8. Demand-Side Resources

Highlights

Ameren Missouri completed a comprehensive Demand Side Management ("DSM") Potential Study and Market Assessment in March 2020.

- *The study identified and developed four portfolios for inclusion in the IRP. This includes the Realistic Achievable Potential ("RAP"), Maximum Achievable Potential ("MAP"), and two "Dynamically Optimized Portfolio Extension ("DOPE") portfolios that consider changes in the timing and type of implementation activities needed to match the first capacity shortfall.*
    - *The RAP portfolio identified nearly 4.5 million MWh and 1.8 GW of cost-effective DSM potential available to customers by 2040, while MAP identified more than 6.5 million MWh and nearly 2.8 GW.*
    - *A DOPE portfolio with implementation activities starting between 2028 and 2030 and another DOPE portfolio made up of select measures that provide 1000 MW of cost-effective DSM potential in the 2034-2036 timeframe.*

- *Key components of the analysis include:*
    - *New Primary Market Research (the first since 2013 study), including an updated assessment of end use measure penetration and saturation and customer willingness to participate and adoption rates in DSM programs at various incentive levels;*
    - *Updated methodologies to account for the interactive effects of DSM measures, segregate results by building type and income strata, and calibrate first year results to existing program delivery;*
    - *Income Eligible (Low Income) potential evaluated against a range of new and expanded policy oriented scenarios and sensitivities, which highlight important considerations for future program implementation;*
    - *An expanded Distributed Energy Resource potential (Combined Heat, Electric Vehicles, & Power and 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 recently accepted modifications and extension of Missouri Energy Efficiency Investment Act ("MEEIA") plans for the 2022 program year, including potential implications for special contemporary issues identified by stakeholders.*

8.1 Key Takeaways and Policy Considerations

Key Takeaways

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

The portfolios passed on for further integrated analyses are based on the robust and comprehensive analysis completed as part of the 2020 DSM Market Potential Study ("2020 MPS").[1] Each DSM portfolio includes the total resource potential from five sectors (residential, commercial, low-income, demand response, and distributed energy resources ("DER")). The potential from these sectors are combined into four different portfolios for further analysis.[2] 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;
- **Dynamically Optimized Portfolio Extension 1 ("Portfolio Level DOPE"):** A narrow DSM portfolio, based on varying the timing of implementing certain subsets of the RAP portfolio, in order to just meet the first resource need; and
- **Dynamically Optimized Portfolio Extension 2 ("Measure Level DOPE"):** A narrow DSM portfolio comprised of select RAP measures identified through a supply curve analysis, and sized to just meet the first resource need.

Figures 8.1 and 8.2 provide the results of the MAP, RAP, and DOPE portfolios with respect to energy and demand potential. Across all five sectors studied, the MAP portfolio identified more than 6.5 million MWh and nearly 2.8 GW of cumulative annual potential in 2040, while the RAP portfolio identified nearly 4.5 million MWh and 1.8 GW of cumulative annual potential by 2040. In contrast, the DOPE portfolios targeted an approximate 1,000 MW coincident peak demand reduction in the 2034-2036 time frame. These portfolios would continue to invest in low income potential starting in 2022, but would restrict further investment by measure or by year. For example, under the portfolio approach, programs

[1] 20 CSR 4240-22.050(1); EO-2020-0047 1.P; EO-2020-0047 1.Q; XE "EO-2020-0047 The 2020 MPS was released in March 2020 and included as Appendix B to this chapter. The 2020 MPS also includes a complete regulatory compliance checklist as Appendix H. This Chapter includes relevant rule references. The interested reader should also refer to the more detailed Market Potential Study and Appendix H. DOPE portfolios were developed after the release of the 2020 MPS; relevant materials are included as Appendix C, respectively.

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

would not be (re)introduced until 2026 (business demand response) and 2028 (residential and business energy efficiency programs).

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 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 (2022) were calibrated to existing MEEIA goals for the 2019-2021 plan. This creates consistency between future potential and actual program delivery. As a final check, the RAP and MAP results from the 2020 MPS were benchmarked against a national U.S. Department of Energy ("DOE") database of 20 year potential studies and a peer benchmark against 10 comparable utility programs. That analysis confirmed that these values are consistent with going forward industry expectations.

