8. Demand-Side Resources

Highlights

Ameren Missouri completed a comprehensive Demand Side Management (DSM) Market Potential Study (MPS) in April 2023.

- *The study identified and developed two portfolios for inclusion in the IRP. This includes the Realistic Achievable Potential (RAP), and Maximum Achievable Potential (MAP) portfolios.*
  - *RAP portfolio identified nearly 4.75 million MWh and 1.68 GW of cost-effective DSM potential available to customers by 2043, while MAP identified more than 6.15 million MWh and nearly 2.58 GW.*
- *Key components of the analysis include:*
  - *Methodologies to account for the interactive effects of DSM measures, segregate results by residential and business sectors, and calibrate first year results to existing program delivery;*
  - *Load Flexibility scenario analysis to demonstrate the potential of EE, DR, and DER MWh and MW reduction potential when applied to winter load;*
  - *An expanded Distributed Energy Resource potential (Combined Heat & Power and Solar Photovoltaic) study, including a sensitivity analysis of increased transmission and distribution avoided costs representing locational value; and*
  - *A comprehensive scenario analysis across all sectors used to inform the load and cost risk adjusted analysis of DSM portfolios.*
- *A discussion of ongoing Missouri Energy Efficiency Investment Act (MEEIA) plans, extensions, and filings including potential implications for special contemporary issues identified by stakeholders.*

8.1 Key Takeaways from DSM Potential Study

The primary purpose of this chapter is to document and describe the various DSM portfolios included within this IRP. Additionally, this chapter highlights emerging issues and connections to the broader resource planning framework, where applicable.

The DSM portfolios passed on for further integrated analysis are based on the robust and comprehensive analysis completed as part of the 2023 DSM Market Potential Study (2023 MPS).[1] Each DSM portfolio includes the total resource potential from four sectors (residential, business, demand response, and distributed energy resources (DER)). The

[1] 20 CSR 4240-22.050(1); The 2023 MPS was released in April 2023 and included as Appendix A to this chapter. The 2023 MPS also includes a complete regulatory compliance checklist as Appendix G. This Chapter includes relevant rule references. The interested reader should also refer to the more detailed Market Potential Study and Appendix G.

potential from these sectors is combined into two different portfolios for further analysis.[2] In addition to these portfolios, a separate analysis was conducted to determine MAP and RAP load flexibility potential. These portfolios are defined as follows:

- **Maximum Achievable Potential (MAP):** Represents the maximum amount of cost-effective DSM that would be expected, assuming incentives that cover the full incremental cost of qualifying measures;
- **Realistic Achievable Potential (RAP):** Represents all cost-effective DSM that would be expected, based on forecast incentive levels and customer willingness to participate, as identified through primary market research conducted in 2020.

Figures 8.1,8.2a, and 8.2b provide the results of the MAP portfolio, RAP portfolio, and load flexibility analysis with respect to energy and demand potential. Across all four sectors studied, the MAP portfolio identified more than 6.15 million MWh and nearly 2.58 GW of cumulative annual potential by 2043, while the RAP portfolio identified nearly 4.75 million MWh and 1.68 GW of cumulative annual potential by 2043.

Total potential in each sector was developed after a careful assessment of baseline market conditions for residential and business customers across relevant dimensions of housing type and income level. This included an assessment of the penetration and saturation of the type and efficiency level of various end use technologies already in use within Ameren Missouri's service territory. Baseline market research conducted in 2020 was also used to estimate customers' willingness to participate and adopt future technologies at various future incentive levels.

Results for the first year of the study (2024) were calibrated to evaluate historic program achievement. This creates consistency between future potential and actual program delivery. As a final check, the MAP and RAP results from the 2023 MPS were benchmarked against a national U.S. Department of Energy (DOE) database of 20-year potential studies and a peer benchmark against ten comparable utility programs. That analysis confirmed that these values are relatively consistent with going forward industry expectations.

[2] 20 CSR 4240-22.050(1)(D); 20 CSR 4240-22.050(4)(E)

Figure 8.1: DSM Portfolios, Cumulative Annual Energy Efficiency Potential (MWh)

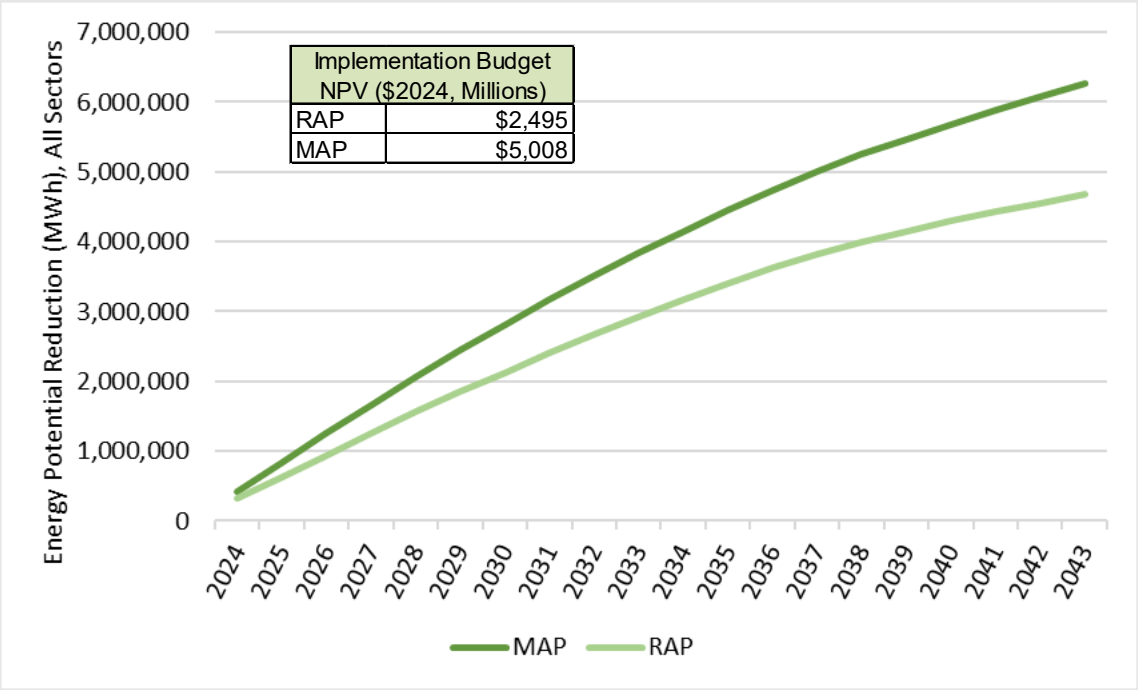


Figure 8.2a: Summer Demand Reduction (MW)

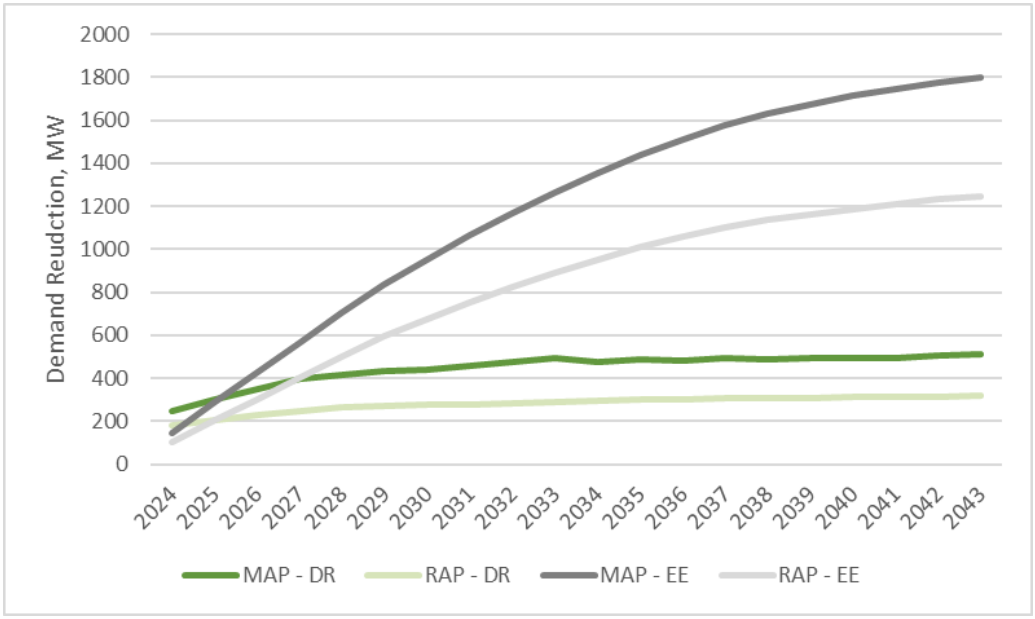
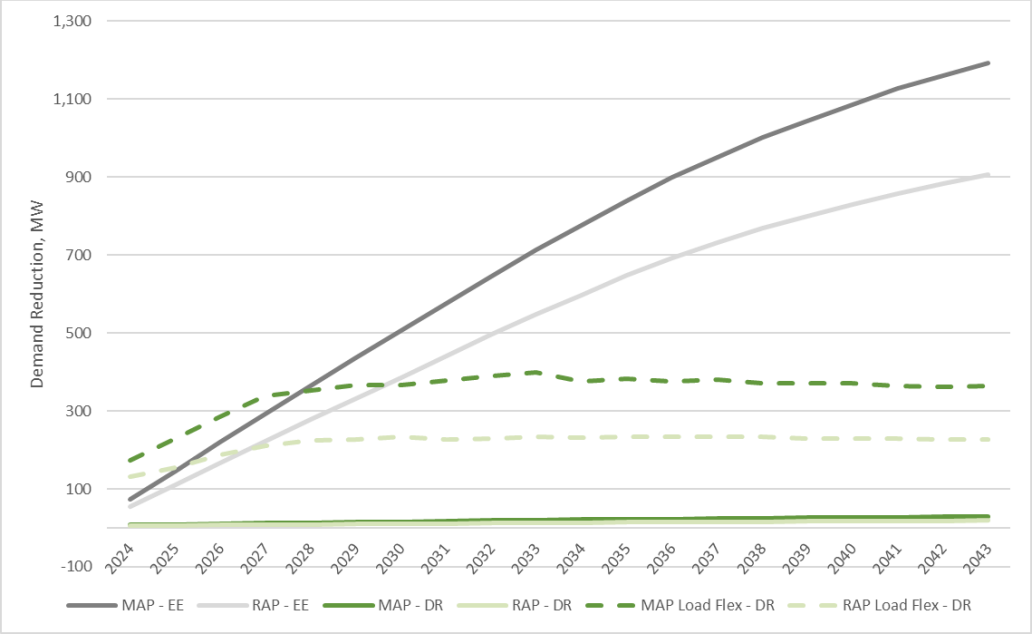


Figure 8.2b: Winter Demand Reduction (MW)



To visualize potential future scenarios, a comprehensive load and cost risk adjusted analysis was developed for each of the DSM portfolios presented above. The 2023 MPS developed sector specific scenarios for each sector studied, designed to account for future uncertainty in economic conditions, technology development, avoided costs, customer adoption given various financial and non-financial barriers, and key policy goals related to implementation design. These scenarios were used to develop a probability weighted average high and low case for load and cost for the MAP and RAP portfolios.

