)	144	9	0
Motors	**30**	**6**	**1**
Stratum 2 (Large)	1	1	1
Stratum 1 (Small)	29	5	0
Total	**202**	**21**	**4**

[A] For sampling purposes, projects are defined by project numeral and enduse.

Given the small contribution of other measures to Standard Program savings (collectively <0.2%), we applied a default realization rate of 100% for all Standard Program refrigeration, compressed air, cooking, and water-heating measures.

3.3 Evaluation Results

This section summarizes gross impact results for the PY2022 Standard Incentive Program. We estimate ex post gross savings by enduse, relying on a combination of a population-level engineering analysis and sample-based, enduse-level realization rates. For lighting measures, ex post gross savings are based on an engineering analysis. We conducted desk reviews and onsite visits for a sample of PY2022 projects to develop enduse-specific realization rates for HVAC and motors measures. Calculated realization rates are based on a desk review and onsite sample of 15 HVAC projects and six motors projects, extrapolated to the population of projects within each of these enduses. Given the small contribution of other enduses to Standard Program savings (<0.2%), we applied a default realization rate of 100% for all other measures (including refrigeration, compressed air, cooking, and water-heating measures).

Table 11 compares ex ante and ex post gross savings at the program level. As shown, the program achieved ex post gross energy savings and demand savings of 59,902 MWh and 17.24 MW, respectively, representing 98% of the program gross energy savings goal and 141% of the program gross demand savings goal.

Table 11. PY2022 Standard Program Gross Impacts

	Ex Ante Gross	Gross RR	Ex Post Gross	Goal Gross	% of Goal
Energy Savings (MWh)	61,344	97.6%	59,902	61,072	98%
Demand Savings (MW)	16.63	103.7%	17.24	12.20	141%

The majority of PY2022 ex post gross energy savings for the Standard Program (85%) came from lighting, including LED linear tube retrofits, LED fixture retrofits, and LED lighting redesign. The remaining 15% of program ex post gross energy savings are from non-lighting measures, mostly from HVAC projects (9%) and motors (5%). Refrigeration, compressed air, cooking, and water-heating equipment collectively account for the remainder (combining for less than 1%).

Table 12 summarizes gross savings and realization rates by enduse.

Table 12. PY2022 Standard Program Gross Savings by Enduse

Enduse	Energy Savings (MWh)			Demand Savings (MW)		
	Ex Ante	Gross RR	Ex Post	Ex Ante	Gross RR	Ex Post
Lighting	52,031	98.1%	51,035	9.88	100.7%	9.95
Other Linear LED	26,340	97.7%	25,738	5.00	100.4%	5.02
LED Replacing T12	12,527	98.0%	12,280	2.38	101.1%	2.41
Other Non-Linear LED	8,936	98.7%	8,823	1.70	101.0%	1.71
Lighting Redesign	2,593	99.4%	2,577	0.49	101.4%	0.50
Lighting Controls	1,275	99.6%	1,270	0.24	99.6%	0.24
LED Replacing Incandescent A-Lamp	321	95.9%	308	0.06	102.8%	0.06
LED Exit Sign	39	99.8%	39	0.01	137.4%	0.01
HVAC	6,190	86.9%	5,379	4.81	97.0%	4.67
Motors	3,013	112.1%	3,378	1.93	135.3%	2.61
Other	111	100.0%	111	0.02	100.0%	0.02
Total	**61,344**	**97.6%**	**59,902**	**16.63**	**103.7%**	**17.24**

Below, we provide additional detail on these results, organized by enduse.

Lighting Impacts

Based on the engineering analysis for lighting projects, we made the following adjustments to ex ante savings:

- **Waste Heat Factor (WHF) and Heating Penalty Interactive Factor (IF).** To capture the heating and cooling interactive impacts when calculating ex ante savings for interior lighting measures, the program implementer applies an average Heating and Cooling Interaction Factor (HCIF) of 1.07 for measures installed in air-conditioned spaces. The HCIF encompasses WHF and IF. Notably, the implementer applies the HCIF to energy savings and demand savings, even though heating penalties are not relevant for demand savings. In contrast, the evaluation team used building-specific

assumptions, based on information reported in the program-tracking database and in accordance with the Ameren Missouri TRM:

- For energy savings, the evaluation team applied building type-specific WHFs and building and HVAC type-specific IFs based on the Ameren Missouri TRM tables, resulting in a weighted average WHF/IF factor of 1.06 and lower ex post energy savings compared to ex ante.
- For demand savings, the evaluation team applied building type-specific WHFs, resulting in a weighted average WHF of 1.09 and higher ex post demand savings compared to ex ante.

- **Application of ISR and HOU Adjustment.** We applied the TRM-prescribed parameters for the Standard Program of 99.6% ISR and 99.4% HOU adjustment, for a combined adjustment of 99.0%. This adjustment had minimal impact on ex post savings.
- **Application of Incorrect Coincidence Factor.** For 195 measures (190 LED exit signs replacing a CFL exit sign and 5 Type C LED lamps), ex ante calculations use the coincidence factor for 24/7 exterior/garage lighting (0.0001379439) instead of the TRM-prescribed value for these measures (0.0001899635). As a result, ex post demand savings for these measures are higher than ex ante savings.

Non-Lighting Impacts

We conducted desk reviews and onsite visits for a sample of PY2022 Standard HVAC and motors projects to develop enduse-specific realization rates for HVAC and motors measures. We calculated realization rates based on a desk review and onsite sample of 15 HVAC projects and six motors projects, extrapolated to the population of projects in each enduse. The overall gross energy and demand realization rates for Standard HVAC measures are 86.9% and 97.0%, respectively. The energy and demand realization rates for individual sampled Standard HVAC projects ranged from 26% to 524%. The overall gross energy and demand realization rates for Standard motors measures are 112.1% and 135.3%, respectively. The energy and demand realization rates for individual sampled Standard motors projects ranged from 0% to 179%.

The evaluation found many, often counteracting, discrepancies between ex ante energy savings calculations and Ameren Missouri TRM calculation methods. We also found discrepancies between equipment parameters in the ex ante savings analysis and equipment information we observed through project documents (e.g., invoices) and through onsite visual inspections.

The key discrepancies we found for Standard HVAC projects are:

- **Verified Equipment Information.** The evaluation team found errors in tracked equipment parameters (e.g., capacity and efficiency) through a combination of desk review and onsite evaluation activities. When errors were found, the evaluation team recalculated energy and demand savings using TRM algorithms and relevant input parameter values. These adjustments reduced savings.
- **Baseline Efficiency.** According to the Ameren Missouri TRM, Appendix H, energy savings for many Standard HVAC measures rely on local energy code minimum efficiency requirements as their baselines. In some cases, the evaluation found that ex ante savings applied International Energy Conservation Code (IECC) 2012 minimum efficiencies instead of following local energy codes, such as IECC 2015 and IECC 2018. Ex post savings are based on energy codes adopted by the county that contains the facility. These adjustments decreased savings.
- **Equivalent Full Load Hours (EFLH).** Energy savings algorithms for many Standard HVAC measures include an EFLH parameter that is multiplied by the equipment cooling or heating capacity. The product of EFLH and capacity represents the annual cooling or heating load. The Ameren Missouri TRM, in

Appendix H, provides a table of EFLH values based on building type and location. Ex ante savings generally use a single "C&I Average" EFLH value. Ex post values use TRM values based on verified building type and location, consistent with the TRM. These adjustments increased or decreased savings depending on the building type and location, with a range of 69% to 324%. Overall, these adjustments resulted in an increase in savings.

- **Savings Factors.** Energy savings algorithms for Demand Control Ventilation use a Cooling Savings Factor (SF_cool) and a Heating Savings Factor (SF_heat). Ex ante savings calculations used deemed average values from the TRM Appendix F. Ex post savings use TRM values based on verified building type and location, consistent with the TRM. These adjustments decreased savings.
- **Heating Season Savings.** Some Standard HVAC measures impact both cooling and heating energy use (e.g., air-source heat pumps). The evaluation found that, in some cases, ex ante savings counted cooling savings only, even when a facility had electric heat. Ex post calculations use TRM algorithms and verified equipment and measure information to calculate both cooling and heating savings, for buildings with verified electric heat. The addition of heating savings increased annual energy savings.
- **Disqualified Measure:** In one of the Standard HVAC projects reviewed, the facility was found to be unoccupied during onsite verification, with no clear indication as to when it would be occupied. As a result of this finding, we disqualified the demand-controlled ventilation measure, which then received zero ex post savings.

The key discrepancies we found for Standard motors projects are:

- **Disqualified Measures:** For two of the six projects (which make up 8% of ex ante savings for the Standard motors sample) the evaluation team disqualified measures, which then received zero ex post savings, for the Following reasons:
  - In one project, the local code (IECC 2015) required the incented VFDs because the new rooftop units that contained the VFDs have a capacity greater than 65,000 Btu/h.[12]
  - In another project, the incented electronically commutated motors installed in a refrigerated display case or walk-in cooler were in a new construction project. The Ameren Missouri TRM, Appendix H, specifies that only retrofit applications of this measure may be claimed.[13]
- **Typographical:** One measure within one of the sampled projects had a typo that had a significant impact on project savings. The ex ante savings calculation used a value of 15 HP, but the spec sheets and site photos indicated this value should have been 125 HP. This adjustment increased savings.
- **Motor Efficiency:** The energy savings algorithm for Standard motors measures includes a motor efficiency parameter. Ex ante savings calculations generally used either the default value of 93% from the Ameren Missouri TRM, Appendix H or 77%, which corresponds to the efficiency of a 1 HP motor operating at 3,600 RPM, as shown in the Ameren Missouri TRM Appendix H table, "NEMA Premium Efficiency Motors Default Efficiencies." When possible, the evaluation team applied values directly from project documentation or by performing lookups in the previously mentioned table using the motor's RPM, HP, and enclosure type. When those methods were not possible, the evaluation team applied the TRM default value of 93%. These adjustments increased and decreased savings depending on the project.

[12] IECC 2015 code section C403.4.1.1 Fan Airflow Control indicates that any new direct expansion units greater than 65,000 Btu/h must have a modulating fan control.
[13] The Code of Federal Regulations section § 431.66, "Energy conservation standards and their effective dates," effectively requires ECMs in order to meet the maximum daily energy consumption requirements.