The focus of the DOPE portfolios is to more narrowly time investment needs with future supply side resource needs, and relies as a starting point, on the RAP portfolio. The addition of the DOPE portfolios represents a new addition to the IRP based on current conditions, and as such, cannot necessarily be benchmarked against prior IRP results or other external studies. The DOPE portfolios provide an important opportunity to evaluate the implications of alternative policy goals or targets on the overall resource plan, considering both the relevant risk analysis and resource acquisition process. The DOPE portfolios represent a lower overall budget commitment, lower total potential, and lower aggregate net benefits.

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

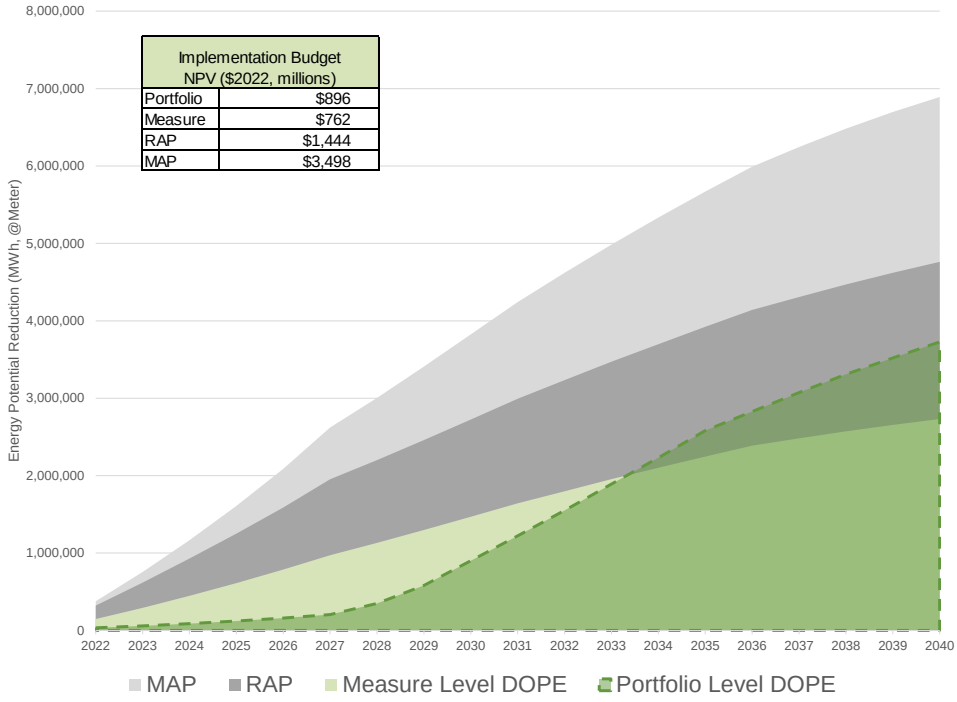
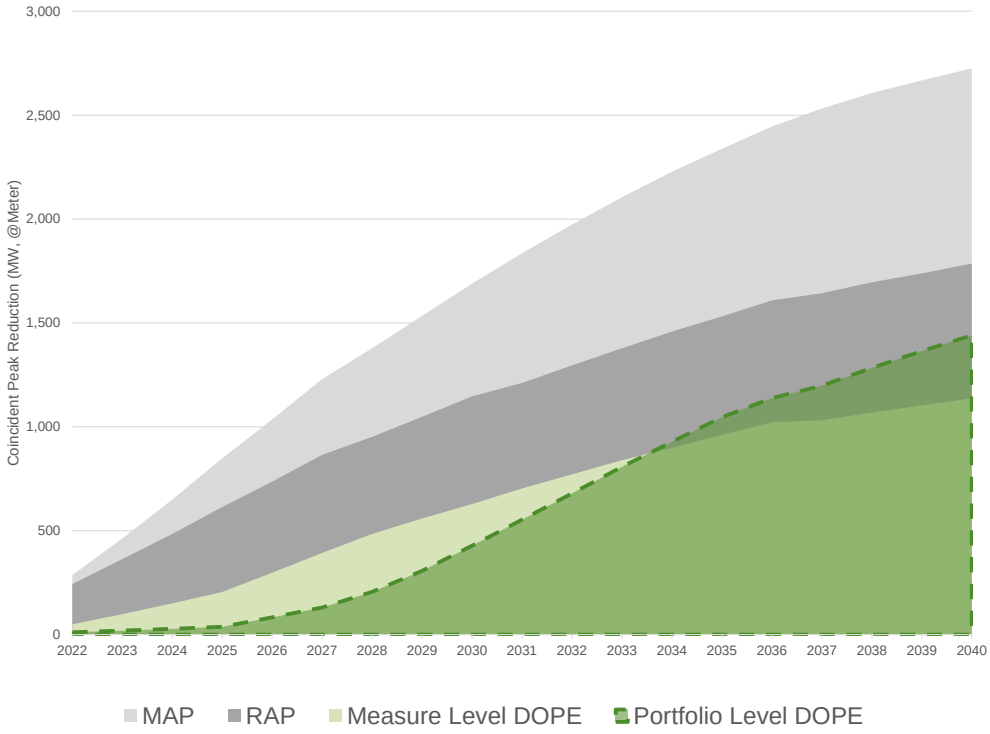