Additional Policy Considerations

As the DSM landscape for utilities steadily evolves, there continue to be outside variables that impact the availability of energy efficiency opportunities for Ameren Missouri to pursue going forward. Ameren Missouri continues to stay abreast of local and national changes in building codes and appliance efficiency standards and designs its programs accordingly. Potential estimates developed as part of this analysis explicitly account for known changes to federal standards over the study period but do not attempt to predict how codes may change over time.[3]

With each concurrent MEEIA filing, equipment baselines and technologies are updated as appropriate, program designs evolve to meet ever changing market demands, and the next era of DSM programs are presented to stakeholders and customers alike. In the best

[3] See Section 3.1.3.4 of the 2023 MPS. At the time of the 2023 MPS, the DOE had ruled that the backstop provision of the Energy Independence and Security Act (EISA) had not been triggered, in effect staying the implementation of this rule. Thus, while the EISA standard is not included in this study as a Federal code and standard, GDS Associates (GDS) did account for limited future potential for residential lighting within its base case forecast of market potential. 20 CSR 4240-22.050(3)(C)

interest of the customer, MEEIA plans must retain a degree of flexibility that will allow for program development at a scale that will retain cost effectiveness and adaptability to new market conditions and capacity needs. Innovative planning and stakeholder collaboration is key to setting up a framework that will provide MEEIA programs with both stability and flexibility in the years to come.

The assessment of DSM potential necessarily requires an assessment of avoided costs. The avoided costs of energy, capacity, and transmission & distribution represent the benefits of DSM implementation as measured under the total resource cost (TRC) framework. The process for developing the avoided costs is described in Chapter 2 - Planning Environment and Chapter 7 – Transmission and Distribution.[4]

At the same time, it is important to note that MAP and RAP estimates included in this chapter reflect all cost-effective energy savings as identified by the TRC test. This is an important threshold and important definition. Cost effective DSM measures as screened by the TRC generate savings and bill benefits for participants and non-participants alike. In the future, if the deployment of other clean energy resources continues to push avoided costs lower, then cost effective DSM potential may be reduced in aggregate as measures on the margin fall out of potential estimates. In some sense, this would force various clean energy supply and demand side resources to compete in future resource acquisitions. As Ameren Missouri begins to transition towards a broader, more diverse clean energy portfolio, cost effectiveness tests and resource screening analyses used to define relevant energy efficiency programs may also need to assess and quantify broader societal benefits.[5] Future cost effectiveness tests may also need to recognize the location specific value that energy efficiency, demand response, and DER resources can provide in areas of greatest need.

A key conclusion of the current study is that there is no one single best delivery strategy that can meet all equity, equality, and efficiency goals. Instead, meeting the needs of customers will require a flexible approach across multiple programs and offerings, with continued programmatic funding and support of RAP level targets. It will also require effective natural gas co-delivery for customers. Ameren Missouri continues to position its programs to meet these multiple needs. Current strategies focus on a tiered geographic

[4] 20 CSR 4240-22.050(5)(A)1 through 3; 20 CSR 4240-22.050(6)(C)2

[5] It is important to note that DSM portfolios provide numerous benefits in addition to meeting future supply resource needs. In File No. EO-2019-0132, the Commission noted that "MEEIA is not a program for managing generation and supply-side power. MEEIA is designed to compensate the utility for promoting energy efficiency as it encourages its customers to save money by using less of the product the utility sells" (¶29) and that "benefits from a reduction in a customer's bill is not the only benefit to customers. There are also societal benefits, such as improved health and safety, investment in local economies, and local job creation." (¶39) See Report and Order, In the Matter of Evergy Missouri Metro and Evergy Missouri West's Notice of Intent to File Applications for Authority to Establish a Demand-Side Programs Investment Mechanism, File No. EO-2019-0132, December 11, 2019.

and income-based approach and provide both broad and deep savings throughout the community. These programs include:

- The direct install of deep retrofit measures on a community basis, defined based on need;
- The offering of a Pay As You Save (PAYS) program, which will provide immediate access to holistic energy efficiency measures funded through on bill payments, greatly reducing financing or capital constraints for customers; and
- A Business Social Services program, which aims to provide increased incentive levels to the organizations and non-profits that serve the communities in highest need.

Future programs will need to further tailor program offerings by housing type, income levels, and geographic region to meet the needs of these customers.

Demand side measures – energy efficiency, demand response, and distributed energy resources – will play a critical role in Ameren Missouri's transition to a clean energy future.

8.2 Review of Past and Current MEEIA Plans

Ameren Missouri continues to build on its DSM planning, implementation, and evaluation performance leadership from the employment of DSM programs, which have operated successfully since 2009.

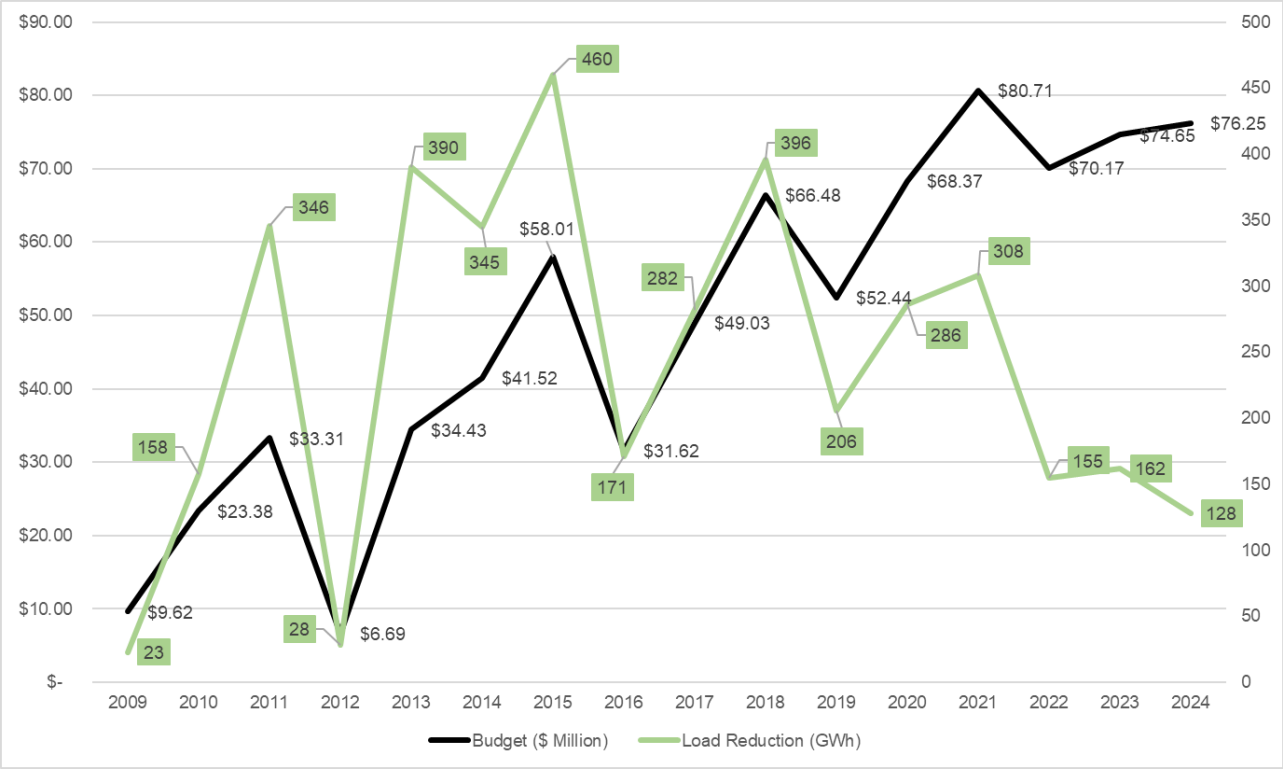
Ameren Missouri has achieved consistent success from its expanding energy efficiency and demand response portfolio. Figure 8.3 shows the annual energy savings and associated budgets from 2009 through 2022, with a forecast of program goals for 2023 and 2024. These programs, when paired with viable cost recovery mechanisms, have been very successful in providing benefits that delay future investments and save customers money for years to come.

In addition to showing a simple view of DSM budgets and net load reductions, the trends shown in the figure below also demonstrate the negative impact of losing program continuity between cycles. The deep valleys in budgets and savings seen in 2012, 2016, and 2019 are largely due to these years serving as a "bridge" year between cycle shut down and ramp up. When there is uncertainty around the future of program funding, projects may fall out of the forecasts. Ramping up programs is labor intensive and frequent delays, both to customer projects and operational integrations, are common.

It should also be noted that while the budgets are seen increasing from 2022 to 2024, savings take a sharp decline in those same years. This decline is largely due to EISA guidelines that began in 2022, causing the discontinuation of the residential lighting

program and change in lighting baseline for income-eligible[6] programs. The savings decline can also be attributed to baseline changes associated with updated heating and cooling guidelines.

Figure 8.3: Ameren Missouri DSM Annual Net Load Reductions and Budgets



Note: 2009 to 2022 values represent actual evaluated (net) values from annual EM&V reports. 2023 and 2024 values represent net as filed values approved as part of program filings.

Beginning in 2021, Ameren Missouri plotted a course for the next MEEIA cycle by initiating an updated market potential study, engaging with stakeholders, and issuing an RFP for program vendors. The program team sought to file a multi-year plan as agreed to with stakeholders in an effort to provide stable offerings to support program growth and long-lead projects. In its original form, Ameren Missouri proposed a six-year MEEIA 4 plan with carefully planned checkpoints to allow for modification as determined by market conditions and avoided cost changes.

Ultimately, Ameren Missouri filed a landmark three-year plan in March of 2023. As compared to the MEEIA 2019-2021 averages, this plan touts 1.74 times the annual budget, 1.2 times the annual energy savings, and 1.6 times the annual peak demand savings. The proposed plan builds on the previous MEEIA cycle (plus extensions) by

[6] The use of Income-Eligible has the same meaning of low-income customer as defined in the Company's tariff and outlined in the Missouri Energy Efficiency Investor Act. 393.1075, RSMo.

offering twenty-five programs, significantly increased spend for income eligible customers, and nearly $440 million in net benefits.

Following negotiation with key stakeholders, an extension to MEEIA Cycle 3 for Plan Year 2024 stipulation and agreement was filed in August of 2023 with the intention to continue negotiation on MEEIA Cycle 4. The extension year will provide Ameren Missouri and stakeholders additional time to account for additional funds due to Inflation Reduction Act (IRA), planned CCN filings, and other items that may impact the DSM space. The extension will offer program continuity from Plan Year 2023 into 2024 to ensure customers continue to have access to DSM programs.

Ameren Missouri remains committed to offering best in class DSM programs for the benefit of its customers.[7] Examples of performance leadership include:

- Market segmentation strategies to tailor specific DSM messages to specific market segments.[8]
- Use of national best practice evaluation processes and procedures.
- Use of national best practice implementation tactics for multifamily and affordable housing.

8.3 IRP DSM Portfolios

This section of Chapter 8 begins with an overview of the 2023 MPS. The overview is followed by the methodology used to develop the DSM portfolios, including a discussion of key design elements and differences with the prior study, before providing a more detailed presentation of results for total resource potential, including the results of benchmarking to other external studies.

8.3.1 Overview

The purpose of the 2023 Market Potential Study is to assess potential energy and demand savings from energy efficiency, demand response, and distributed energy resources across multiple sectors of the economy.

Ameren Missouri held a series of workshops to review methodologies and assumptions, analyze market data, and review draft and final results. To accomplish this task, Ameren Missouri commissioned GDS Associates (GDS) to serve as the lead author of the study. GDS also completed the 2016 and 2020 MPS, which allows for a baseline level of consistency and comparison across studies.

[7] 20 CSR 4240-22.050(1)(B)
[8] 20 CSR 4240-22.050(1)(A)1 through 3; 20 CSR 4240-22.050(3)(B)

GDS partnered with subject matter experts to assist with sections of key interest. Brightline Group provided technical expertise and modeling of emerging distributed energy resources. Together, these partners form the "GDS Team."