- **Annual Operating Hours:** The energy savings algorithm for Standard motors measures includes an annual operating hours parameter. In two sampled projects, ex ante savings calculations used either the nonresidential value of 6,773 hours from the Ameren Missouri TRM, Appendix H Default Hours table or hours from the table that correspond to a building type that does not align with the site information. The evaluation team applied an annual operating hours value from the TRM table that aligns with the site information. These adjustments increased and decreased savings depending on the project.
- **Quantity:** Ex ante savings calculations for one sampled project neglected to use the quantity of VFDs/motors in the data and site documents. The evaluation team included these quantities for ex post savings calculations. These adjustments increased savings.
- **Brake Horsepower (BHP):** The energy savings algorithm for Standard motors in the Ameren Missouri TRM, Appendix H, specifies that calculations must use BHP. If this value is not known, a load factor of 65% may be applied to the nominal motor horsepower. In some cases, ex ante savings calculations applied neither the BHP nor the 65% load factor. The evaluation team applied the 65% load factor to the nominal HP values when the BHP could not be found in site documents. These adjustments decreased savings.

For measures in all other enduse categories, including refrigeration, compressed air, cooking, and water heating, we applied realization rates of 100% for both energy and demand savings. These measures account for a minimal portion of savings (<0.2%).

Additional details about the desk review and onsite visit findings, ex post analysis methods, and reasons for discrepancies are available in Appendix A and Appendix B.

3.4 Conclusions and Recommendations

The Standard Incentive Program performed strongly during PY2022. Similar to previous years, the Standard Program carried the BizSavers portfolio and was the largest contributor to portfolio ex post gross savings.

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

- **Conclusion #1:** Lighting measures continued to dominate the PY2022 Standard Program, but non-lighting measures have increased in importance every year of this MEEIA cycle (non-lighting measures collectively increased from 2.5% of Standard Program ex ante gross energy savings in PY2019 to 15% in PY2022). The BizSavers Program has been successful in promoting non-lighting measures.
  - **Recommendation:** Continue to harvest energy savings from lighting measures, while available, but also continue the increased promotion of other enduses among Trade Allies and customers to facilitate the transition away from lighting as the LED market matures.
- **Conclusion #2:** The program implementer uses an average HCIF of 1.07 to estimate ex ante energy and demand savings for interior lighting measures, regardless of building type or HVAC system type. In contrast, the evaluation team applied building and HVAC-type-specific WHFs and IFs based on the tracked building and system types for each project and specifications in the Ameren Missouri TRM, Appendix H. Across all Standard Program projects, the average combined ex post energy savings adjustment (WHF plus IF) was 1.06, and the average ex post demand savings adjustment (WHF only) was 1.09.

- **Recommendation:** To improve the accuracy of ex ante savings, we recommend that the implementer either (1) apply building-type-specific WHF and IF values (as stipulated in the TRM and done in the ex post analysis); or (2) apply the revised TRM HCIF of 1.056 to calculate energy savings and the newly added IF_{kW} factor of 1.032 to calculate demand savings.[14]

- **Conclusion #3:** For Standard HVAC measures, the evaluation team observed several areas where ex ante savings calculation methods were not consistent with savings methods prescribed in the Ameren Missouri TRM, Appendix H. For example, ex ante savings used an average value for EFLH rather than the TRM values that are based on building type and geographic location. Similarly, ex ante savings calculations used deemed average savings factors (from TRM Appendix F) for demand control ventilation measures rather than using Appendix H savings factors based on building type and geographic location.
  - **Recommendation:** To improve consistency with the Ameren Missouri TRM, ex ante savings should use EFLH values and savings factors provided in the TRM based on building type and location. For unique building types that do not fit within the existing Building Type categories, implementers should use an average value for the geographic location.

- **Conclusion #4:** In multiple instances, ex ante savings calculations did not count heating savings for ASHP measures. ASHP measures improve heating season efficiency, and the associated TRM algorithms include prescriptive methods for estimating electric heating savings.
  - **Recommendation:** To improve consistency with the Ameren Missouri TRM for estimated energy savings for Standard HVAC measures, and to count all energy impacts from HVAC measures, ex ante savings should include heating season impacts for facilities with electric heat.

- **Conclusion #5:** For Standard motors measures, the evaluation team observed several areas where ex ante savings calculation methods were not consistent with savings methods prescribed in Ameren Missouri TRM, Appendix H. For example, ex ante savings calculations used an average value for annual operating hours rather than information from the TRM table based on building type. Similarly, implementers used default motor efficiencies for ex ante savings calculations rather than performing a lookup based on motor RPM, HP, and enclosure type.
  - **Recommendation:** To improve consistency with the Ameren Missouri TRM, ex ante savings should use annual operating hours and motor efficiencies based on site and project information rather than the TRM default values.

[14] IF_{kW} is a second electric heat interaction factor designed to remove the heating penalty from demand savings. This factor is necessary when ΔkW is calculated as $kW = \Delta kWh \; x \; CF$ and ΔkWh includes the heating penalty; it is necessary because demand savings should not include the heating penalty. The IF_{kW} of 1.032 was developed based on PY2021 ex post energy and demand lighting savings.

4. Custom Incentive Program

This chapter summarizes the PY2022 evaluation methodology and results for the Custom Incentive Program. The PY2022 evaluation of the Custom Incentive Program included desk reviews and onsite visits for a sample of projects within the HVAC and lighting enduse categories and of indoor agriculture new construction projects. To optimize evaluation budgets, we applied historical gross realization rates for the compressed air, motors and "other" enduse categories.[15] The evaluation did not include an assessment of program processes but did include a new assessment of FR (forthcoming) for potential prospective application.[16] Additional details on the evaluation methodology are presented in Chapter 2. Detailed desk review and onsite visit findings for the sampled lighting, HVAC, and indoor agriculture projects are presented in Appendices C through E.

The Custom Incentive Program is the second largest program in Ameren Missouri's PY2022 business portfolio by ex post gross savings. Within the BizSavers portfolio, the Custom Incentive Program accounts for 45% and 51% of ex post gross energy and demand savings, respectively.

The Custom Program is designed to promote energy awareness and installation of energy-efficient technologies or services by providing incentives to offset the higher cost associated with completing these projects. The Custom Incentive Program applies to processes, technologies, and energy efficiency measures that do not fall within the other pre-defined programs. These projects are sometimes complex and always unique, requiring customer-specific incentive applications and calculations of estimated energy savings. Incentive levels for the Custom Program are calculated based on energy savings estimates for each proposed measure, except for interior lighting measures that rely on a code baseline, in which case incentives are calculated based on the watts reduced. Onsite visits are required for projects with incentives exceeding $15,000 to verify baseline data, energy savings estimates, and post-installation measuring capabilities. In PY2022, the only participation channel for the Custom Program was application-based and supported by a network of registered trade allies and other, non-registered market partners (including contractors, distributors, wholesale retailers, and, where applicable, local economic development and professional associations).

The target market for the Custom Program includes commercial, industrial, and institutional customers and excludes multifamily and low-income customers, who are served by the residential programs. Beginning in PY2022, the Custom Program also serves new construction projects, including new construction indoor agriculture project, which were previously served under a stand-alone New Construction Program.

The PY2022 Custom Program is ongoing from the previous MEEIA cycle, and implementation has remained largely unchanged from previous years. Notable changes compared to PY2021 include:

- Temporarily increasing incentives in September 2022.
- Inclusion of new construction projects under the Custom Program.

4.1 Participation Summary

During PY2022, Ameren Missouri business customers implemented 259 projects through the Custom Program, resulting in 68,396 MWh of ex ante gross energy savings. This represents a decrease in participation but a significant increase in ex ante gross savings compared to both PY2021 (279 projects; 31,884 MWh in

[15] The "other" enduse category includes process, refrigeration, and miscellaneous measures.
[16] The results of the FR analysis will be provided in a standalone memorandum.

ex ante gross savings) and PY2020 (344 projects; 35,049 MWh in ex ante gross savings). In part, this is due to the inclusion of new construction projects in the Custom Program in PY2022.

The PY2022 Custom Program was heavily focused on HVAC, lighting, and indoor agriculture projects (collectively accounting for 85% of ex ante gross energy savings). Although the program only served four indoor agriculture projects, they accounted for over one-quarter (27%) of ex ante gross savings. Table 13 summarizes PY2022 participation in the Custom Program, including the number of projects and ex ante gross savings, by enduse.

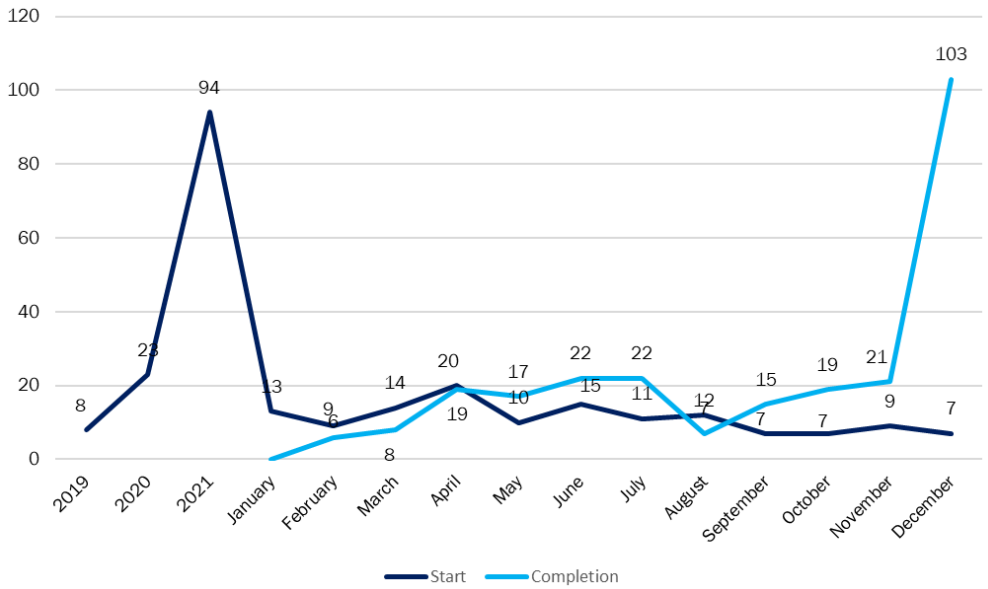
Table 13. PY2022 Custom Program Participation Summary

Enduse/Project Type	Projects		Ex Ante Gross Savings	
	Number [A]	%	MWh	%
HVAC	94	36%	23,916	35%
Indoor Ag	4	2%	18,290	27%
Lighting	147	57%	16,032	23%
Compressed Air	20	8%	4,158	6%
Motors	17	7%	1,694	2%
Other	16	6%	4,306	6%
Total	**259**	**100%**	**68,396**	**100%**

[A] The number of projects by enduse and project type sum to more than the totals shown due to some projects containing more than one enduse.