Figure 8.2: DSM Portfolios, Cumulative Annual Coincident Peak Reduction Potential (MW)



As a final step, a comprehensive load and cost risk adjusted analysis was developed for each of the DSM portfolios presented above. The 2020 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.

In contrast, DOPE portfolios are defined to be "optimized" to meet the required system resource need – and as such, the program would be actively managed in such a manner to avoid a higher or lower than necessary load impact. Implementation risks would expected to be managed either by increasing budgets (if implementation lags DOPE savings goals) or by decreasing budgets (if implementation exceeds DOPE savings goals). This implementation budget risk would be incremental to any uncertainty inherent in cost estimates, even for the forecasted base case implementation forecast. In addition to incremental cost uncertainty, it is important to note that any "optimized" portfolio will only be as robust as the optimization criteria used to develop the plan. Such a specific focus may reduce the overall flexibility of the portfolio, should conditions change from the initial forecast.

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 design its programs accordingly. Potential estimates developed as part of this analysis explicitly account for known changes to federal standards over the study period, but does not attempt to predict how codes may change over time.[3]

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]

[3] See Chapter 4 of the 2020 MPS. At the time of the 2020 MPS, the DOE had ruled that the backstop provision of the Energy Security 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 uncertainty in the lighting market within its base case forecast of market potential. 20 CSR 4240-22.050(3)(C)

[4] 20 CSR 4240-22.050(5)(A)1 through 3; 20 CSR 4240-22.050(6)(C)2; Chapters 4 and 7 of the 2020 MPS discusses the sensitivity analysis performed around avoided cost for energy efficiency and distributed energy resources, respectively.

The 2020 MPS began in March 2019 and completed its assessment in March 2020. Therefore, the 2020 MPS relied on the avoided costs developed as part of the 2017 IRP to complete the initial screening analysis and identify cost effective measures to be included in each portfolio.[5] These costs differ from those developed for this IRP, given changes in market outlook and conditions. As shown in Figure 8.3 and Table 8.1, overall avoided costs have declined slightly between the two different studies when compared over the same period. However, avoided energy costs remain within the 20% trigger initially identified in Ameren Missouri's initial filing for a 2019-2024 plan, while the avoided total capacity costs (transmission, distribution, and capacity) falls just outside of that same trigger with a 21% change on a net present value ("NPV") perspective. On a NPV basis, these changes are within the risk adjusted analysis described above and contemplated in prior MEEIA filings. This analysis supports, in part, the ability to take a long term planning perspective when establishing MEEIA programs over multiple years.[6]

[5] As discussed in Chapters 2 and 9, the integration and risk analysis of DSM portfolios uses the same market based avoided energy and capacity curves that are used to evaluate supply side resources.
[6] As described in Section 8.4.1 below, the 2020 MPS evaluated a sensitivity that varied avoided energy and capacity costs by +30% and -50%. That scenario found that total energy efficiency potential (MWh) varied by 8% and -5%, respectively.