The 2023 Market Potential Study was composed of four distinct areas of study:

- Residential and business sector market-rate energy efficiency,
- Demand response peak load reduction potential,
- Distributed Energy Resource (DER) potential, and
- Sensitivity and scenario analysis.

It should be noted that although these distinct areas are investigated separately, the overall effect is aggregated for the purposes of integration into the IRP and reported here as such. The 2023 MPS reviewed the period from 2024 to 2043. During the initiation of this MPS project, Ameren Missouri was in the process of creating the application for its MEEIA Cycle 4 program portfolio; therefore, certain segments of the analysis were conducted strategically in terms of timing. Obtaining market potential data lays the critical groundwork for setting budget and energy savings targets for the MEEIA portfolio.

8.3.2 Key Methodologies and Assumptions

For each sector studied, the MPS first assessed the technical potential. The technical potential represents the theoretical upper bound on savings and reflects total potential regardless of cost-effectiveness. Technical potential is then screened against the TRC to estimate all economic potential. In a final step, the economic potential is further categorized as the MAP[9] and RAP[10] described above. MAP and RAP are based on expected customer adoption rates and willingness to participate, given relevant incremental costs, utility incentives assumed to be available to the customer, and the presence (or lack thereof) of other financial and non-financial barriers.[11]

There is an important distinction to make when describing energy efficiency potential. There are two types of potential estimates – measure level and program level. Measure level potential does not include net to gross impacts. With this consideration, it is not unusual to remove marginally cost-effective energy efficiency measures from a program in order to make the program cost-effective. For this reason, program potential is usually less than the measure level potential.

[9] 20 CSR 4240-22.050(3)(G)5B
[10] 20 CSR 4240-22.050(3)(G)5B
[11] 20 CSR 4240-22.050(3)(H)

Overall Approach

For the residential, demand response, and DER sectors, GDS relied on a bottom-up approach to estimate potential. GDS relied on market research to first characterize the eligible equipment stock that could be replaced by a more efficient measure and the relative potential savings per measure against that baseline equipment. This defines the technical potential. Next, measures were screened for cost effectiveness and then assessed relative to expected customer adoption. Total potential represents the sum of all measures for the relevant populations of interest. In contrast, GDS relied on a top-down approach when estimating potential in the business sector. GDS first estimated measure level savings and costs using a bottom-up modeling approach and then applied all cost-effective measure savings to all applicable shares of electric energy load.

As a starting point, GDS reviewed the Ameren Missouri load forecast to generate the necessary inputs for the analysis. The study modified the Ameren forecast to create an adjusted baseline forecast to account for various impacts[12] such as:

- Current DSM impacts,
- Naturally occurring efficiency savings,
- Adjustment for large C&I opt-out customers, and
- Reclassification of load.

For additional details regarding Ameren Missouri's load forecasting system as well as each of these adjustments, see sections 2.1 through 2.2 of the 2023 MPS.

[12] 20 CSR 4240-22.050(3)(G)1; 20 CSR 4240-22.050(3)(G)2

Cost-Effectiveness Defined

Cost effectiveness of Ameren Missouri DSM measures, programs, and portfolios was calculated using the TRC test,[13] the utility cost test (UCT), the participant cost test (PCT), and the ratepayer impact measure (RIM) test.[14] In each year of the planning horizon, the benefits of each demand-side program are calculated as the cumulative energy and demand impact multiplied by all applicable avoided costs, and then summed into net present values for the timeframe considered.[15] The definitions of the tests are outlined below:

The Total Resource Cost test measures benefits and costs from the perspective of the utility and society as a whole. The benefits are the net present value of the energy and capacity saved by the measures. The costs are the net present value of all costs to implement those measures. These costs include program administrative costs and full incremental costs (both utility and participant contributions), but no incentive payments that offset incremental costs to customers and no lost revenues.[16] The full incremental costs include single upfront costs and operational & maintenance costs where applicable.[17] Programs passing the TRC test (that is, having a B/C ratio greater than 1.0) result in a decrease in the total cost of energy services to electric ratepayers.[18]

The Utility Cost Test measures the costs and benefits from the perspective of the utility administering the program.[19] As such, this test is characterized as the revenue requirement test. Benefits are the net present value of the avoided energy and capacity costs resulting from the implementation of the measures. Costs are the administrative, marketing and evaluation costs resulting from program implementation along with the costs of incentives but do not include lost revenues.[20] Programs passing the UCT result in overall net benefits to the utility, thus making the program worthwhile from a utility cost accounting perspective.[21]

The Participant Cost Test measures the benefits and costs from the perspective of program participants, or customers, as a whole. Benefits are the net present value savings that participating customers receive on their electric bills as a result of the implementation of the energy efficiency and demand response measures plus incentives received by the customer. Costs are the customer's up-front net capital costs to install the measures. If the customer receives some form of a rebate incentive, then those costs are considered as a credit to the customer and are added to the customer's total benefits.[22]

The Ratepayer Impact Measure test measures the difference between the change in total revenues paid to a utility and the change in total costs to a utility resulting from the energy efficiency and demand response programs. If a change in the revenues is larger or smaller than the change in total costs (revenue requirements), then the rate levels may have to change as a result of the program.[23]

Market Adoption Rates

Market adoption rate estimates were based on 2020 primary research on building and equipment characteristics in the Ameren Missouri service territory as well as historical

[13] 20 CSR 4240-22.050(5)(B)
[14] 20 CSR 4240-22.050(5)(E); 20 CSR 4240-22.050(5)(F); 20 CSR 4240-22.050(5)(G); 20 CSR 4240-22.050(3)(I)
[15] 20 CSR 4240-22.050(5)(A)
[16] 20 CSR 4240-22.050(5)(B)2; 20 CSR 4240-22.050(5)(B)3
[17] 20 CSR 4240-22.050(5)(B)1
[18] 20 CSR 4240-22.050(5)(D)
[19] 20 CSR 4240-22.050(5)(C)
[20] 20 CSR 4240-22.050(5)(C)1; 20 CSR 4240-22.050(5)(C)2&3
[21] 20 CSR 4240-22.050(3)(G)5E; 20 CSR 4240-22.050(5)(D)
[22] 20 CSR 4240-22.050(3)(G)5C;20 CSR 4240-22.050(5)(F)
[23] 20 CSR 4240-22.050(5)(F)

achievements by Ameren Missouri in prior years. One of the major objectives of the primary research was to develop measure/program adoption curves in support of measuring achievable potential.[24] Adoption rate calculations were based on survey questions measuring (1) willingness to participate (WTP) in programs under assumptions of varying levels of incentives, (2) the magnitude of financial and non-financial barriers to adoption/participation, and (3) their awareness of Ameren Missouri energy efficiency programs and/or high efficiency technologies.

Development of DSM Applicable Measure Lists

DSM potential is derived from individual measures available within each sector. The study's sector-level measure lists were developed through various resources. The initial measure list was primarily informed by Ameren Missouri's most recent Deemed Savings Table and Technical Reference Manual. Consideration of additional measures can be attributed to current Ameren Missouri program offerings, prior Ameren Missouri and other regional potential assessments and program offerings, other regional technical reference manuals, and commercially viable emerging technologies.[25] GDS explicitly included measures using emerging technologies. This includes multiple connected, or "smart" devices aimed at home and business automation and integrated energy management systems (e.g., smart outlets, heat pump dryers, connected lighting, advanced sensors and controls, and other devices).[26]

GDS qualitatively screened measures that should not be included in the final study, due to one of several possible reasons: a) including recent changes in relevant baselines; b) limited market applicability; c) existing market adoption for non-EE considerations; d) poor customer acceptance of the measure or measures; and e) outdated measures with health and safety concerns. Research to inform this screening included input from stakeholders, expertise/experience from program managers, recommendations from EM&V reports, measure cost effectiveness tests, and research on availability/prevalence of specific measure offers at outside utilities (Energy Star Resources). The final study included 185 residential and 195 business energy efficiency measures. A total of 3,135 different measure permutations were performed for this study to help inform future program planning and align with existing offerings. Each permutation was screened for cost-effectiveness according to the TRC test.

GDS estimated relevant costs for each measure, as defined by each cost effectiveness test.[27] Costs for each measure include either incremental or full costs, depending on program design and implementation. GDS estimated measure costs from Ameren Missouri program planning databases and evaluation reports, other state technical

[24] 20 CSR 4240-22.050(3)(G)3
[25] 20 CSR 4240-22.050(3);20 CSR 4240-22.050(3)(A); 20 CSR 4240-22.050(3)(B)
[26] 20 CSR 4240-22.050(1)(E)1
[27] 20 CSR 4240-22.050(3)(G)5A-F

resource manuals, secondary sources and industry databases, and other program evaluation reports. Administrative costs for each measure were developed based on a review of historical evaluated costs and/or budgets for program years 2021-2023. RAP scenarios assume an incentive as a percent of the incremental measure cost, consistent with past program delivery, with the remainder of the incremental cost borne by the participant. In contrast, the MAP assumes an incentive equal to 100 percent of the incremental cost.

As a final step, measure savings were adjusted for interactive effects between competing effects to avoid double-counting of savings potential. For example, HVAC measures installed at the same time as building shell measures would be expected to operate at fewer effective full load hours. The study developed a program stacking order, prioritizing new equipment measures, then retrofit measures, and finally, behavioral measures.[28]

8.3.3 DSM Potential under MAP and RAP[29]

By combining 2020 market research with the detailed assessment of potential DSM measures described above, GDS estimated all cost-effective potential in each year from 2024 through 2043. This cost-effective potential was used to define the MAP and RAP portfolios.

Tables 8.1 – 8.4 provide the energy efficiency program MAP and RAP cumulative annual potential and budget by sector for select years. Figures 8.4 and 8.5 provide a more detailed representation of the energy efficiency and peak reduction program MAP and RAP potentials across the 20-year planning horizon for the residential (Market Rate/Income Eligible) and commercial/industrial (C&I) sectors, and DER.[30] Figure 8.6 provides the MAP and RAP potential for demand response. Collectively, these totals represent the MAP and RAP DSM cases included in the 2023 IRP.

[28] 20 CSR 4240-22.050(3)(G)2
[29] 20 CSR 4240-22.050(6)(A)
[30] 20 CSR 4240-22.050(3)(G); Section 4.1.8.1 of the Potential Study describes development of the program potential through the application of net-to-gross factors. Measure net-to-gross ratios were based on the most recent evaluation findings for Ameren Missouri at the in
dividual measures level).