Custom Program project starts were relatively steady over the program year (Figure 2), averaging 11 projects started per month. Almost half of the projects completed in PY2022 (48%) started in previous years. Since Custom projects generally take longer to complete, there are more Custom projects that started in preceding years compared to the Standard Program. Project completions also remained steady over the first eleven months of the program year before they increased significantly in December. Notably, the Custom Program achieved over half of ex ante savings (53%) during the final month of the program year.

Figure 2. PY2022 Custom Program Monthly Project Starts and Completions



Based on the participant survey, just under two-thirds of PY2022 Custom Program participants (62%) are repeat participants (i.e., their company had received incentives from Ameren Missouri's BizSavers Program in prior program years).

4.2 Evaluation Methodology

Table 14 provides an overview of the PY2022 evaluation activities for the Custom Program. Most of these activities are similar across the various business programs and were described in Chapter 2. The sections following the table highlight program-specific aspects of key evaluation activities.

Table 14. PY2022 Evaluation Activities for the Custom Incentive Program

Evaluation Activity	Description
Program Manager and Implementer Interviews	▪ Conducted interviews in December 2021 to inform evaluation planning and in January 2023 to understand program staff's perspective on program performance.
Program Material Review	▪ Reviewed program materials to understand program changes relative to PY2021.
Engineering Desk Reviews & Onsite Verification (Select Enduses)	▪ Reviewed supporting project documentation for a sample of projects to ensure that original data were entered correctly from invoices and other documentation. ▪ Performed onsite verification visits for a sample of projects to confirm quantity and continued operation of incented measures, collect additional data to develop energy savings, and verify other parameters through staff interviews. ▪ Collected additional data and confirmed key analysis parameters through direct outreach to participants. ▪ Collected pre/post facility consumption data, when possible, to validate the overall savings impact. ▪ Developed ex post savings for the sample and the population. ▪ Applied historical RRs for non-sampled enduses.
Prospective Attribution Analysis (Forthcoming)	▪ Conducted cognitive interviews to inform updates to FR questions and algorithm. ▪ Conducted participant survey to collect FR algorithm inputs and related information. ▪ Developing new estimates of FR for prospective application.

We conducted engineering desk reviews for a sample of 31 Custom projects to review and verify project documentation and savings assumptions.[17] The main purpose of the desk reviews was to verify that the program-tracking database correctly reflected the installed measure(s), including equipment types, efficiencies, quantities, hours of operation, and other information needed to verify project installation and estimate gross energy and demand savings. Where possible, we confirmed or updated key analysis inputs through direct outreach to participants. Wherever needed and possible, we leveraged phone and e-mail communication with site contacts to verify measure installation and operation, including timing of the installation, and key parameters affecting savings for installed equipment (e.g., occupancy schedules, system setpoints, HOU, and operating strategies). To support the desk review data collection, site contacts provided photographs of installed equipment (e.g., equipment nameplates), screenshots from the building automation systems, and trend data showing historical performance.

In most cases, the evaluation team updated ex ante savings estimates based on project documentation, review of facility consumption data, publicly available information (e.g., building size), review of additional project details collected during the evaluation, or other post-installation information. For some projects, the

[17] The PY2022 Evaluation Plan included up to 40 project reviews, including up to 20 reviews with onsite visits. We reduced this number to 31 projects, including 11 onsite visits, because we leveraged phone and e-mail communication with site contacts to verify measure installation and operation, focusing onsite visits on projects where reliable information could not be gathered remotely.

evaluation team developed project-specific calculations or analyzed pre- and post-installation billing data as a more accurate method of quantifying ex post energy savings.

We conducted onsite visits for a subset of 11 of the 31 Custom projects, where key project details or parameters could not be verified through the desk reviews and customer outreach. Onsite visits provided additional rigor to the verification process by confirming through visual inspection that the incented measures were still installed and operational, and that the baseline conditions, equipment characteristics, and building characteristics were consistent with project documents and program implementer assumptions.

Table 15 summarizes the final desk review and onsite visit sample for the PY2022 Custom Program.

Table 15. Custom Program Gross Impact Sampling Summary

Enduse/Project Type & Size Stratum	Number of Projects [A]		
	Population	Desk Reviews	Onsite Visits
HVAC	**94**	**19**	**6**
Stratum 3 (large)	6	4	3
Stratum 2 (medium)	13	4	1
Stratum 1 (small)	75	11	2
Lighting	**147**	**8**	**2**
Stratum 2 (large)	10	2	2
Stratum 1 (small)	137	6	0
Indoor Agriculture	**4**	**4**	**3**
Stratum 2 (large)	2	2	2
Stratum 1 (small)	2	2	1
Total	**245**	**31**	**11**

[A] For sampling purposes, projects are defined by project numeral and enduse or project type.

For enduses not covered by the desk reviews/onsite visits, we applied gross realization rates based on PY2021 or PY2020 evaluation results, depending on the enduse, to optimize evaluation budgets. Specifically, we applied PY2020 gross realization rates for Custom motors and other measures and applied PY2021 gross realization results for Custom compressed air measures. Each of these enduses represents a small share of Custom Program savings (6% or less of ex ante gross savings), and historical realization rates showed good precision (achieving 10% relative precision or better at a 90% confidence level).

4.3 Evaluation Results

This section summarizes gross impact results for the PY2022 Custom Incentive Program. Ex post gross savings were estimated by enduse, relying on a combination of new sample-based and historical realization rates. For motor and "other" measures (where "other" consists of process, refrigeration, and miscellaneous measures) we applied the PY2020 realization rates and for compressed air measures we applied PY2021 realization rates (all of which had strong relative precision values). We conducted desk reviews and onsite visits for a sample of PY2022 projects to develop enduse-specific realization rates for HVAC, lighting, and indoor agriculture measures. Calculated realization rates are based on a desk review and onsite sample of 31 projects, consisting of 19 HVAC projects, eight lighting projects, and four indoor agriculture projects, extrapolated to the population within an enduse/project type.

Table 16 compares ex ante and ex post gross savings, at the program level. As shown, the program achieved ex post gross energy savings and demand savings of 56,375 MWh and 19.92 MW, respectively, representing 73% of the program gross energy savings goal and 88% of the program gross demand savings goal.

Table 16. PY2022 Custom Program Gross Impacts

	Ex Ante Gross	Gross RR	Ex Post Gross	Goal Gross	% of Goal
Energy Savings (MWh)	68,396	82.4%	56,375	77,722	73%
Demand Savings (MW)	27.23	73.1%	19.92	22.60	88%

Most of the PY2022 savings for the Custom Program come from HVAC, indoor agriculture, and lighting projects. Table 17 summarizes gross savings and realization rates by enduse.

Table 17. PY2022 Custom Program Gross Savings by Enduse

Enduse/Project Type	Energy Savings (MWh)			Demand Savings (MW)		
	Ex Ante	Gross RR	Ex Post	Ex Ante	Gross RR	Ex Post
HVAC	23,916	71.1%	16,999	16.34	72.4%	11.83
Indoor Ag	18,290	84.7%	15,497	6.20	60.6%	3.76
Lighting	16,032	90.5%	14,511	3.04	90.5	2.76
Compressed Air	4,158	100.0%	4,158	0.57	100.0%	0.57
Motors	1,694	97.6%	1,653	0.49	98.6%	0.48
All Other [A]	4,306	82.6%	3,557	0.59	87.2%	0.51
Total	**68,396**	**82.4%**	**56,375**	**27.23**	**73.1%**	**19.92**

[A] The "Other" enduse includes process, refrigeration, and miscellaneous.

Below, we provide additional detail on these results, organized by enduse. Additional details on the onsite findings, ex post analysis methods, and reasons for discrepancies are available in the individual site reports in Appendices C, D, and E.

HVAC Impacts

HVAC is the largest enduse within the Custom Program, and—due to cooling season operation—provides a significant amount of peak demand savings. The overall gross energy and demand realization rates for Custom HVAC measures are 71.1% and 72.4%, respectively. The energy and demand realization rates for individual sampled Custom HVAC projects ranged from 10% to 202%, indicating a wide range of evaluation results at the project level.

- For most projects, the measures were installed and are operating as expected. A variety of discrepancies were identified in the desk reviews, however, leading to almost half of sampled Custom HVAC projects (9 of 19) having gross kWh realization rates of less than 90%, and one project having gross kWh realization rate of 10%. These discrepancies included:
  - Ex ante occupied hours versus verified occupied hours;
  - Ex ante baseline efficiencies or control requirements for New Construction or Replace on Fail measures differing from minimum code or standard requirements;
  - Discrepancies in key parameters such as cooling capacity; and

  - Ex post bin analyses generally assuming that HVAC equipment is oversized by 15% relative to the design cooling load in the absence of specific sizing information.[18]
- In some cases, ex ante calculations did not document the source of primary input assumptions. In these cases, the evaluation team reached out to the implementation team or to participants directly for the missing information, or attempted to obtain it through an onsite visit. If the information could not be obtained, the evaluation team relied on engineering judgement using the best available information.
- Two projects had discrepancies that led to gross kWh realization rates of over 110%.
  - In one project, the ex ante analysis assumed the wrong equipment type and corresponding efficiency value.
  - In another project, the ex post analysis used the baseline and proposed efficiencies as rated at the site-specific design conditions rather than the Air-Conditioning, Heating, and Refrigeration Institute (AHRI) standard testing conditions.
- Per Ameren Missouri's TRM, demand (kW) savings are calculated by multiplying each measure's energy savings (kWh) by an enduse-specific deemed CF. For each sampled project, the evaluation team reviewed the ex ante CFs by measure to ensure the correct enduse was applied, and made adjustments as needed in the ex post analysis. Two projects were found to have incorrect enduse assignments in one or more measures including: (1) water-source heat pumps, (2) economizers, and (3) demand-controlled ventilation. Each of these measures was assigned the HVAC enduse in the ex ante calculation but was changed to the Cooling enduse in the ex post calculation. The Cooling CF is approximately twice the HVAC CF so these changes increased the estimated demand savings and associated kW gross realization rates. (Note that for heat pumps, the TRM specifies that the Cooling CF is to be multiplied by the *cooling* energy savings only rather than total energy savings.)