Figure 8. 3: Avoided Cost Comparison – 2020 MPS and 2020 IRP

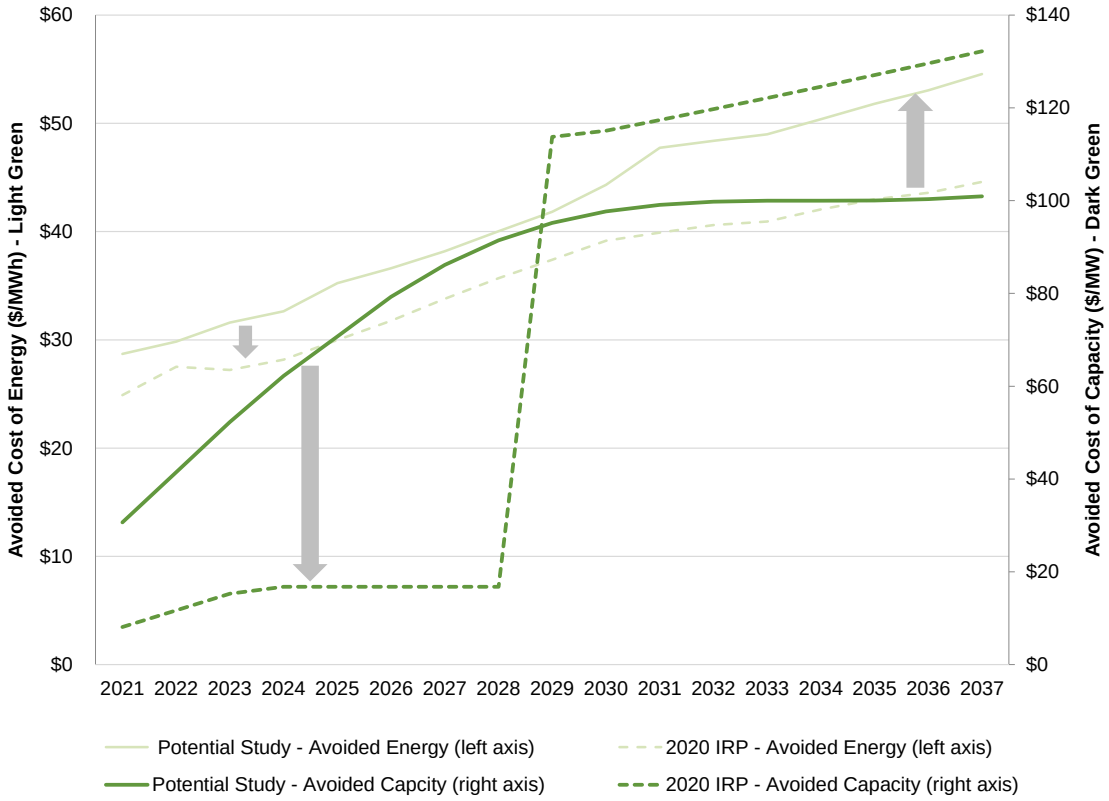


Table 8. 1: Percent Change in NPV of Avoided Costs

	Avoided Energy Costs (NPV, $/MWh)	Avoided Total Capacity Costs (NPV, $/kW-Year)
2017 IRP Value	$413	$1,106
2020 IRP Value	$355	$879
Percent Change	-14%	-21%

Note: NPV calculated over the period 2022-2037 (expressed in $2021), using a 5.95% discount rate. See Initial Filing, 2019-2024 MEEIA Plan, Section 5.6, for additional detail.

At the same time, it is important to note that because 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.[7] Future cost effectiveness tests may also need to recognize the location specific value that energy efficiency, demand response, and DER resources can provide when sited on customer premises in areas of greatest need.

In addition to avoided costs, the determination of ex post net savings are necessary to evaluate the total cost effectiveness of programs. To this end, MEEIA programs undergo a robust annual evaluation, measurement and verification ("EM&V") process each year, which includes an assessment of process results, net impact, and data collection protocols.[8] The purpose of EM&V is to help drive continuous improvement in programs, to the benefit of customers. Net savings estimates 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. In many instances, this annual variability has no bearing on the overall implementation strategy or cost-effectiveness of the programs. 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. To this end, many states have increasingly moved towards a prospective evaluation framework as opposed to a backwards looking, reactive or retrospective framework. In approving program year ("PY") 2022, Ameren Missouri believes important progress in this direction has been made.[9]

Given the time and resources to develop these estimates, many EMV&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.