Table 8.1: MAP and RAP Energy Reduction Potential (MWh) and Implementation Budget (NPV $Million)

Potential and Sector	2026	2028	2033	2038	2043	Implementation Budget (NPV $2025 millions)
MAP						
Residential	371,043	640,791	1,313,125	1,957,044	2,496,008	$1,746
C&I	794,859	1,264,437	2,193,182	2,756,969	2,955,288	$1,231
Demand Response						$304
DER	11,647	23,230	74,663	182,533	384,839	$80
Total	1,177,549	1,928,458	3,580,970	4,896,546	5,836,135	$3,361
RAP						
Residential	285,138	499,649	1,043,683	1,543,201	1,920,310	$1,017
C&I	585,202	933,202	1,620,248	2,046,836	2,204,250	$404
Demand Response						$182
DER	10,318	20,149	60,138	130,872	233,075	$37
Total	880,658	1,453,000	2,724,068	3,720,909	4,357,635	$1,640

Table 8.2: MAP and RAP Coincident Peak Reduction Potential (MW) and Implementation Budget (NPV $Million)

Potential and Sector	2026	2028	2033	2038	2043	Implementation Budget (NPV $2025 millions)
MAP						
Residential	157	263	457	597	696	$1,746
C&I	244	395	724	924	984	$1,231
Demand Response	324	385	460	455	479	$304
DER	2	4	11	28	58	$80
Total	726	1,047	1,652	2,004	2,217	$3,361
RAP						
Residential	122	207	355	451	509	$1,017
C&I	161	261	476	609	655	$404
Demand Response	214	246	271	288	298	$182
DER	2	3	9	20	35	$37
Total	499	717	1,111	1,368	1,497	$1,640

Table 8.3: MAP and RAP Energy Reduction Potential (MWh) Percent of Forecasted Load

Potential and Sector	2026	2028	2033	2038	2043
MAP					
Residential	1.14%	1.94%	3.84%	5.51%	6.78%
C&I	2.45%	3.83%	6.42%	7.76%	8.03%
Demand Response					
DER	0.04%	0.07%	0.22%	0.51%	1.05%
Total	3.62%	5.84%	10.48%	13.78%	15.86%
RAP					
Residential	0.88%	1.51%	3.05%	4.34%	5.22%
C&I	1.80%	2.82%	4.74%	5.76%	5.99%
Demand Response					
DER	0.03%	0.06%	0.18%	0.37%	0.63%
Total	2.71%	4.40%	7.97%	10.47%	11.84%

Table 8.4: MAP and RAP Coincident Peak Reduction (MW) Potential Percent of Forecasted Load

Potential and Sector	2026	2028	2033	2038	2043
MAP					
Residential	2.23%	3.69%	6.22%	7.81%	8.78%
C&I	3.47%	5.56%	9.86%	12.08%	12.43%
Demand Response	4.61%	5.41%	6.26%	5.95%	6.05%
DER	0.03%	0.05%	0.15%	0.36%	0.74%
Total	10.34%	14.71%	22.50%	26.21%	28.00%
RAP					
Residential	1.74%	2.90%	4.83%	5.90%	6.43%
C&I	2.29%	3.67%	6.48%	7.96%	8.26%
Demand Response	3.05%	3.45%	3.69%	3.77%	3.76%
DER	0.02%	0.04%	0.12%	0.26%	0.45%
Total	7.10%	10.07%	15.13%	17.89%	18.90%

Figure 8.4: Cumulative Annual MAP/RAP Energy Efficiency Savings (MWh)

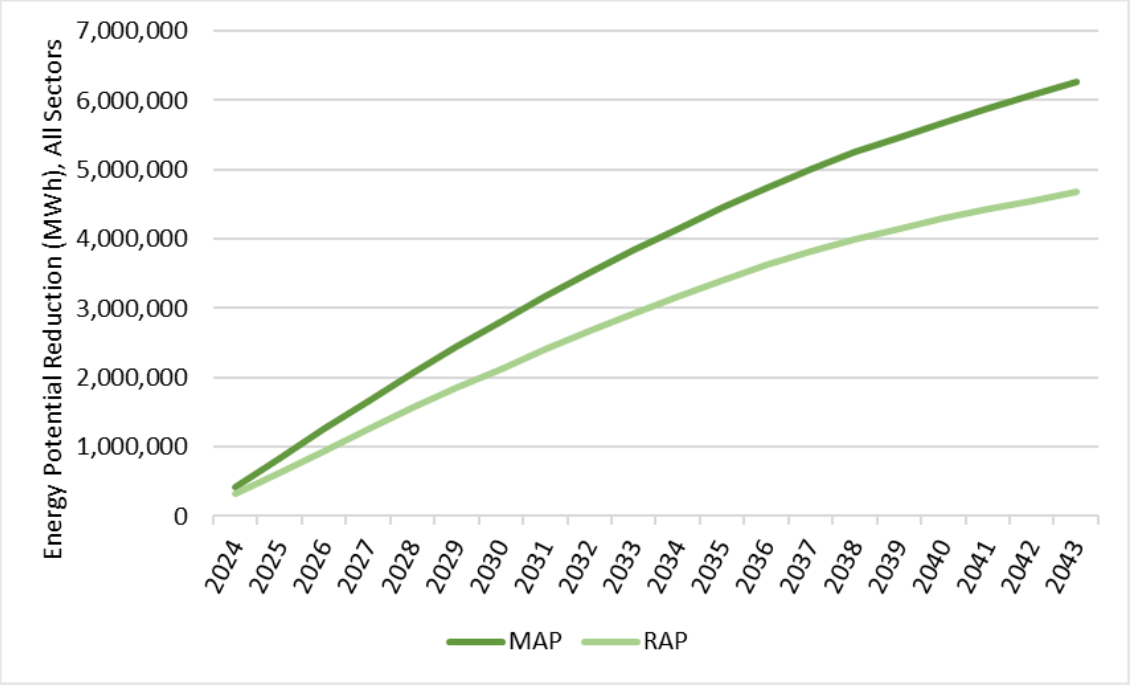


Figure 8.5: Cumulative Annual MAP/RAP Coincident Peak Reduction (MW)

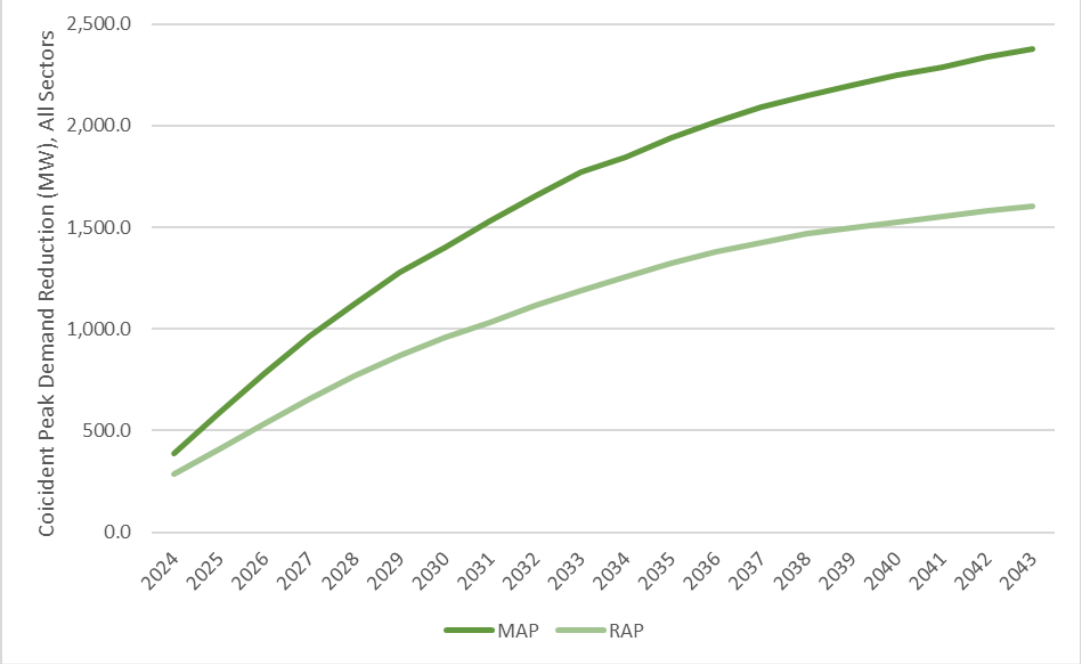
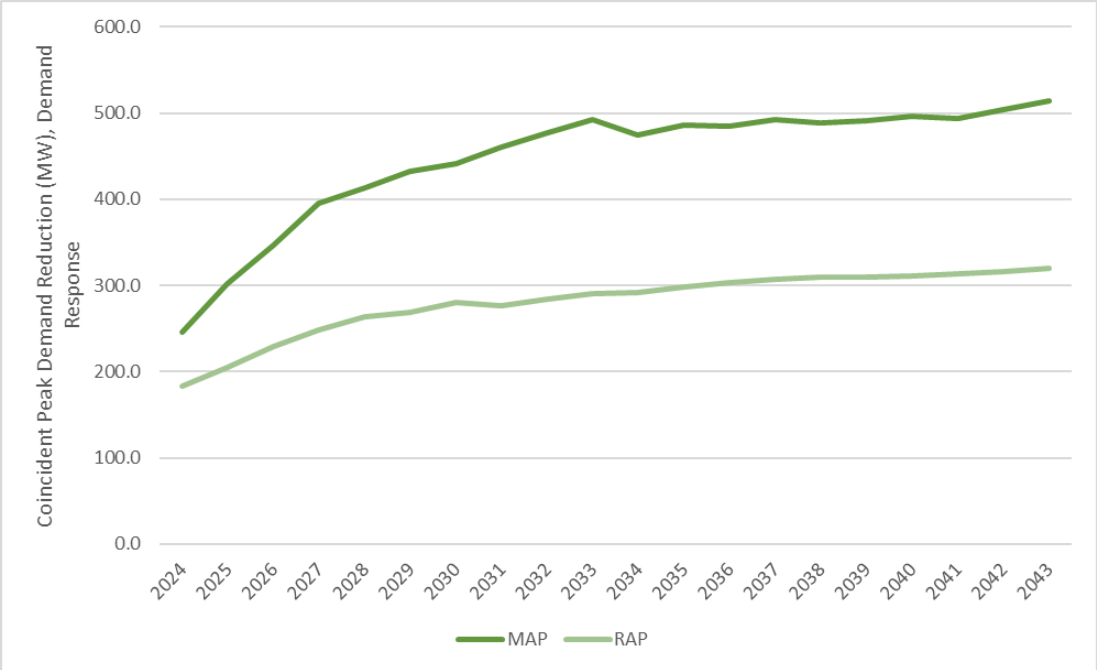


Figure 8.6: Cumulative Annual MAP/RAP Demand Response Savings (MW)



8.3.3.1 Load Flexibility Analysis

Ameren Missouri's 2023 MPS contains a separate "load-flexibility" scenario (See Appendix F of the MPS) to assist in informing the ability of DSM resources to modify the net consumption of electricity and serve as a time-differentiated resource. This analysis utilizes the expected energy efficiency and demand response MW and MWh savings by sector and shifts the full value of avoided generation capacity from summer months to winter months. As noted in Appendix F, the highest potential was demonstrated by adding demand response in winter months for both residential and business sectors. The business sector increases in cost effectiveness with the addition of winter DR while Residential DR maintains its cost effectiveness. Residential energy efficiency demonstrated strong potential for winter megawatt savings; however, the cost to achieve these savings is more substantial when compared to DR. Impacts from business energy efficiency and distributed energy resources were relatively minor. Tables 8.5 and 8.6 serve to illustrate the Residential and Business DR impacts and costs of Program RAP as compared to the DR load flexibility analysis results.