Indoor Agriculture Impacts

- The overall gross energy and demand realization rates for Custom indoor agriculture projects are 84.7% and 60.6%, respectively. For individual indoor agriculture projects, the energy savings realization rates ranged from 50% to 98%, and demand impact RRs ranged from 21% to 97%. Evaluation adjustments for Heating, Ventilation, Air Conditioning, and Dehumidification (HVACD) equipment and grow room LED lighting included the following:
  - Adjustments to ex ante assumptions for baseline HVACD equipment efficiencies when they were not consistent with the relevant IECC Standard minimum efficiencies.
  - CFs for three of the four projects were updated from the HVAC enduse values to Process enduse values, which reduced ex ante demand values by 31%. We made this adjustment based on an analysis the 8,760-hour building simulation (Trane TRACE 3D) results, which compared the calculated project-specific CF to the TRM-defined HVAC and Process values, and then applying the TRM CF that was closest to the project-specific value. This adjustment was only applied to HVACD equipment.
  - For one project, the onsite verification found fewer lighting fixtures installed than were claimed in ex ante calculations. This discrepancy was also confirmed by the site contact. This impact was a minor reduction, and affected only one room type at this facility.

[18] The 15% oversizing assumption aligns with the recommended value for cooling equipment in ASHRAE 90.1 Appendix G.

- For one project, the HVACD baseline system type was changed which had a significant impact on savings. The ex ante approach assumed a package direct expansion (DX) system as the baseline to calculate savings for the central plant (chiller/boiler) system installed in the project. In the ex post analysis, we changed the baseline to a central plant with IECC minimum equipment efficiencies to align with the installed system type. To further support this change, the PY2022 project was Phase 2 of a sequence of projects at the facility and Phase 1 also installed a separate chiller-based system. This project received the largest reduction to both energy and demand savings at 50% and 21%, respectively.

Lighting Impacts

The overall gross energy and demand realization rates for Custom lighting measures are both 90.5%. The energy and demand realization rates for individual sampled Custom Lighting projects ranged from 57% to 123%. Evaluation adjustments for lighting included the following:

- For all sampled projects, the evaluation team used Ameren Missouri TRM factors where applicable (e.g., for lighting in conditioned spaces) to estimate the additional cooling savings and/or heating penalty based on the verified building type and HVAC equipment type. For retrofit projects, ex ante calculations used an average HCIF of 1.07 for measures installed in conditioned spaces regardless of the building type; for new construction projects, ex ante calculations did not use any waste heat or interactive factors to determine their final savings.[19] Adjusting the waste heat energy factor increased energy and demand savings for electrically cooled facilities and applying the heating penalty decreased energy savings for electrically heated facilities.
- For seven of the eight sampled projects (88% of sampled projects for Custom Lighting), the evaluation team made adjustments to the HOU, installed lighting fixtures wattages, and quantities based on desk reviews. Ex post calculations relied on customer-verified HOU wherever possible, while ex ante calculations applied the C&I average HOU. This increased demand and energy savings for projects with higher verified HOU and decreased energy and demand savings for projects with lower verified HOU compared to the C&I average. The ex post calculations relied on wattages derived from specification sheets and quantities from invoices, wherever possible.

4.4 Conclusions and Recommendations

The Custom Program fell short of goals and achieved energy realization rates between 70.2% (HVAC) and 90.5% (Lighting) for the enduses evaluated in PY2022. Based on the results of this evaluation, the evaluation team offers the following conclusions and recommendations for the Custom Program:

Overarching

- **Conclusion #OA-1:** Compared to PY2021, the Custom Program was smaller in PY2022 in terms of participation (259 projects in PY2022 compared to 279 projects in PY2021) but was much larger in terms of gross ex ante gross savings (68,396 MWh in ex ante gross savings in PY2022 compared to 31,884 MWh in PY2021). In part, this increase can be attributed to the inclusion of new construction projects, especially new construction indoor agriculture projects, into the Custom Program beginning in PY2022, but the Custom Program also achieved increases in ex ante gross savings in multiple enduses compared to PY2021, including lighting, compressed air, and motors.

[19] The HCIF encompasses both WHF and IF.

- **Conclusion #OA-2**: Quality control issues were prevalent in the sample of Custom projects reviewed. For example, our evaluation found the installed make and model numbers of some equipment differed from ex ante claims, projects had incomplete or non-existent summary descriptions, baseline efficiency values for New/Replace on Fail measures differed from code minimums, primary input assumptions to savings calculations were unsourced, errors existed in ex ante calculation workbooks, input parameters differed from trend data provided with the ex ante calculations, and discrepancies between the total savings in the ex ante calculations and the total savings in the project application. In one project, the total cooling capacity of one equipment type was entered as 3,788 tons in the ex ante calculations, but was verified as only 275 tons. This finding contributed to a gross realization rate of 10% for the project. In another example, 19 out of 23 ex ante calculation workbooks had errors in one or more input parameters, and the total savings differed from the savings entered on the application. In another example, nine out of nine rooftop units were found to have a different make and model number (and associated efficiency rating) than in the application, despite the project receiving a post-inspection. While some of the errors discovered had relatively minor effects on the project's gross realization rate, others had a very large impact.
  - **Recommendation:** We recommend the implementation team review its quality control processes, especially with regard to third-party engineering calculations submitted with Custom Program applications. As a general practice, we recommend that the implementer document its engineering reviews in a standard workbook template including project description, baseline descriptions, savings summary, verification of correct energy code version (as applicable), clearly labeled and referenced input assumptions, and recreated/modified calculations. For projects that use building energy modeling tools, the workbook should document the modeling tool name and version, key input parameters and output reports, and any changes to input parameters or data sources made by the implementation team. A quality control process such as this will help ensure Ameren Missouri and its ratepayers receive the most value from their investments in energy efficiency and will also help reduce evaluation risk by minimizing the number and extent of evaluation adjustments to project savings.

Custom HVAC

- **Conclusion #HVAC-1:** We reviewed two Custom projects that used proprietary energy modeling tools to develop the ex ante savings. The underlying calculations were therefore not accessible to the evaluation team, but the projects were simple enough that we were able to develop bin analyses to gauge the reasonableness of the ex ante savings. There was no explicit documentation in the project files that indicated the savings were thoroughly reviewed by the implementation team before approving the Custom incentive.
  - **Recommendation:** We recommend Ameren Missouri develop criteria for approving the use of proprietary energy modeling tools for Custom applications. Tools that are frequently used could be placed on an approved list after thorough review by the implementation and evaluation teams. Tools that are not frequently used should be evaluated on a project-by-project basis, with the implementation team reviewing the energy savings estimates and documenting the review in an Excel workbook as described under Conclusion #OA-2. For more complex projects that use building simulation tools, Ameren Missouri should consider developing a list of approved, widely accepted tools such as TRACE, eQuest, or Energy Plus so that both the implementation and evaluation teams can rerun the models and verify the modeling assumptions.
- **Conclusion #HVAC-2:** We reviewed two Custom projects that involved a novel device called "HVAC-CHIP" that is installed as an add-on to existing HVAC equipment and purports to save energy by modifying the control sequencing of the compressor and fans. The evaluation team reviewed the ex

ante savings calculations and requested field studies or data from the implementer demonstrating that the product saves energy as claimed. The implementer responded that they had reviewed the engineering calculations for the device but had not requested field studies or energy-savings data before approving the product as an eligible measure for Custom incentives.

- **Recommendation:** We recommend that, as general practice, the implementer request and review field studies or energy savings data before approving new technologies for Custom Program incentives. While rigorous third-party studies are not always available, it is our experience that reputable companies usually have field measurements or studies available, either developed by themselves or by third parties, that they are willing to share so that their product can qualify for energy efficiency rebates. If there are no field measurements available or the data that are available are felt to be insufficient, the implementation team can make a determination as to whether the vendor's engineering calculations are sufficient, but that is not the preferred option.

- **Conclusion #HVAC-3:** The majority of ex ante calculations we reviewed involved bin analyses. Bin analyses typically assume the design heating or cooling load for a zone from the capacity of the installed equipment rather than from the building characteristics and operation. Many ex ante calculations reviewed by the evaluation team did not assume the cooling equipment was oversized relative to the design cooling load.

  - **Recommendation**: HVAC contractors typically oversize equipment to add a "safety margin" and because equipment that is not custom-designed is available in discrete capacities. The evaluation team recommends that the implementer ensure that bin analyses incorporate oversizing assumptions using site-specific information such as selection reports, sizing calculations, or BAS trend data if available. If site-specific sizing information is not available, we recommend that bin analyses incorporate oversizing assumptions of 15% for cooling equipment and 25% for heating equipment, consistent with ASHRAE 90.1 Appendix G.

- **Conclusion #HVAC-4:** Some new construction projects used energy modeling tools as the basis for claimed energy savings. Generally, energy modeling involves the creation of a baseline building model that is supposed to represent the building if the energy enduse equipment only met the minimum efficiency requirements and the least efficient control methods allowed by code, and an efficient building model that represents the building as designed. Each model is simulated, and the difference in the resulting energy usages is equal to the energy savings. One of the projects reviewed had ex ante savings over 1,000,000 kWh, but the evaluation team determined that the baseline model largely did not meet minimum code requirements. When the evaluation team modified the baseline model to meet minimum code requirements, the savings decreased significantly, leading to a gross realization rate of only 14%. The energy models were developed by a mechanical engineering firm involved with the building design and appear to have been reviewed by the implementer.

  - **Recommendation:** While the evaluation team supports the use of energy modeling for new construction projects, it is important that baseline energy models accurately reflect local code requirements. Clearly there was a major oversight in the engineering review by the implementer for the project in question. We recommend that the implementation team develop checklists for reviewing new construction projects to help avoid oversights like this in the future, and ensure all staff involved with new construction reviews are fully familiar with relevant energy codes.