[7] It is important to note that DSM portfolios provide numerous benefits in addition to meeting future supply resource needs. In 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, EO-2019-0132, December 11, 2019.

[8] 20 CSR 4240-22.050(7); 20 CSR 4240-22.070(8)(A)-(C)

[9] This is an important distinction. Given any level of DSM budget and resources, Ameren Missouri and its stakeholders must decide how much of that to invest in implementation of programs and how much to invest on EM&V. A forward looking, prospective evaluation framework allows stakeholders and the independent evaluator to identify the most important and pressing issues 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. This allows for more robust planning and reduced administrative expenses.

This is an important consideration to align incentives around program implementation, while maintaining sufficient EM&V resources to assess necessary program changes for future delivery of cost effective programs. A change in focus of the primary purpose of EM&V also better aligns implementation incentives with several of the special contemporary issues and policy implications identified within the 2020 MPS. This includes an ability to drive deeper savings in multiple sectors and begin to transition towards more holistically offering energy efficiency as a service, financed with no upfront cost by the customer and paid back from savings on the utility bill. This will be true for both residential and business customers, under current codes and standards and for those customers that will need to comply with future and evolving Building Energy Performance Standards ("BEPS") within St. Louis City.

Of particular importance, the 2020 MPS and baseline market research also included a detailed analysis of program potential and customer needs within the low income sector. Low income customers often use more energy (per square foot) due to lower energy efficiency equipment and housing stock, and not surprisingly, also pay a higher portion of their household budget for energy services. Bringing these customers back to a baseline level of use or energy burden represents an important policy goal to create more equitable conditions for customers.

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. It will also require effective co-delivery for customers with gas heating. Ameren Missouri continues to position its programs to meet these multiple needs. Current strategies focus on tiered geographic 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 neighborhood by neighborhood basis, defined based on need;
- The launch in 2021 of a new 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
- Starting in 2022, a new targeted neighborhood lighting program, that will sell discounted LED bulbs at retail channels located throughout the service territory focused entirely on areas of lagging adoption of LEDs.

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 – will play a critical role in Ameren Missouri's transition to a clean energy future.

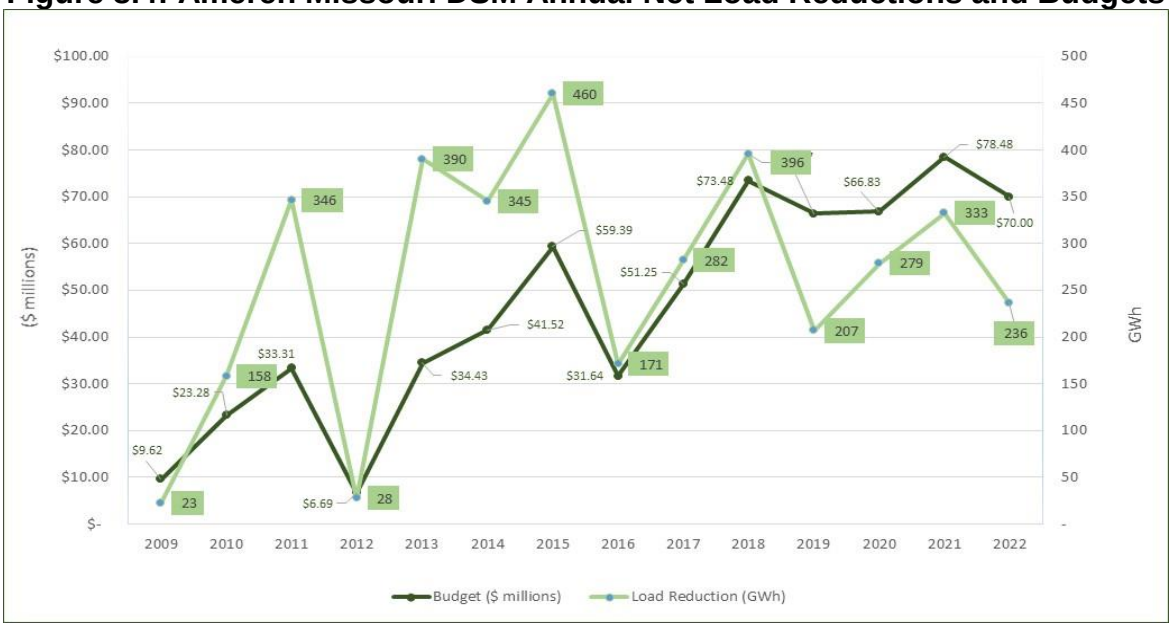
The rest of this chapter is organized as follows. Section II provides an overview of past and current Ameren Missouri MEEIA programs. Section III provides an overview of the 2020 MPS, including a detailed discussion of scenarios and sensitivities across multiple sectors. Section IV reviews the risk and uncertainty analysis used to develop high and low load and cost sensitivities for the DSM IRP inputs. Section V reviews the role of Evaluation, Measurement and Verification within the DSM portfolio. Section VI provides additional regarding the detailed sector analyses for low income, demand response and DER, and Section VII concludes with an assessment of other special contemporary issues.