Table 8.5 Residential DR – Impact/Cost Comparison of Program RAP vs Load Flex

	2024	2025	2026	2033	2043
Base Case					
Summer MW	47	54	63	98	141
Winter MW	5	6	7	12	17
Annual Costs ($ millions)	$ 3.2	$ 3.2	$ 3.7	$ 4.7	$ 7.0
Load Flex Scenario					
Summer MW	47	54	63	98	141
Winter MW	10	24	44	67	73
Annual Costs ($ millions)	$ 3.3	$ 3.6	$ 4.6	$ 6.1	$ 8.4

Table 8.6 Business DR – Impact/Cost Comparison of Program RAP vs Load Flex

	2024	2025	2026	2033	2043
Base Case					
Summer MW	125	137	152	173	158
Winter MW	0	0	0	0	0
Annual Costs ($ millions)	$ 8.9	$ 9.4	$ 10.4	$ 11.3	$ 10.5
Load Flex Scenario					
Summer MW	125	137	152	173	158
Winter MW	113	122	132	150	138
Annual Costs ($ millions)	$ 14.3	$ 15.2	$ 16.7	$ 18.4	$ 17.0

8.3.3.2 External Benchmarking of Market Potential

As part of the review process, the energy efficiency and demand response MAP and RAP estimates presented above were benchmarked against other potential studies. This comparison was performed on both a national level and against a "peer" group of like utilities in neighboring states.[31]

The national comparison was made using the U.S. Department of Energy catalog of state and local potential studies with comparable study horizons (roughly 20-year studies). The MAP comparison was based on the average of the highest two utilities in the benchmarking analysis, while RAP was based on the 50th percentile. As shown in Table 8.7, the current study results are lower for MAP when compared to the DOE study and consistent with other 20-year potential studies for RAP.

[31] See section 8.3 of the 2020 MPS for a detailed discussion of benchmarking against peer utilities.

Table 8.1: Comparison of Potential Study MAP/RAP across DOE Archive

	Ameren MPS			DOE MPS
	Residential	C&I	Combined	Combined
Maximum Achievable Potential	17%	22%	19%	25%
Realistic Achievable Potential	14%	16%	15%	16%

8.3.4 Portfolio MAP and RAP Costs[32]

As described above, the study assessed both incentive and non-incentive (administrative) costs. MAP and RAP differ primarily in the level of incentives offered to customers. Under a MAP scenario, incentives are assumed to cover the full incremental cost of the measure. In contrast, the RAP scenario assumes that incentives are available for a portion of the incremental costs, based on historical program implementation. The greater incentive in the MAP case drives greater adoption of potential (as illustrated above) and also results in a greater total budget.

Incremental measure costs and utility incentives were held constant in nominal dollars, based on a review of external TRM data. This implies that the incremental cost of energy efficiency measures will narrow, in real terms, over the study period. In contrast, the study assumes that administrative costs will increase at half of the forecasted inflation rate, reflecting potential operational efficiency gains offsetting cost of living and labor adjustments.

Figure 8.7 shows the projected annual budget for the MAP portfolio while Figure 8.8 shows the projected annual budget for the RAP portfolio. All costs are expressed in nominal terms.

[32] 20 CSR 4240-22.050(3)(G)1; 20 CSR 4240-22.050(3)(G)4; 20 CSR 4240-22.050(3)(G)5

Figure 8.7: Portfolio Budget, MAP ($Millions)

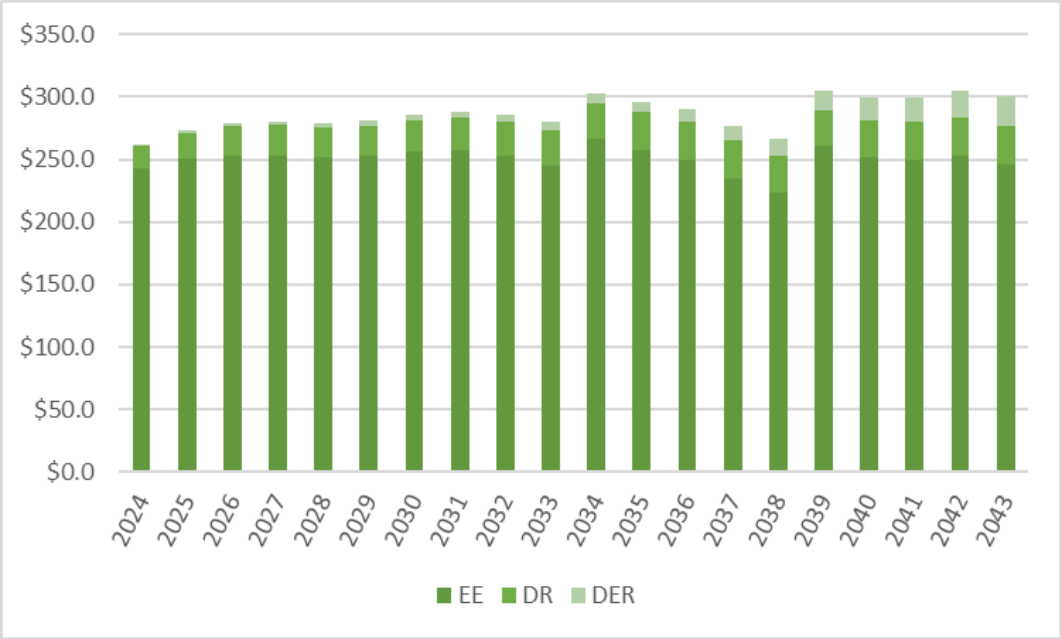
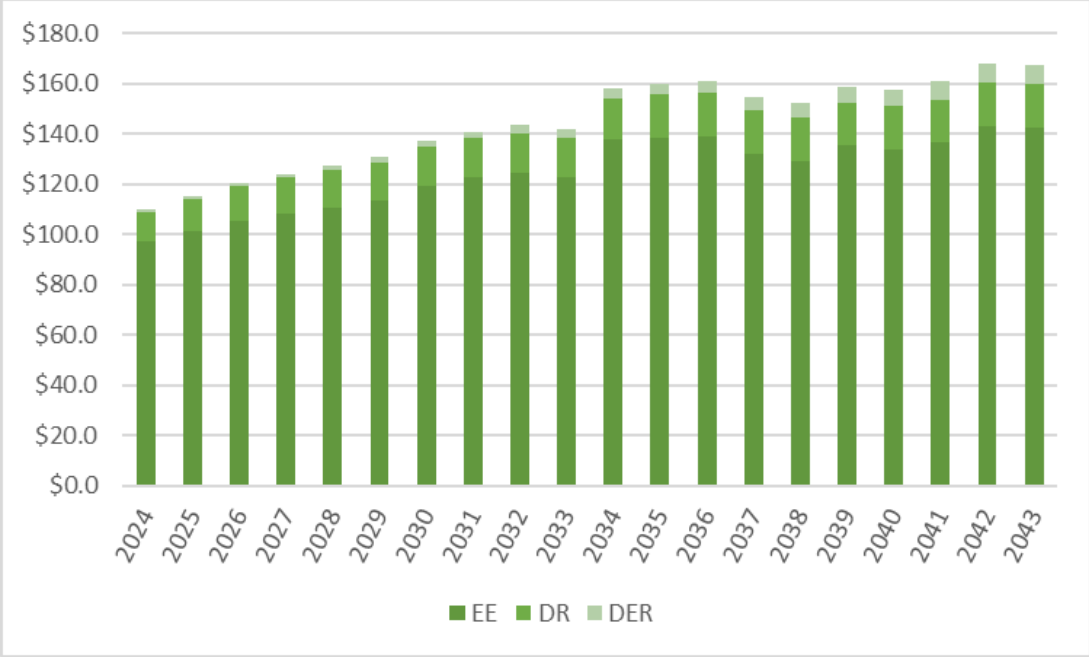


Figure 8.8: Portfolio Budget, RAP ($Millions)



8.4 DSM Potential Uncertainty

8.4.1 Risk and Uncertainty Analysis[33]

In addition to the development of a base case for Program MAP/RAP potential, sensitivity analyses were performed surrounding several key assumptions in the study. The final set of sensitivities were ultimately the product of stakeholder discussions. In general, candidates for the sensitivity analysis were related to two overarching themes, factors which concern uncertainty of customer participation and/or cost-effectiveness.[34] These themes involved looking at various factors that impact both the energy savings potential and the accompanying costs of the DSM programs in a favorable or unfavorable manner. These uncertainties are inherent in the assumptions necessary to develop point estimates for future DSM load and budget impacts.

The uncertainty analysis was analyzed for both MAP and RAP scenarios.[35] The 2023 MPS developed a robust scenario analysis, covering a wide array of potential factors and uncertainties. Some scenarios assess both a higher and lower impact, while other scenarios assess uncertainty in only one direction. Scenarios for the residential and business sectors include:

- **Avoided Costs**: Avoided costs represent the primary benefit within the TRC, and higher/lower avoided costs will lead to greater/lesser potential. Included two sensitivities for a) an increase in avoided energy and capacity costs of +30%/-50% and b) change in T&D costs by 200%/$0, with no change in avoided energy and capacity.
- **Prolonged Economic Downturn**: A reduction in load forecast and customer adoption rates, reflecting negative impacts of economic conditions.
- **COVID-19 Short/Long-Term Impacts:** A reduction in load forecast and customer adoption rates, with a focus in pre/post COVID customer usage and impacts due to supply-chain concerns.
- **Volatile Weather**: Assume heating and cooling degree days increase by 25%, which affects both the load and sales forecast and measure level savings and cost-effectiveness.
- **High Touch Marketing**: Assume additional marketing raises program awareness and reduces non-financial barriers to adoption.[36]
- **Large Customer Opt-Out**: Estimates potential, both including and excluding all eligible opt-out customers in the analysis, for both a higher and lower estimate of business potential.

[33] 20 CSR 4240-22.050(4)(C)
[34] 20 CSR 4240-22.050(6)(C); 20 CSR 4240-22.050(6)(C)1; 20 CSR 4240-22.050(6)(C)2
[35] 20 CSR 4240-22.050(6)(C)1 through 2
[36] 20 CSR 4240-22.050(1)(E)2

- **Utility Attribution (NTG uncertainty):**[37] Net to gross factors affect total program potential and the cost-effectiveness of each program; sensitivities assessed a 15% increase and 30% decrease to the Net to Gross factors used in the base case analysis.
- **Universal Time of Use (TOU) Rates**: Assumes all customers are immediately converted to a TOU rate, with a decrease in annual consumption of 1.2% across all household and small/medium business. TOU rates are assumed to offset other existing behavior programs.
- **Improved Technology Savings/Costs:** [38] Assumes program participation is moved to the most efficient technology with a 35% decrease in costs and incentives over the study period.
- **Additional IQ-Funding:** Assumes increased adoption rates with 100% of full measure cost incentivized.
- **PAYS Sensitivity:** Assumes the financing adoption rates of measures, equals similar level as covering 100% of measure cost.
- **Summer Planning Reserve Margin:** Assesses the impact of transitioning from MISO Planning Reserve Margin (PRM) Installed Capacity (ICAP) to Unforced Capacity (UCAP), with reducing planning reserve margin to 7.4%.

Ameren Missouri used these scenario analyses as a primary input into its uncertainty analysis by comparing the net present value of the energy and program costs scenarios to the base case for each to determine a percentage variation from the base for both a favorable and unfavorable state.

Demand response was evaluated against a subset of these sensitivities, but also included a specific scenario accounting for additional program options rate options with enabling technology and other emerging DR program. It should be noted that although these subsectors are examined separately, their respective uncertainty probabilities are factored in with the overall section measuring the impact on savings and cost.

The Distributed Energy Resource analysis also differs from the main EE/DR uncertainty analysis. For DER, the study team examined sensitivities for both Combined Heat and Power and Photovoltaics. Sensitivities include higher and lower avoided energy costs, multiple sensitivities of higher and lower avoided Transmission and Distribution costs, reflecting locational value of DER, removal of opt-out customers, and decreasing technology costs of Solar PV and batteries.

Also consistent with the prior study, the 2023 MPS analyzed scenarios as independent uncertainties. An overall risk assessment that incorporates these individual uncertainties

[37] 20 CSR 4240-22.050(1)(C)
[38] 20 CSR 4240-22.050(1)(E)1

is required for the risk analysis of various alternative resource plans. It is impractical to try to assess the various interactive codependences of the individual uncertainties so as a simplification, Ameren Missouri again developed subjective weights for each scenario and combined these weights into an overall weighted risk assessment. Table 8.8 and 8.9 provide the MAP and RAP sensitivities high and low results for budget and energy (MWh).