Custom Indoor Agriculture

- **Conclusion IA-1:** Poor project documentation and file organization continues to be an issue for indoor agriculture new construction projects. Over the course of PY2022 the evaluation team developed a project documentation memo and checklist to assist in the creation and standardization of packages of project documentation that concisely and completely support the ex ante savings claims. Given that this process and our guidance was provided during the program year, we also allowed time for the implementer to reconcile project documentation (in the Captures system) before we retrieved project files for sampled projects, to accommodate any additions or revisions that might be necessary in this first year of the new process. Despite these efforts, project documentation remained a barrier to efficient evaluation within the short timeframe between the close of the program year and submission of the draft report.
  - **Recommendation:** We recommend the BizSavers team review and implement the project documentation memo and checklist created by the evaluation team or work with the evaluation team to develop an improved version to ensure that all final documentation is captured and loaded to Captures for all sampled projects.
- **Conclusion IA-2:** The HVACD system characteristics and efficiency assumptions are often not completely defined or concisely summarized in the project documentation. Instead, the elements have to be assembled from multiple project documents and interactive review of the TRACE building simulation models.
  - **Recommendation:** Provide a high-level summary and narrative of HVACD systems, baseline, and efficient scenario assumptions, and how the measures are supposed to contribute to savings. This would facilitate a more complete and accurate evaluation of project HVACD savings. The summary would include all HVAC system types at the site, the areas they serve, and, most importantly, a comparison of the key building simulation parameters used for the baseline versus efficient scenarios that can be checked and evaluated against the actual models, mechanical schedules, specification sheets, and other project documentation. The implementation team should review the individual site reports in Appendix E for examples of how to provide this critical information.
- **Conclusion IA-3:** For grow area lighting, determining the number of HPS or T5 HO fixtures that would deliver the same lighting performance as the efficient LED fixture is a critical assumption to characterizing the baseline for savings calculations. In ex ante calculations the BizSavers team relies on a workbook that is used to calculate the equivalent number of fixtures for grow areas using LED performance characteristics. However, a copy of the workbook is not always included with every project.
  - **Recommendation:** A copy of the lighting equivalent baseline fixture workbook that was used to develop the project-specific claimed values should always be included in the documentation for that project.
- **Conclusion IA-4:** Per the *Agreement In Lieu Of Change Requests* filed under the PY2020 Ameren Missouri Annual Report Settlement, conventional HVAC demand CFs were used in PY2021 to estimate demand for the process HVACD systems serving the grow rooms by both the BizSavers team and the evaluation team. In PY2022, in coordination with Ameren Missouri and the BizSavers team, we decided to apply either the Process CF or HVAC CF to each project based on which was closer to the site-specific CF calculated using building energy model outputs. Our analysis of the site-specific CFs showed the peak energy-to-demand CF values were typically (3 of 4 projects) closer to the Process CF than the HVAC CF value.

- **Recommendation:** While the Process CF was closer for most projects we reviewed, we often found the site-specific CF fell largely between the Process CF and HVAC CF. Moving forward, the best option would be to develop a unique indoor agriculture "HVACD" enduse CF. Alternatively, Ameren could require that ex ante projects adopt the same approach used this year by the evaluation team to determine which enduse CF is the most appropriate for each project. The final and simplest option would be to apply the Process CF to all indoor agriculture project HVACD savings, although this could underestimate demand savings. Given that this change occurred during the PY2022 program year, Ameren Missouri did not update ex ante savings for these projects, which resulted in a lower demand realization rate. Had this change been incorporated into the ex ante claims, the savings-weighted demand savings realization rate across the four indoor agriculture projects would have been 80.3% (instead of 61%).

- **Conclusion IA-5:** While simulation models are appropriate for calculating energy savings, given the size and complexity of these projects there is an opportunity for using consumption data to assess the general consistency of energy use and energy savings.
  - **Recommendation:** We recommend conducting a post-occupancy evaluation of indoor agriculture projects to validate the building simulation modeled annual energy use against actual consumption. This would have to be conducted as a special study or under evaluation for future years since a period of 100% operational energy use would be needed. Results from this analysis could also be used to provide benchmarking of future projects, and be integrated into the indoor agriculture baseline memo.
- **Conclusion IA-6:** One of the projects used a baseline HVACD system for the grow areas that was completely different from the actual installed central plant chiller/boiler system, which is not appropriate and significantly overestimated savings. There was no justification provided in the project documentation for using the selected baseline. Additionally, this was Phase 2 of a multi-phased project at the facility and the existing Phase 1 used the same chiller/boiler HVACD system.
  - **Recommendation:** The baseline HVACD system type for grow rooms should be the same as the efficient, installed system type. For example, if the installed equipment is a package/split DX system then the baseline system should also be DX-based. The efficient configuration of a system would then be one that uses high-efficiency equipment with integrated design features (such as hot gas reheat or heat recovery) and central control scheme versus one assembled from minimum efficiency equipment and separate elements with their own separate control systems, which react independently to space conditions. Similar to many other process measures, efficiency should reflect a change in performance not a change in system type, unless a different system type is established as valid via robust industry standard practice research, formal guidance, proof that a different system was actually considered by the customer, or it is a customer's current practice for other similar existing facilities.
- **Conclusion IA-7:** For some projects, especially those that use atypical or custom-manufactured equipment, the installed units do not have AHRI-rated efficiency values. In one case, coefficient of performance (COP) values were provided without a specification sheet citation or back-up calculations. This is not surprising, given that standard air conditioning units are designed for human conditioning, not plant conditioning, but it does make it difficult to do efficiency comparisons with an assumed standard DX AHRI-rated equipment baseline.
  - **Recommendation:** For any custom or atypical HVACD equipment that does not have AHRI-rated efficiency values consistent with either the federal equipment Standards or IECC, ensure that an appropriate efficiency value is available from the manufacturer, ideally cited on a specification

sheet. Alternatively, the BizSavers team could provide a calculated value, but the approach used to calculate the value must be clearly documented and included in the project documentation.

- **Conclusion IA-8:** One project was not yet operational, and was not expected to be operational until March 2023.
  - **Recommendation:** For projects that are not expected to be fully or almost fully operational at some time during the program year, consider deferring the claim for those projects to the year that they are expected to be operational. This will help reduce uncertainty in ex ante and ex post savings calculations.

Custom Lighting

- **Conclusion #L-1**: For retrofit measures, the program implementer used a HCIF of 1.07 to estimate HVAC interactive effects when calculating ex ante energy and demand savings for interior lighting measures in conditioned spaces. The implementer used this "C&I Average" value from a previous TRM version, regardless of building type, HVAC system type, or heating fuel.
  - **Recommendation**: To improve the accuracy of ex ante savings, we recommend that the implementer estimate the HVAC interactive effects by applying either customized calculations (e.g., based on the site-specific HVAC equipment efficiencies) or the building type-specific WHF and IF values provided in the Ameren Missouri TRM, based on building and HVAC type.
- **Conclusion #L-2**: A key parameter for estimating savings for lighting projects is the annual HOU for baseline and new lighting systems. For most Custom lighting projects, the project documentation did not include information supporting the annual HOU value.
  - **Recommendation**: We recommend the implementer develop a standardized approach to estimating and documenting annual lighting system HOU. The details supporting the HOU estimate should include daily lighting schedules for weekdays, weekends, holidays, and any seasonal variation (e.g., for schools) and should be included in the project documentation.
- **Conclusion #L-3**: Other key parameters for estimating energy savings for lighting projects are the quantity and wattages for baseline and new lighting fixtures. For several projects, this information was not included in project documentation. For two of the eight sampled Custom lighting projects, the project documentation lacked one or more of these parameters needed to verify ex ante savings calculations.
  - **Recommendation**: We recommend the implementer develop a standardized approach to documenting these parameters, including the fixture types, counts, and wattages by building area (e.g., office, bathroom, hallway, etc.)

5. Small Business Direct Install Program

This chapter summarizes the PY2022 evaluation methodology and results for the SBDI Program. The PY2022 evaluation of the SBDI Program included an engineering analysis of lighting measures. It did not include an assessment of program attribution or program processes.

The SBDI Program is designed to promote the installation of energy-efficient technologies in small businesses by removing barriers such as high upfront cost, lack of knowledge, and lack of time and resources to investigate energy efficiency opportunities. The target market includes small non-residential customers with a Small General Service Rate 2(M), including commercial and institutional customers but excluding multifamily customers. The SBDI Program encourages small business customer participation through a simple, immediate, and streamlined program process. A group of SBDI Program Service Providers delivers the energy-efficient measures at low-cost to small business customers. These Service Providers supply, install, and finalize paperwork for eligible participants, and are tasked with identifying additional energy efficiency opportunities not covered under the SBDI Program.

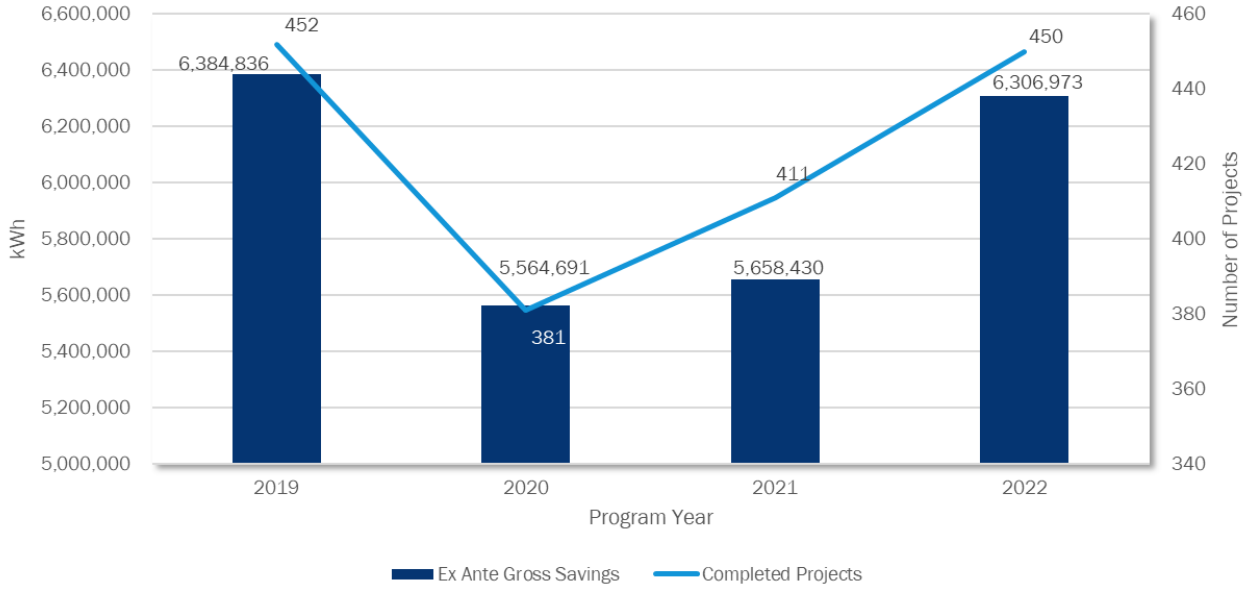
The SBDI Program is an ongoing program from MEEIA Cycle II. In PY2019, program-eligible measures were limited to LED lighting and smart thermostats. In PY2020, the program introduced additional HVAC measures (air-cooled chillers, advanced rooftop unit controls, and demand controlled ventilation), occupancy sensors, and exterior lighting (in combination with interior lighting projects). The program also increased the incentive cap in PY2020, from $3,500 to $5,000 (per Ameren Missouri customer per cycle); developed a simplified, stand-alone HVAC application form; and extended the application due date from 30 to 90 days of the invoice date. These changes remained in effect in PY2021 and PY2022. In September 2022, the program increased incentives for all measures by approximately 25%.

5.1 Participation Summary

During PY2022, the SBDI Program provided incentives to 344 unique small businesses for a total of 450 projects,[20] resulting in 6,307 MWh of ex ante gross energy savings. This level of participation and savings was similar to PY2019 (452 projects and 6,385 MWh in ex ante gross savings) and represents an increase relative to PY2021 (411 projects and 5,658 MWh of ex ante savings) and PY2020 (381 projects and 5,565 MWh of ex ante gross savings; see Figure 3).

[20] Unique businesses are defined at the company level, rather than the location level (i.e., a company that participated at more than one location is only counted once).

Figure 3. PY2022 SBDI Project Completions and Ex Ante Gross Savings



In PY2019 and PY2021, all incentives provided through the SBDI Program were for lighting measures. PY2020 program activity was still dominated by lighting (accounting for 99.8% of ex ante gross savings) but also included four projects with HVAC measures (smart thermostats). In PY2022, program activity was again dominated by lighting, but the program incented a single non-lighting measure: a three-ton SEER 14 package DX air conditioner.

In 2022, 21% of SBDI projects were implemented at tenant-occupied buildings, a traditionally hard-to-reach population, a slight decrease from PY2021 (25%) and a significant decrease from the 54% in PY2020. Overall, 28 Service Providers completed SBDI projects in PY2022 (up from 23 in PY2020 and 20 in PY2021), with the most active four providers accounting for 42% of all projects.

5.2 Evaluation Methodology

Table 18 provides an overview of the PY2022 evaluation activities for the SBDI Program. Most of these activities are similar across the various business programs and are described in Chapter 2.

Table 18. PY2022 Evaluation Activities for the SBDI Program

Evaluation Activity	Description
Program Manager and Implementer Interviews	▪ Conducted interviews in December 2021 to inform evaluation planning and in January 2023 to understand program staff's perspective on program performance.
Program Material Review	▪ Reviewed program materials to understand program changes relative to PY2021.
Engineering Analysis (Lighting Measures)	▪ Verified that ex ante savings use correct TRM algorithms and project-specific values or TRM assumptions. ▪ Developed ex post savings using TRM algorithms, site-specific parameters, and deemed savings assumptions.

We conducted an engineering analysis of all SBDI Program lighting measures to estimate ex post gross program savings. We first reviewed program-tracking data to verify that ex ante savings calculations used correct TRM algorithms and savings assumptions. We then calculated ex post savings using Ameren Missouri TRM algorithms, site-specific parameters from the program-tracking database, and deemed savings assumptions (including application of HOU and ISR adjustment factors).

Given the small contribution of non-lighting measures to SBDI Program savings (<0.1%), we applied a default realization rate of 100% for non-lighting measures.

5.3 Evaluation Results

This section summarizes gross impact results for the PY2022 SBDI Program, which was the third largest program in Ameren Missouri's Business Portfolio in PY2022, but contributed just 5% of ex post gross energy savings and 3% of ex post gross demand savings.

Table 19 compares first year ex ante and ex post gross savings, at the program level. As shown, the program achieved first year ex post gross energy and demand savings of 6,216 MWh and 1.22 MW, respectively, representing 53% of the program gross energy savings goal and 58% of the program gross demand savings goal. As noted above, all savings come from lighting measures, including linear and non-linear LED lighting, LED exit signs, lighting controls, and one efficient air conditioning unit.

Table 19. PY2022 SBDI Gross Impacts

	Ex Ante Gross	Gross RR	Ex Post Gross	Goal Gross	% of Goal
Energy Savings (MWh)	6,307	98.6%	6,216	11,777	53%
Demand Savings (MW)	1.20	101.9%	1.22	2.12	58%

As shown in the table above, the SBDI Program achieved gross realization rates of 98.6% and 101.9% for energy and demand savings, respectively. Based on the engineering analysis for lighting measures, we made the following adjustments to ex ante savings assumptions:

- **WHF and IF.** To capture the heating and cooling interactive impacts when calculating ex ante savings for interior lighting measures, the program implementer applies an average HCIF of 1.07 for measures installed in air-conditioned spaces. The HCIF encompasses both WHFs and IFs. Notably, the implementer applies the HCIF to both energy and demand savings, even though heating penalties are not relevant for demand savings. In contrast, the evaluation team used building-specific assumptions, based on information reported in the program-tracking database and in accordance with the Ameren Missouri TRM:
  - For energy savings, the evaluation team applied building type-specific WHFs and building and HVAC type-specific IFs based on the Ameren Missouri TRM tables, resulting in a weighted average WHF/IF factor of 1.06 and lower ex post energy savings compared to ex ante.
  - For demand savings, the evaluation team applied building type-specific WHFs, resulting in a weighted average WHF of 1.09 and higher ex post demand savings compared to ex ante.
- **Application of ISR and HOU Adjustment.** We applied the TRM-prescribed parameters for the SBDI Program of 99.2% ISR and 100.7% HOU adjustment, for a combined adjustment of 99.9%. This had minimal impact on ex post savings.
- **Coincidence Factor for LED Exit Signs Replacing CFL Exit Signs.** The PY2022 SBDI Program provided incentives for 7 LED exit signs that replaced CFL exit signs. Ex ante demand savings use the

coincidence factor (CF) for 24/7 exterior/garage lighting (0.0001379439) instead of the TRM-prescribed value for this measure (0.0001899635). As a result, ex post demand savings for these measures are higher than ex ante savings.

Table 20 presents first year ex post gross energy and demand savings by measure type. As shown, more than two-thirds of both energy and demand savings came from linear LEDs replacing T12s.

Table 20. PY2022 SBDI Ex Post Gross Savings by Measure Category

Measure Category	Energy Savings		Demand Savings	
	MWh	%	MWh	%
Lighting	6,216	100%	1.22	100%
LED Replacing T12	4,432	71%	0.87	71%
Other Linear LED	957	15%	0.19	15%
Other Non-Linear LED	724	12%	0.14	12%
LED Replacing Incandescent A-Lamp	90	1%	0.02	1%
LED Exit Sign	4	<1%	<0.01	<1%
Lighting Controls	9	<1%	<0.01	<1%
HVAC	0.2	<1%	<0.01	<1%
Total	**6,216**	**100%**	**1.22**	**100%**

5.4 Conclusions and Recommendations

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

- **Conclusion #1:** While the program still fell well short of its savings goals, achieving 53% of first year gross energy savings and 57% of first year gross demand saving, PY2022 saw an increase in participation and ex ante savings compared to the previous two years. The PY2022 program was again less successful in encouraging participation by renters, a traditionally hard-to-reach population, with 21% of PY2022 SBDI projects implemented in tenant-occupied buildings (compared to 25% in PY2021 and 54% in PY2020). Yet, the program engaged with more approved SBDI Service Providers than in any previous year of the MEEIA III Cycle.
- **Conclusion #2:** Lighting measures continued to dominate the SBDI Program, with virtually no uptake of non-lighting measures.
  - **Recommendation:** Continue to harvest energy savings from lighting measures, while available, but work with Service Providers to increase promotion of other enduses to facilitate the transition away from lighting as the LED market matures. Ensure that the network of approved Service Providers includes a sufficient number of providers that offer non-lighting services throughout Ameren Missouri's service territory.
- **Conclusion #3:** The program implementer uses an average HCIF of 1.07 to estimate ex ante energy and demand savings for lighting measures installed in air-conditioned spaces, regardless of building type or heating system fuel. In contrast, the evaluation team applied building and HVAC type-specific WHFs and IFs based on the tracked building and system types for each project and specifications in the Ameren Missouri TRM Appendix H. Across all projects, the average combined ex post energy savings adjustment (WHF plus IF) was 1.06, and the average ex post demand savings adjustment (WHF only) was 1.09.

- **Recommendation:** To improve the accuracy of ex ante savings, we recommend that the implementer either (1) apply building and HVAC type-specific WHF and IF values (as stipulated in the TRM and done in the ex post analysis); or (2) apply the revised TRM HCIF of 1.056 to calculate energy savings and the newly added IF_{kW} factor of 1.032 to calculate demand savings.[21]

[21] IF_{kW} is a second electric heat interaction factor designed to remove the heating penalty from demand savings. This factor is necessary when ΔkW is calculated as $kW = \Delta kWh \; x \; CF$ and ΔkWh includes the heating penalty; it is necessary because demand savings should not include the heating penalty. The IF_{kW} of 1.032 was developed based on PY2021 ex post energy and demand lighting savings.

6. Retro-Commissioning Program

This section summarizes the PY2022 evaluation methodology and results for the RCx Program. The PY2022 evaluation of the RCx Program included desk reviews and onsite visits for a sample of five projects. It did not include an assessment of program attribution or program processes.[22] Additional details on the evaluation methodology are presented in Chapter 2. Appendix F includes detailed findings from the desk reviews and onsite visits.

The RCx Program is designed to help customers retro-commission existing facilities. Program activities include conducting a retro-commissioning study, benchmarking existing building system performance levels, identifying operating system performance optimization improvements, and, where applicable, providing financial incentives to support implementation of program recommendations. The most common optimization measures involve compressed air, refrigeration, and building systems. The program relies on program-approved contractors (Retro-Commissioning Service Providers, or RSPs) to deliver measurable energy savings. These RSPs complete a facility energy study on equipment optimization and educate customers about maintaining equipment efficiency.

The PY2022 RCx Program is an ongoing program from MEEIA Cycle II. Incentive levels and program design remained largely consistent with PY2021.

6.1 Participation Summary

The PY2022 RCx Program completed nine projects, accounting for 2,066 MWh of ex ante gross energy savings. Table 21 presents PY2022 participation and gross energy savings by enduse.