Table 8.8: DSM MAP Portfolio Sensitivities, Energy Reduction Potential (MWh) and Budget Potential

Sensitivity Scenario	20-yr MWh	20-yr Budget ($ Millions)
Program MAP	5,451,983	$5,000
High Avoided Costs 1	5,658,531	$6,000
High Avoided Costs 2	5,466,174	$5,000
Low Avoided Costs 1	4,640,141	$4,000
Low Avoided Costs 2	5,419,012	$5,000
Economic Downturn	4,650,379	$4,000
COVID	5,330,481	$5,000
High NTG	6,269,780	$5,000
Low NTG	3,816,388	$5,000
High Touch Marketing	6,242,339	$7,000
Opt-Outs Included	6,127,686	$5,000
All Opt-Outs Excluded	5,265,651	$5,000
Extreme Weather	6,052,155	$6,000
Improved Technology	7,002,134	$7,000
Additional IQ	5,559,668	$5,000
PAYS	5,503,476	$5,000
ICAP	5,432,195	$5,000

Table 8.9: DSM RAP Portfolio Sensitivities, Energy Reduction Potential (MWh) and Budget Potential

Sensitivity Scenario	20-yr MWh	20-yr Budget ($ Millions)
Program RAP	4,466,488	$2,500
High Avoided Costs 1	4,282,580	$3,000
High Avoided Costs 2	4,135,333	$2,600
Low Avoided Costs 1	3,515,692	$2,100
Low Avoided Costs 2	4,099,930	$2,500
Economic Downturn	3,515,301	$2,100
COVID	4,031,549	$2,400
High NTG	4,743,244	$2,500
Low NTG	2,887,192	$2,500
High Touch Marketing	4,718,331	$3,500
Opt-Outs Included	4,970,473	$2,600
All Opt-Outs Excluded	4,327,510	$2,500
Extreme Weather	4,584,268	$2,900
Improved Technology	5,314,226	$3,900
Additional IQ	4,207,385	$2,700
PAYS	4,164,166	$2,500
ICAP	4,109,744	$2,500

8.4.2 Managing Uncertainty During Implementation

Ameren Missouri manages uncertainty regarding program implementation through multiple channels and processes. Two important processes include the annual EM&V and continuous efforts regarding ongoing outreach, marketing, and communication.

8.4.2.1 Evaluation, Measurement, and Verification

Ameren Missouri continues to work with the independent evaluation contractor to apply national best practices to the EM&V of its programs. A single evaluator is typically under contract for the Residential and Business portfolios. The Commission has hired an Auditor to assess and report on the work of Ameren Missouri's independent EM&V contractor. The Commission Auditor monitors EM&V planning, implementation, and analysis of the EM&V contractors and files a report each year with its findings.

A key purpose of EM&V is to help drive continuous improvement in programs to the benefit of customers. In this sense, EM&V is best thought of as the first step in the implementation plan and cycle, as opposed to the last step. In this manner, EM&V helps identify necessary program changes on an annual basis, partly in response to any identified uncertainties that arise within a given program year. To this end, some states

have moved towards a prospective evaluation framework as opposed to a backwards looking, reactive or retrospective framework.

Given any level of DSM budget and resources, Ameren Missouri and its stakeholders decide how much of that budget to invest in implementation of programs and how much to invest in EM&V. A forward-looking, prospective evaluation framework will allow stakeholders and the independent evaluator to identify the most important and pressing issues (based in part on the issues identified in the uncertainty and risk analysis presented above) and then assess them on a going forward basis, rather than planning to evaluate every issue every year. A forward-looking framework also creates additional stability and certainty for the Company and its implementation contractors, which can lead to more robust planning and reduced administrative expenses.

There are two main components to any successful evaluation: process and impact. To complete these important studies, Ameren Missouri coordinates with the evaluation contractor to develop and implement the necessary protocols, methodologies, and technology to gather the appropriate data necessary for review.[39]

Process evaluations provide a detailed, holistic assessment of how programs are being delivered relative to the underlying program theory logic regarding how utility interaction in the market will drive meaningful change. Process evaluations provide important insights into the relationships and interactions between Ameren Missouri program staff, implementation administrators, trade ally and contractor networks, and the customer. Process evaluations identify any necessary program changes to ensure an efficient and effective delivery of services.[40]

The impact evaluation helps measure and verify energy and demand savings.[41] Within the impact evaluation, savings are classified as ex ante gross (original forecast), the ex post gross (based on the mix of measures actually installed), and the ex post net savings (the fraction of ex post gross savings that would not have occurred but for the utility investment). Ameren Missouri has developed, in coordination with the evaluation contractor(s), the necessary methods to estimate load impacts of the energy efficiency programs offered by the Company. The impact evaluation estimates of gross program savings typically include engineering analysis and formulas, building simulation models, meter data, statistical models, and billing analysis. For low-income programs, the evaluation also includes an analysis of how the program affects bill payments, arrearages, and disconnections.

Ex post net savings are necessary to evaluate the total cost effectiveness of programs. However, net savings represent only one input, and only one source of uncertainty, in a

[39] 20 CSR 4240-22.070(8)(C); 20 CSR 4240-22.050(7)
[40] 20 CSR 4240-22.070(8)(A); 20 CSR 4240-22.050(7)
[41] 20 CSR 4240-22.070(8)(B); 20 CSR 4240-22.050(7)

cost-effective analysis. Net savings for many programs are determined through detailed and resource intensive participant surveys, with the total outreach designed to meet a given confidence and precision levels. Participant surveys are used to develop a net to gross ratio, or the fraction of savings that are attributable to the utility program. This can be based on the impact program rebates and/or information from the program on the availability of tax credits and other federal, state, or manufacturer rebates and the benefits of installing efficient equipment had on the customer's decision to install qualifying equipment. In addition to the actual program implementation, this ratio can vary year to year, based on the survey design and methodology employed, assumptions used to aggregate results, the attitudes and makeup of the sample population, and other methodological factors. For this reason, many programs use a rolling average of three, four or five years of net to gross ratios.

Given the time and resources to develop these estimates, many EM&V plans will "deem" or carry forward net to gross factors for select programs into future program years, and then re-evaluate or re-assess on a planned, multi-year cycle. Higher priority can be given to those programs that play a greater role in the overall portfolio, or that may expect a meaningful change in results given changing market conditions. These prospective results can be used to inform future program delivery.

8.4.2.2 Evaluation of Residential Demand Response

The evaluation of the Residential Demand Response Program has historically relied on telemetry data, the signal sent from the thermostat to the HVAC system telling it whether to operate based on room temperature and setpoint. As significant numbers of residential AMI meters are installed, the evaluation has begun to transition to using AMI data instead.

This offers several improvements over telemetry data:

- Telemetry data provides information on run-time and must be converted to demand savings using assumptions on the HVAC systems connected load. AMI data will more accurately provide demand savings at the time of the event.
- Telemetry data is typically anonymized by the equipment manufacturer. AMI will allow us to tie savings back to the individual customer.
- Telemetry data has been plagued by data issues including misalignments or missing data for day type assignment to treatment and control groups and delays in obtaining data. AMI data will avoid or reduce these issues.

8.4.2.3 Outreach, Marketing and Communications[42]

Developing and executing a comprehensive marketing communications plan is essential to reaching the residential and business energy efficiency goals and represents one of the key strategies used to help mitigate annual uncertainty in implementation plans. Executing a mix of broad and targeted marketing simultaneously with a consistent message creates repetitive exposure which drives awareness and as a result drives participation. In addition, a multi-media plan enables Ameren Missouri to reach its diverse customer base.

The most opportunistic means to market the business energy efficiency programs is through Trade Allies, Program Business Development staff, and key customer facing employees such as Key Customer Executives and Regional Account Executives. Trade Allies are experts in energy efficient technology, understanding market conditions, and are whom customers go-to when seeking energy efficient products and services. They are the primary channel for marketing and outreach. The marketing efforts for the business portfolio are a combination of internal and external activities.

Residential programs also leverage Trade Allies to communicate incentives to customers. Both broad and targeted multi-media advertisements are used to drive awareness of programs and incentives. Residential income eligible programs utilize a community approach by building partnerships with organizations that have already established communication and trust with the targeted customer segment.

To provide an array of avenues through which customers can take advantage of programs, Ameren Missouri employs multiple approaches. To name a few, on-bill financing (PAYS), traditional rebates (residential HVAC, BizSavers), online discounts (Efficient Products) and direct installation (income-eligible, Peak Time Savings, Business Social Services) options all provide multiple access points to the same end use measures.

8.5 Additional Detail by Study Sector

This section provides additional detail on the Demand Response (DR) and DER, study components of the 2023 MPS.

8.5.1 Foreseeable Demand Response Technologies, including Demand-Side Rate Potential[43]

8.5.1.1 Overview

The 2023 MPS identified nearly 298 of peak demand MW from measure implementation (base case) and an additional 300 MW of peak demand reduction from rate sensitivities

[42] 20 CSR 4240-22.050(3)(E)
[43] 20 CSR 4240-22.050(4)

for a total DR RAP potential of 572 MW.[44] The total DR potential identified in the 2023 MPS is driven by several factors, including the addition of new measures based on foreseeable technologies, additional rate offerings, and specific market research regarding likely customer adoption.[45]

Within the 2023 MPS, demand response is defined consistent with applicable FERC rules as:[46]

> "[C]hanges in electric usage by demand-side resources from their normal consumption patterns in response to change the price of electricity over time, or to incentive payments designed to induce lower electricity use at times of high wholesale market prices or when system reliability is jeopardized."

Under this broad definition, demand response creates a reduction in usage during coincident peak. This can be due to a reduction in overall load or due to the shifting of load to later periods. The 2023 MPS does not account for any potential energy efficiency savings associated with an integrated EE/DR approach.

In 2020, Ameren Missouri began to install the first of its smart meters as part of its Smart Energy Plan. The adoption of, and total savings potential from, demand response and demand side rates will vary for customers with and without AMI technology. The 2023 MPS explicitly accounted for this effect, with different adoption rates and savings estimates for measures with and without this enabling technology.[47] Assumptions in the study relied on Ameren Missouri's current forecast of AMI deployment, starting in 2022 with all customers on smart meters by 2025. Potential rate programs were applied to eligible customers that require smart meters based on that forecast.

The study also explicitly accounted for the interactive effects of energy efficient measures and programs, demand response measures, and demand side rates. The study applied a hierarchical approach to ensure that savings were not double counted between programs or for programs that seek to influence customers through similar channels.[48]

8.5.1.2 Foreseeable Demand Response Measures and Technologies

Table 8.10 describes the DR measures included in the base case analysis. This includes direct load control, battery storage, and capacity and demand bidding options. The program option list largely follows the same categories included in the 2020 MPS.

[44] DR potential for these base case programs was also evaluated against many of the same sensitivities outlined in Section 8.3 above. This includes scenarios for a) changed in avoided costs b) prolonged economic downturn c) high touch marketing and d) large customer opt-outs. Total potential ranged from slightly less than 300 MW to nearly 600 MW.
[45] 20 CSR 4240-22.050(1)(E);20 CSR 4240-22.050(1)(E)1; 20 CSR 4240-22.050(1)(E)2
[46] 20 CSR 4240-22.050(4)(F)
[47] 20 CSR 4240-22.050(3)(D)
[48] 20 CSR 4240-22.050(4)(D)(2)

The current study also included a peak time rebate option. Ameren Missouri began to offer peak time savings program in the PY 2019-2021 MEEIA cycle, designed as a fully integrated residential energy efficiency and demand response program. In the current peak time savings program, customers receive an incentive for enrolling a qualifying smart thermostat and for allowing operation of the thermostat to reduce demand during curtailment events, and an additional fixed (annual) incentive for their continued participation. Participating thermostat manufacturers also rely on energy optimization algorithms to help reduce energy use throughout the year. Through 2022, the program has enrolled nearly 40,000 residential customers, with a total resource capability of more than 50 MW and more than 980 MWh of energy savings.