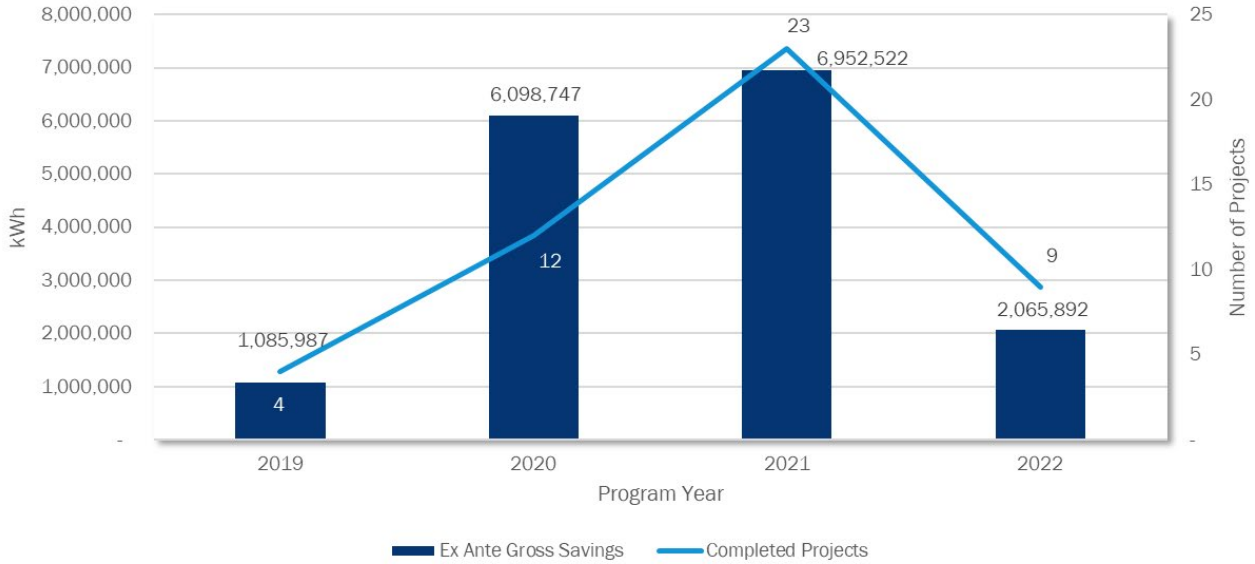
Table 21. PY2022 RCx Program Participation Summary

Enduse/Channel	Projects		Ex Ante Savings	
	Number	%	MWh	%
Compressed Air	7	78%	1,743	84%
HVAC	2	22%	323	16%
Total	**9**	**100%**	**2,066**	**100%**

Compared to PY2021, the RCx Program completed less than half as many projects (nine projects in PY2022 compared to 23 projects in PY2021) and generated only one-third of ex ante savings (2,066 MWh in PY2022 compared to 6,953 MWh in PY2021; see Figure 4).

[22] The evaluation also did not include assessment of Virtual Commissioning™ projects, as described in our evaluation plan, because this channel did not launch during PY2022.

Figure 4. PY2022 RCx Project Completions and Ex Ante Gross Savings



6.2 Evaluation Methodology

Table 22 provides an overview of the RCx Program evaluation activities. Following the table, we outline program-specific aspects of evaluation methodologies. Most of these activities are similar across the various business programs and were described in Chapter 2. The sections following the table highlight program-specific aspects of key evaluation activities.

Table 22. PY2022 Evaluation Activities for the RCx Program

Evaluation Activity	Description
Program Manager and Implementer Interviews	▪ Conducted interviews in December 2021 to inform evaluation planning and in January 2023 to understand program staff's perspective on program performance.
Program Material Review	▪ Reviewed program materials to understand program changes relative to PY2021.
Engineering Desk Reviews & Onsite Verification	▪ Reviewed supporting project documentation for a sample of projects to ensure that original data was correctly entered from invoices and other documentation. ▪ Performed onsite verification visits for a sample of projects to confirm quantity and continued operation of incented measures, collected additional data to develop energy savings, and verify other parameters through staff interviews. ▪ Collected additional data and confirmed key analysis parameters through direct outreach to participants. ▪ Collected pre/post facility consumption data, when possible, to validate the overall savings impact. ▪ Developed ex post savings for the sample and the population.

The evaluation team conducted engineering desk reviews for a sample of five projects to review and verify project documentation and savings assumptions. The main purpose of the desk reviews was to verify that the program-tracking database correctly reflected the installed measure(s), including equipment types, efficiencies, quantities, hours of operation, set points, and other information needed to verify project installation and estimate gross energy and savings. Where possible, we confirmed or updated key analysis inputs through direct outreach to participants. Wherever needed and possible, we leveraged phone and e-mail

communication with site contacts to verify measure installation and operation, including timing of the installation, and key parameters affecting savings for HVAC and compressed air equipment (e.g., occupancy schedules, system setpoints, HOU, and operating strategies). To support the desk review data collection, site contacts provided photographs of installed equipment (e.g., equipment nameplates), screenshots from the building automation systems, and trend data showing historical performance.

We conducted onsite visits for a subset of three of the five RCx projects, where key project details or parameters could not be verified through the desk reviews and customer outreach. Onsite visits provided additional rigor to the verification process by confirming through visual inspection that the incented measures were still installed and operational, the commissioning actions (such as leak repair) occurred, and that the baseline conditions, equipment characteristics, and building characteristics were consistent with project documents and program implementer assumptions.

Table 23 summarizes the final sample for the desk reviews and onsite visits for the PY2022 RCx Program.

Table 23. RCx Gross Impact Sampling Summary

Size Stratum	Number of Projects		
	Population	Desk Reviews	Onsite Visits
Stratum 2 (Large)	3	2	0
Stratum 1 (Small)	6	3	3
Total	**9**	**5**	**3**

6.3 Evaluation Results

This section summarizes gross impact results for the PY2022 RCx Program. Ex post gross savings are based on desk reviews and onsite verification for a sample of five (out of nine) projects.

Table 24 presents PY2022 RCx Program annual gross savings. As shown, the program achieved first year ex post gross energy and demand savings of 2,042 MWh and 0.40 MW, respectively, representing 25% of the program gross energy savings goal and 13% of the program gross demand savings goal.

Table 24. PY2022 RCx Program Gross Impact Summary

	Ex Ante Gross	Gross RR	Ex Post Gross	Goal Gross	% of Goal
Energy Savings (MWh)	2,066	98.8%	2,042	8,111	25%
Demand Savings (MW)	0.41	96.7%	0.40	2.97	13%

The overall gross energy and demand realization rates for the RCx program are 98.8% and 96.7%, respectively. Project-level realization rates for the sampled RCx projects ranged from 69% to 124% for both energy and demand savings. Onsite visits conducted for three of the five sampled projects showed evidence of project implementation. Two of the five projects have realization rates over 100% for both energy and demand savings, two projects have realization rates between 90% and 100%, and one project has a realization rate of 69%. Key adjustments for the sampled RCx projects included:

- Four of the five sampled projects consisted of retro-commissioning studies of compressed air systems followed by the repair of leaks identified during the studies. The implementation team used collected data alongside power and flow curves to calculate the impact of leak repairs.

- Within the ex ante analyses the evaluation team found discrepancies in the HOU between the hours recommended by the Ameren Missouri TRM, the hours represented by the collected data, the hours used by the implementation team, and the hours reported by facility staff. The evaluation team prioritized the HOU reported by facility staff, using Ameren Missouri TRM recommendations for facilities with 24/7 operation. These changes reduced the energy and demand savings for the compressed air projects.
- Another area of discrepancy observable in two of the compressed air RCx projects is the modification of compressor maximum power consumption based on system operating pressures. In both cases this reduced energy and demand savings.
- Two of the compressed air projects have leakage rate discrepancies. These are a result of slight differences in leakage rates assumed for the given size/pressure of the leaks along with, in one case, a discrepancy in the pressure assumed at the leaks. These changes slightly altered energy and demand savings.
- In one of the compressed air projects, the onsite visit found a different compressor in use than the one included in the original savings calculations. The adjustments in the calculations to align with the identified compressor resulted in an increase in energy and demand savings.

- The fifth sampled RCx project optimized HVAC equipment scheduling and operation. These improvements include supply fan optimization for which the ex ante calculation included energy savings from lowering the fan speed and reduced use of the compressor. The evaluation team believes that only fan savings should result from this measure because in the existing situation the compressor cycles off and on, resulting in a similar energy consumption. This change results in a reduction in energy and demand savings associated with the project.

Additional details on the sampled projects—including findings, ex post analysis methods, and reasons for discrepancies—are available in the individual site reports in Appendix F.

Table 25 presents first year ex post gross energy and demand savings by enduse. As shown, the majority of ex post gross savings comes from the compressed air enduse (84.4% of energy and 58.8% of demand).

Table 25. PY2022 RCx Program Ex Post Gross Savings by Enduse

Enduse	Energy Savings		Demand Savings	
	MWh	%	MW	%
Compressed Air	1,722	84.4%	0.23	58.8%
HVAC	319	15.6%	0.16	41.2%
Total	**2,042**	**100%**	**0.40**	**100%**

6.4 Conclusions and Recommendations

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

- **Conclusion #1:** Evaluation activities verified that all five sampled RCx projects were implemented and operating based on available project materials. Only one of the sampled RCx projects included post-implementation trend data. Utilizing trend data to verify implementation and savings is a best practice.
  - **Recommendation:** Share best practices among RSPs and encourage them to collect pre- and post-installation trend data and/or to provide a method for the implementer to remotely obtain access

to the management systems to collect these trend data. Trend data can help facility personnel verify achieved savings and facilitate evaluation of program savings.

- **Conclusion #2:** Four of the five sampled projects consisted of the retro-commissioning of compressed air systems in industrial facilities. In each of these projects, leak repairs were the only source of savings attributed to retro-commissioning.
  - **Recommendation:** Consider strategies to encourage customers to pursue additional savings measures identified in the RCx studies.

7. Business Social Services Program

This chapter summarizes the PY2022 evaluation methodology and results for the BSS Program. While the BSS Program is part of Ameren Missouri's portfolio of low-income programs, the evaluation results are presented in this volume because of implementation and evaluation similarities with the other business programs: (1) it is implemented by the same implementation contractor using similar program processes, and (2) it was evaluated using similar evaluation methods. The PY2022 evaluation of the BSS Program included an engineering analysis of lighting measures. The evaluation did not include an assessment of program attribution or program processes.