Table 8.10: Demand Response Options, Base Case 2023 MPS

DR Program Option	Program Description	Eligible Markets
DLC AC (Switch)	The compressor of the air conditioner is remotely shut off (cycled) by the system operator for periods that may range from 7 ½ to 15 minutes during every 30-minute period (i.e., 25%-50% duty cycle)	Residential and Non-Residential Customers
DLC AC (Thermostat)	The system operator can remotely raise the AC's thermostat set point during peak load conditions, lowering AC load.	Residential and Non-Residential Customers
DLC Pool Pumps	The swimming pool pump is remotely shut off by the system operator for periods normally ranging from 2 to 4 hours.	Residential and Non-Residential Customers
DLC Water Heaters	The water heater is remotely shut off by the system operator for periods normally ranging from 2 to 8 hours.	Residential and Non-Residential Customers
DLC Room AC	The compressor of the air conditioner is remotely shut off (cycled) by the system operator for periods that may range from 7 ½ to 15 minutes during every 30-minute period (i.e., 25%-50% duty cycle)	Residential Customers
DLC Lighting	A portion of the lighting load is remotely shut off by the system operator for periods normally ranging from 2 to 4 hours.	Non-Residential Customers
DLC Agricultural Irrigation Pump Control	The irrigation pump is remotely shut off by the system operator for periods normally ranging from 2 to 4 hours.	Agricultural Farms
Time of Use Rates	A retail rate with different prices for usage during different blocks of time. Daily pricing blocks could include on-peak, mid-peak, and off-peak periods. Pricing is pre-defined, and once established do not vary with actual cost conditions. Includes the four residential TOU rates Ameren already has.	Residential and Non-Residential Customers
Capacity Bidding Programs	CBP is a flexible bidding program offering qualified businesses payments for agreeing to reduce when a CBP event is called. Make monthly nominations and receive capacity payments based on the amount of capacity reduction nominated each month, plus energy payments based on your actual kilowatt-hour (kWh) energy reduction when an event is called. The amount of capacity nomination can be adjusted on a monthly basis. Penalties occur if load nominations are not met.	Non-Residential Customers
Demand Bidding Programs	DBP is a year-round, flexible, Internet-based bidding program that offers business customers credits for voluntarily reducing power when a DBP event is called.	Non-Residential Customers
Battery Storage	Dispatch of residential customer-sited batteries during critical peak hours.	Residential Customers

8.5.1.3 Review of Demand Side Rate Sensitivities[49]

Within the 2023 MPS, demand side rate options were assessed as an additional set of sensitivities to the base case described above. This included: Time of Use Rates, Critical Peak Pricing (with/without Enabling Technology), and Electric Vehicle Charging Rates.[50] The study further included additional TOU rate options for Business customers: Interruptible Rates, Time of Use Rates, Critical Peak Pricing (with/without Enabling Technology), Thermal Storage Rates, and Golf Cart off-peak charging. Table 8.11 provides the MAP and RAP adoption levels for each customer sector, with and without enabling technology.[51]

Table 8.11: Adoption Rates (MAP and RAP) by Rate Option with and without Enabling Technology

Sector	Program	MAP	RAP
Residential	Peak Time Savings	9.60%	4.80%
	Critical Peak Pricing	10.20%	5.00%
	with Enabling Technology		
	Critical Peak Pricing	7.90%	3.90%
	without Enabling Technology		
	Electric Vehicle Charging Rate	94%	57%
Non-Residential	Interruptible Rate	21%	3%
	Time of Use	4%	2%
	Peak Time Savings	8%	3%
	Critical Peak Pricing	7%	3%
	with Enabling Technology		
	Critical Peak Pricing	7%	3%
	without Enabling Technology		
	Thermal Electric Storage Cooling Rate	20%	7%
	Golf Cart Charging Rate	20%	7%

8.5.1.4 Implementation of Demand Side Rates

Ameren Missouri has installed over 1,000,000 AMI meters and five TOU rates for customers to choose to best manage their energy. The following guidelines are set forth for customers during this transition. Ameren Missouri customers with an AMI meter installed prior to October 1, 2023, that have had an advanced meter installed for six months shall be placed on the Evening/Morning Saver rate at the beginning of their next bill cycle. Ameren Missouri requires all customers with an AMI meter installed after October 1, 2023, that have had an advanced meter installed for six months shall be placed on the Smart Saver Option A rate at the beginning of their next bill cycle. Beginning March

[49] 20 CSR 4240-22.050(2); 20 CSR 4240-22.050(4)(A); 20 CSR 4240-22.050(4)(B)
[50] 20 CSR 4240-22.050(3)(D) 20 CSR 4240-22.050(4)(D)(2)
[51] 20 CSR 4240-22.050(4)(D); 20 CSR 4240-22.050(4)(D)(1); 20 CSR 4240-22.050(4)(D)(3);20 CSR 4240-22.050(4)(D)(4); 20 CSR 4240-22.050(4)(D)(5)A through D;20 CSR 4240-22.050(4)(G)

31, 2024, new customers or accounts with an advanced meter shall be placed directly on the Smart Saver Option A rate.

In contrast, the 2023 MPS assessed TOU scenarios with a peak to off-peak ratio ranging from 3:1 to 8:1. Off-peak rates were defined as $0.08/kWh. Thus, under a default 3:1 ratio, customers would be assumed to face a $0.24/kWh on peak rate. All else equal, greater peak to off-peak ratios would be expected to have lower adoption rates and greater savings.

To avoid double-counting potential and to account for the interactive effects between rates, the 2023 MPS assumed the hierarchy as shown in table 8.12.

Table 8.12: DR Hierarchy by Sector (including Rate Programs)

Order	Residential Hierarchy	Small Non-Residential Hierarchy	Large Non-Residential Hierarchy
1	Direct Load Control	Direct Load Control	Capacity Bidding
2	Time of Use	Critical Peak Pricing	Interruptible Rate
3	Peak Time Savings		Critical Peak Pricing
4	Critical Peak Pricing		

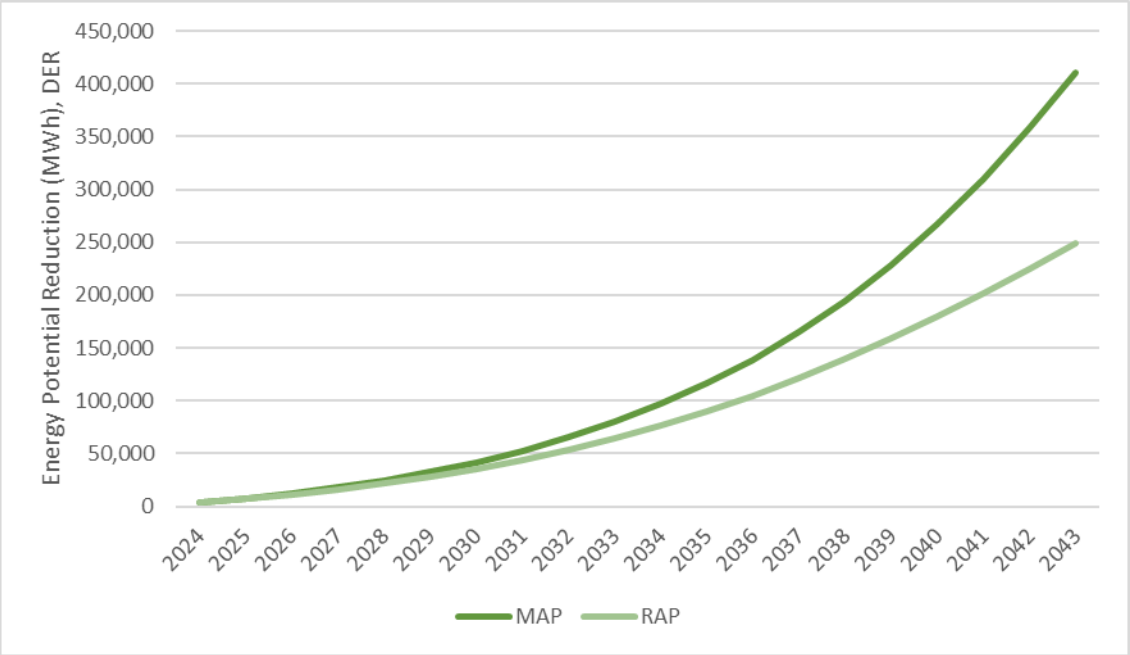
In total, the rate sensitivities identified an additional 274 MW of RAP potential for the Residential sector and 26 MW of RAP potential for the Business sector.

Future savings from DSM rates and rate design will depend significantly on the pace of implementation, rate of customer adoption, and the strength of the price signal. Note too, that the TOU rates implemented through the general rate case are not considered a MEEIA program, and therefore, potential savings are not developed through the EM&V as described in Section 8.4. The 2023 MPS does not necessarily consider implementation constraints and instead, estimates the potential upper bound of potential under the most aggressive implementation plan. In contrast, the Company recognizes that changes to residential rate design represent "a gradual transition" that is necessary to modernize its rate structure.

8.5.2 Distributed Energy Resources Potential

The 2023 MPS focused on combined heat and power (CHP) and Solar Photovoltaics (PV) to analyze their potential under the current MEEIA cost-effectiveness framework to provide the collective distributed energy resources (DER) MAP and RAP potential. The results, as shown in the figure below, indicate MWh potential for MAP just upwards of 400,000 and sitting at 250,000 for RAP. By 2043, CHP technical potential represents 22% of the business sector sales forecast and Solar PV technical market potential represents 36.8% of the residential and business sector sales forecast combined.

Figure 8.9: Cumulative Annual MAP/RAP Distributed Energy Resources Energy Efficiency Savings (MWh)



The 2023 MPS relied on a bottom-up approach to estimate potential for each technology.[52] This included an assessment of applicable premises within each market sector (and associated energy use per premise); detailed assessment of hourly generation profiles, hourly avoided costs, and installed and operating costs; analysis of cost-effectiveness as measured by the TRC and other tests as applicable; forecast of potential through application of customer adoption curve(s) for technologies that are cost-effective; and considers sensitivities through alternative scenarios with unique inputs. The solar analysis relied on the most current cost data, as provided by the National Energy Renewable Laboratory, adjusted for Missouri-specific values, scaled operating and maintenance costs with system size, and relied on the existing federal investment tax credit schedule.

A key conclusion of this robust DER analysis is that while significant technical potential exists, no technologies were cost effective as measured by the TRC under base case avoided costs. The lone exception to this is a single configuration of large CHP natural gas reciprocating turbine, with capacity greater than 15MW. Sensitivities included alternative cost effectiveness testing criteria for CHP. Despite the lack of cost effectiveness as measured by the existing MEEIA framework - TRC, both solar PV and CHP technologies were found to be cost effective using the PCT.

[52] 20 CSR 4240-22.050(3)(I); 20 CSR 4240-22.050(6)(B);20 CSR 4240-22.050(5)

Similar to the 2020 MPS, the 2023 MPS highlights that while technical potential for DER exists, deployment and installation will depend on multiple location- and customer-specific financial and non-financial criteria.

To this end, Ameren Missouri continues to operate voluntary renewable subscription programs for residential and business customers as alternatives to behind the meter resources. These programs allow interested customers to participate in the manner that works best for their unique needs, while also ensuring that Ameren Missouri can continue to provide the most cost-effective service to non-participating customers.[53] Additionally, the Business energy efficiency program continues to offer custom incentives to provide opportunity for cost-effective CHP projects to receive a rebate.

8.6 Other Special Contemporary Issues

8.6.1 Urban Heat Island[54]

8.6.1.1 UHI Pilot Study

In December 2022, Ameren Missouri conducted an urban heat island pilot study in collaboration with East-West Gateway Council of governments. An urban heat island (UHI) is the physical location of higher temperatures caused by urbanization which replaces natural land cover with low-albedo impervious surfaces such as roads and buildings. High temperatures typically have adverse impacts on high-risk populations, the environment, and the economy. Through the pilot study, Ameren Missouri explored the sources of data that can be used to map the local UHI and analyzed energy use data for select number of census tracts to determine if there is a correlation between the UHI and energy demand.

Conclusions from the study pointed towards the need to conduct additional data collection and analysis, as the study only looked at a limited set of data. Unexpectedly, the data utilized did not find a relationship between residential energy use and tracts of land that are more urban/have less vegetation. It is true that urban and suburban areas generally experience the urban heat island effect, but there are also pockets of higher heat in rural areas. Trends were visible that showed warmer air temperatures in urban areas and cooler temperatures in more rural/vegetated areas. Differences in air temperature heat were only a few degrees as opposed to land surface temperatures that showed a 20-degree difference between urban and rural areas.

The study proposed a few areas of additional analysis, which are listed below:

[53] By definition, resources with a TRC below 1 and a PCT above 1 that reduce system load transfer or shift in costs from participants to non-participants.
[54] File No. EO-2023-0099 1.A

1. Conduct further analysis to define the spatial and temporal characteristics of urban heat in St. Louis.
2. Expand energy use data as well as explore and define the impacts of urban heat island on St. Louis' people and infrastructure.
3. Assess various ways to mitigate the impacts of urban heat island.

Efforts are underway to further the analysis indicated above.

8.6.1.2 UHI Mitigation Potential

In addition to the pilot study, the 2023 MPS included cool roofs in its assessment of potential in both the residential and commercial sectors. Cool roof technology is understood to be effective in mitigating some UHI effect.

Increasing vegetation in urban areas can aid in reducing UHI effect. In its MEEIA 4 3-Year Plan application, Ameren Missouri proposed a potential pilot program that would aim to increase the efficiency of homes through the education and proper placement of shade trees. The tree planting program for homes would provide trees and software to participants to show the best place to plant trees for shade that will produce energy saving benefits for their home.

Within the MEEIA 3 Extension for plan year 2024, Ameren Missouri will make up to $100k available to supplement and support third-party research and/or grant writing to progress UHI mitigation. Additionally, a portion of the Multifamily Income Eligible program budget will be allocated to provide incentives for cool roof measures.

8.6.2 Third Party Aggregation[55]

Ameren Missouri initiated business and residential Demand Response programs as part of the MEEIA 2019-2021.[56] In 2022, Ameren Missouri delivered robust cost-effective business and residential DR programs and achieved actual demand response capability of 82.7 MW and 48.82 MW, respectively, equating to over 130 MW of peak load reductions. On August 23rd, 2023, the Missouri Public Service Commission approved the MEEIA 3 Stipulation PY 2024 extension[57] increasing filed cumulative targets to 137 MW and 68 MW, respectively, and allowed all business opt-out customers to participate. Ameren Missouri plans for continued participation in Midcontinent Independent System Operator, Inc.'s (MISO) Planning Resource Auctions as a Load Managed Resource.

Utilizing demand response as a virtual power plant has the potential to benefit all customers through future avoided investment in capacity resources, transmission, and

[55] File No. EO-2023-0099 1.B
[56] File No. EO-2018-0211
[57] File No. EO-2018-0211

distribution infrastructure; through participation in MISO's four-season capacity Planning Resource Auction (PRA); and through increased MISO revenues flowing through the Fuel and Purchased Power Adjustment Clause (FAC) Rider. As stated in Ameren Missouri's response to file NO. EW-2021-0267, "[t]he Company's programs provide opportunities for its retail customers to earn predictable incentives in exchange for their willingness to provide load reductions that can benefit the system and all of the Company's retail customers served by it, both economically and with respect to reliability. These programs are an invaluable part of the Company's resource planning and resource adequacy efforts, which benefits all customers."

As the Missouri Public Service Commission considers whether to modify the prohibition of aggregators of retail customers (ARC) from aggregating DR resources for commercial and industrial customer demand response (and if so, the timing),[58] and thus competing with utility run DR programs, the 2023 MPS conducted analysis to incorporate into discussions regarding potential future impacts to demand response. The 2023 MPS included two programs to serve as a proxy for the examination of potential for third-party aggregators of retail customers (ARCs) – capacity and demand bidding. The analysis included low, medium, and high participation scenarios of commercial and industrial customers electing to participate in DR. The capacity bidding program targeted large business customers and the demand bidding program targeted small to medium sized businesses. Brief descriptions of each program can be found in Table 8.11, within the DR section above. In the MW potential results shown below in Figure 8.10 and Figure 8.11, low case is considered to be "business as usual," medium case as RAP, and high case as MAP. Ameren Missouri assumed that the potential to reduce demand through these two programs are as identified in the 2023 MPS whether they are implemented by the ARC or the Company. If they are implemented by the utility, Ameren Missouri would pay the program costs, and if they are implemented by the ARCs, then Ameren Missouri would pay the ARCs for the demand reduction. Ameren Missouri assumed the cost to implement or the cost to purchase from the ARC are the same as we do not have any better estimates at this time.

[58] File No. EW-2021-0267

Figure 8.10 MAP and RAP MW Potential, DR Capacity Bidding Program

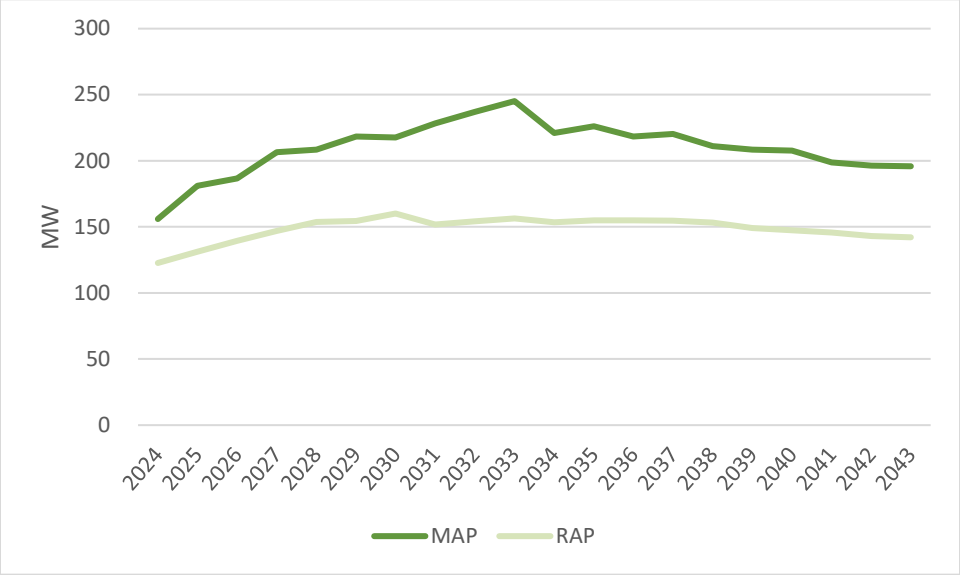
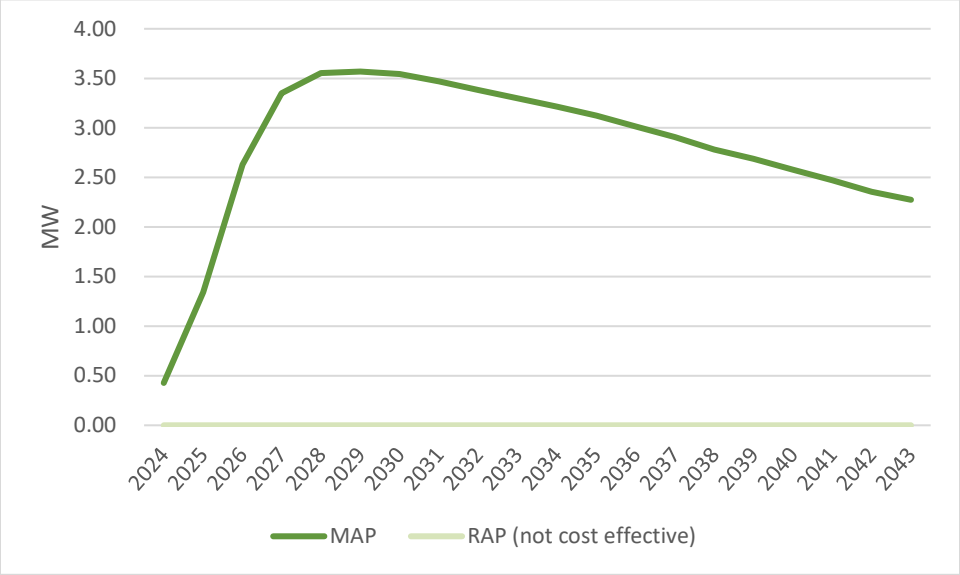


Figure 8.11 MAP and RAP MW Potential, DR Demand Bidding Program



8.6.3 Inflation Reduction Act and DSM Impacts[59]

Since the introduction of historic energy efficiency and electrification funds via the Inflation Reduction Act (IRA), the Ameren Missouri DSM team has been gathering available information and attempting to understand potential impacts to the future DSM portfolios. Federal funds are presented in several streams, some of which are more easily integrated into the analysis at this time (tax credits) and others which have much left to be determined (Home Energy Rebate programs). The 2023 MPS included assumptions about the IRA in the base case for EE and DR. Tax credit impacts as well as modifications to adoption rates to reflect additional participation as a result of IRA funds were included for EE. For DER, tax credits were factored into the cost-effectiveness screening.

Although the dollar amounts within the IRA appear significant, only a fraction of those dollars will be accessible for EE upgrades, making it more important than ever for Ameren Missouri MEEIA programs to receive approval for as filed or RAP level budgets. For example, Missouri is allocated $151M towards the Home Energy Rebate (HER) programs with 20% of those funds to be used for administrative costs. Based on Ameren Missouri's territory size, it could be assumed that somewhere around 50% of those funds could go towards Ameren's Missouri customer base. After these inputs, the combined budget for the two HER programs over a 10-year period would be $45,300,000. This means that the programs would receive roughly $4.53M annually in rebates – roughly the size of Ameren Missouri's Multifamily Income Eligible program in 2023.

Federal funds will need to be carefully allocated and administered to maximize their impact. The state should use all available resources to develop the programs to ensure they are not competing with utility programs and instead are braided into existing program structures to leverage both the utility rebates and federal funds to stretch customer and taxpayer dollars further. Stacking these rebates and providing utilities attribution of savings for projects which have utility program influence will be critical to ensuring the MEEIA programs are able to operate effectively and have meaningful benefits to customers and energy use reduction alike.

Ameren Missouri will continue to remain engaged in state and stakeholder discussions regarding the IRA topic. As more information becomes available, the DSM team will work to incorporate it into planning efforts.

[59] File No. EO-2023-0099 1.C

8.7 Compliance References