The BSS Program was a new program for Ameren Missouri in PY2019. The program is designed to promote the installation of energy-efficient technologies in social service organizations by removing barriers such as high upfront cost, lack of financing, lack of knowledge, and lack of time and resources to investigate energy efficiency opportunities. The target market consists of commercial, nonprofit, and tax-exempt business customers that provide social services to the low-income public in federally designated opportunity zones, including family services, healthcare facilities, homeless shelters, employment services, worker training organizations, job banks, and childcare facilities. The BSS Program provides lighting and other measures at low- or no-cost to social services business customers with qualifying facilities. Program-approved Service Providers supply and install measures, finalize paperwork for eligible participants, and identify additional energy efficiency opportunities not covered under the BSS Program. The BSS Program offers the highest incentive levels for deemed measures among all BizSavers programs, including incentives for select interior lighting measures that cover 100% of eligible costs.

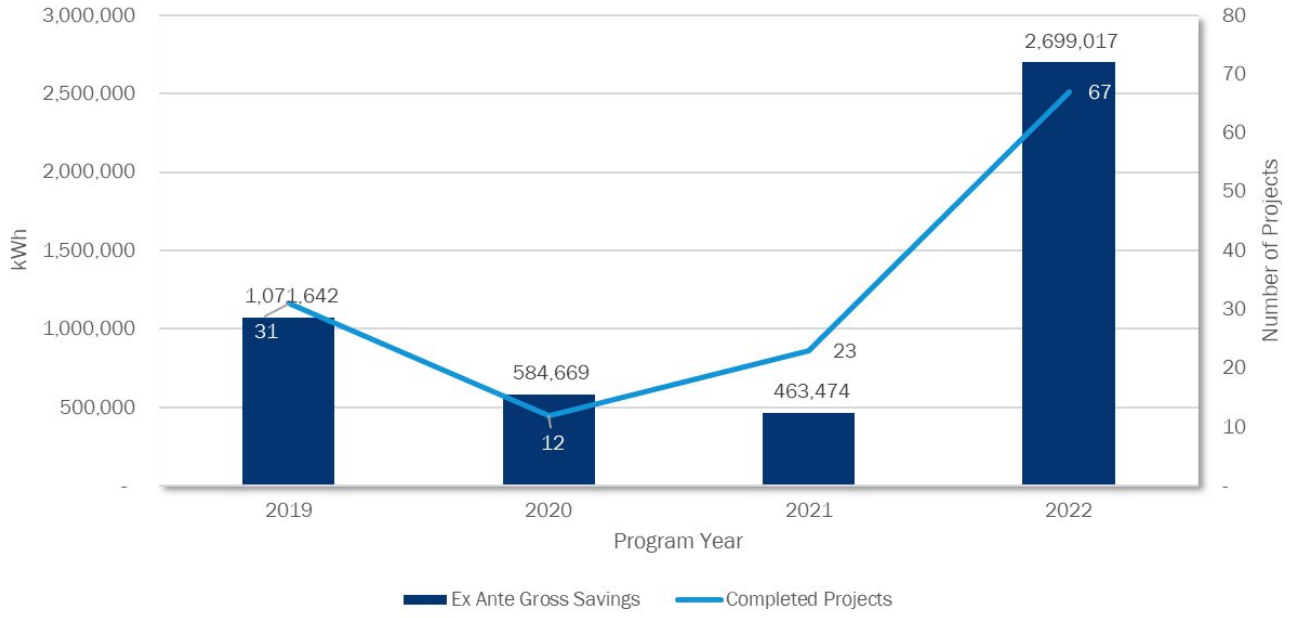
In PY2022, primary responsibility of outreach for the BSS Program shifted from Ameren Missouri's Corporate Contributions and Community Initiatives Group to the implementation contractor, in response to higher program goals and budgets. In addition, incentive levels for all available BSS measures increased in September 2022.

7.1 Participation Summary

In PY2022, the BSS Program served 43 unique customers, mostly social services organizations. These customers implemented 67 energy efficiency projects accounting for 2,699 MWh of ex ante gross energy savings, a significant increase compared to program participation and savings in prior years of this program cycle (see Figure 5). According to implementation staff, the increase in BSS-realized savings in PY2022 was a direct result of PY2022 goals and budgets that exceeded those of PY2019, PY2020, and PY2021 combined. In prior years, the program implementer discontinued enrollment when the program reached its implementation budgets, but this was not the case in PY2022.

Similar to prior program years, PY2022 program activity was dominated by LED lighting upgrades; only one of the 43 participants installed non-lighting measures (two SEER 16 air conditioning units).

Figure 5. PY2022 BSS Project Completions and Ex Ante Gross Savings



7.2 Evaluation Methodology

Table 26 provides an overview of the PY2022 evaluation activities for the BSS Program. Most of these activities are similar across the various business programs and were described in Chapter 2.

Table 26. PY2022 Evaluation Activities for the BSS Program

Evaluation Activity	Description
Program Manager and Implementer Interviews	▪ Conducted interviews in December 2021 to inform evaluation planning and in January 2023 to understand program staff's perspective on program performance.
Program Material Review	▪ Reviewed program materials to understand program changes relative to PY2021.
Engineering Analysis (Lighting Measures)	▪ Verified that ex ante savings use correct TRM algorithms and project-specific values or TRM assumptions. ▪ Developed ex post savings using TRM algorithms, site-specific parameters, and deemed savings assumptions.

We conducted an engineering analysis of all BSS Program lighting measures to estimate ex post gross program savings. We first reviewed program-tracking data to verify that ex ante savings calculations used correct TRM algorithms and savings assumptions. We then calculated ex post savings using Ameren Missouri TRM algorithms, site-specific parameters from the program-tracking database, and deemed savings assumptions (including application of HOU and ISR adjustment factors).

Given the small contribution of non-lighting measures to BSS Program savings (<0.1%), we applied a default realization rate of 100% for non-lighting measures.

7.3 Evaluation Results

This section summarizes gross impact results for the PY2022 BSS Program. Table 27 compares first year ex ante and ex post savings, at the program level. As shown, the program achieved first year ex post gross energy and demand savings of 2,767 MWh and 0.531 MW, respectively, representing 47% of the program gross energy savings goal and 38% of the program gross demand savings goal.

Table 27. PY2022 BSS Savings Summary

	Ex Ante Gross	Gross RR	Ex Post Gross	Goal Gross	% of Goal
Energy Savings (MWh)	2,699	102.5%	2,767	5,918	47%
Demand Savings (MW)	0.513	103.5%	0.531	1.39	38%

As shown in the table above, the BSS Program achieved gross realization rates of 102.5% to 103.5% for energy and demand savings, respectively. Based on the engineering analysis for lighting measures, we made the following adjustments to ex ante savings assumptions:

- **WHF and IF.** To capture the heating and cooling interactive impacts when calculating ex ante savings for interior lighting measures, the program implementer applies an average HCIF of 1.07 for measures installed in air-conditioned spaces. The HCIF encompasses both WHF and IF. Notably, the implementer applies the HCIF to both energy and demand savings, even though heating penalties are not relevant for demand savings. In contrast, the evaluation team used building-specific assumptions, based on information reported in the program-tracking database and in accordance with the Ameren Missouri TRM:
  - For energy savings, the evaluation team applied building type-specific WHFs and building and HVAC type-specific IFs based on the Ameren Missouri TRM tables, resulting in a weighted average WHF/IF factor of 1.09 and higher ex post energy savings compared to ex ante.
  - For demand savings, the evaluation team applied building type-specific WHFs, resulting in a weighted average WHF of 1.10 and higher ex post demand savings compared to ex ante.
- **Application of ISR and HOU Adjustment.** We applied the TRM-prescribed parameters for the BSS Program of 100.1% ISR and 100% HOU adjustment, for a combined adjustment of 100.1%. This had minimal impact on ex post savings.
- **Coincidence Factor for LED Exit Signs Replacing CFL Exit Signs.** The PY2022 BSS Program provided incentives for 45 LED exit signs that replaced CFL exit signs. Ex ante demand savings use the coincidence factor (CF) for 24/7 exterior/garage lighting (0.0001379439) instead of the TRM-prescribed value for this measure (0.0001899635). As a result, ex post demand savings for these measures are higher than ex ante savings.

Table 28 presents first year ex post gross energy and demand savings by measure type. As shown, half of both energy and demand savings came from linear LEDs replacing T12s.

Table 28. PY2022 BSS Ex Post Gross Savings by Measure Category

Measure Category	Energy Savings		Demand Savings	
	MWh	%	MW	%
Lighting	2,765	100%	0.53	100%
LED Replacing T12	1,382	50%	0.26	50%
Other Linear LED	693	25%	0.13	25%
Other Non-Linear LED	470	17%	0.09	17%
LED Replacing Incandescent A-Lamp	201	7%	0.04	7%
LED Exit Sign	18	1%	<0.01	1%
HVAC	2	<1%	<0.01	<1%
Total	**2,767**	**100%**	**0.53**	**100%**

7.4 Conclusions and Recommendations

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

- **Conclusion #1:** In PY2022, the BSS Program supported more projects (67) and achieved higher ex ante energy savings (2,699 MWh) than the prior three years combined (66 projects and 2,120 MWh). Yet, the program's gross energy and demand savings goals both increased by more than a factor of three compared to PY2021, and therefore the program still only achieved 47% and 38% of its energy and demand savings goals, respectively.
- **Conclusion #2:** The program achieved strong first year energy and demand realization rates (102.5% and 103.5%, respectively).
- **Conclusion #3:** The program implementer uses an average HCIF of 1.07 to estimate ex ante energy and demand savings for lighting measures installed in air-conditioned spaces, regardless of building type or heating system fuel. In contrast, the evaluation team applied building- and HVAC-type-specific WHFs and IFs based on the tracked building and system types for each project and specifications in the Ameren Missouri TRM Appendix H. Across all projects, the average combined ex post energy savings adjustment (WHF plus IF) was 1.09, and the average ex post demand savings adjustment (WHF only) was 1.10.
  - **Recommendation:** To improve the accuracy of ex ante savings, we recommend that the implementer either (1) apply building and HVAC type-specific WHF and IF values (as stipulated in the TRM and done in the ex post analysis); or (2) apply the revised TRM HCIF of 1.056 to calculate energy savings and the newly added IF_{kW} factor of 1.032 to calculate demand savings.[23]

[23] IF_{kW} is a second electric heat interaction factor designed to remove the heating penalty from demand savings. This factor is necessary when ΔkW is calculated as $kW = \Delta kWh \; x \; CF$ and ΔkWh includes the heating penalty; it is necessary because demand savings should not include the heating penalty. The IF_{kW} of 1.032 was developed based on PY2021 ex post energy and demand lighting savings.

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