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 portfolio. Figure 8.4 shows the annual energy savings and associated budgets from 2009 through 2019, with a forecast of program goals for 2020-2022. 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.

Figure 8.4: Ameren Missouri DSM Annual Net Load Reductions and Budgets



Note: 2009 to 2019 values represent actual evaluated (net) values from annual EM&V reports. 2020 to 2022 values represent net as filed values approved as part of program filings.

In 2018, Ameren Missouri received continued support from the Commission for this leadership through approval for its third MEEIA cycle, which covers the period 2019 to 2021. For the PY 2019 to 2021 cycle, Ameren Missouri developed plans to target 794 GWh of cumulative portfolio energy savings and 361 MW of cumulative demand savings, with a total budget of $195.5 million. This represents the largest commitment to DSM planning in the state of Missouri to date. And with good reason: the plan is forecast to generate $324 million in lifetime net benefits. The current plan also includes a six-year commitment to significantly grow and expand low income programs, with more than $50 million targeted specifically for these customers. To date, Ameren Missouri has made important progress in meeting these goals and remains on track to deliver these benefits.

Stakeholders recognize this progress. On August 5, 2020, the Commission approved a unanimous stipulation and agreement in File No. EO-2018-0211, extending the MEEIA 2019-21 cycle through the end of the calendar year 2022. This extension includes several notable changes from the PY 2019-21 plan, including:

- A new on-bill financing program known as PAYS for residential customers, with $5 and $10 million in new financing available in 2021 and 2022, respectively;[10]
- An increase in the proportion of dollars allocated to low income programs from 10% to 18% of the portfolio; and
- The elimination – for PY 2022 – of several cost-effective customer offerings, including the Residential Home Energy Report, school kits, appliance recycling, and education programs, and the Business new construction program.

Ameren Missouri remains committed to offering best in class DSM programs for the benefits of its customers.[11] Examples of performance leadership include:

- Market segmentation strategies to tailor specific DSM messages to specific market segments.[12]
- Use of national best practice evaluation processes and procedures.
- Addition of new and improved demand-side programs tailored to ever-changing markets, customer and program needs. This includes but is not limited to:
    - A nationally recognized fully integrated energy and demand residential demand response program;

[10] This makes Ameren Missouri one of the first investor owned utilities in the country to offer this service. Customers will now have access to low cost financing, provided by the utility which will create a new opportunity to reach more customers in the market and begin to offer energy efficiency as a service.
[11] 20 CSR 4240-22.050(1)(B)
[12] 20 CSR 4240-22.050(1)(A)1 through 3; 20 CSR 4240-22.050(3)(B)

- New programs for low-income customers designed to target meaningful savings at each premise, with average savings over 15% per customer;
- The launch of a comprehensive customer web experience with custom energy saving tips and rewards; and
- A robust business pipeline, including accommodation of long lead projects and dedicated and expanded offerings for the non-profit sector.

8.3 Development of the IRP DSM Portfolios[13]

This section of Chapter 8 begins with an overview the 2020 MPS, including stakeholder interactions. 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. Information on overall costs are presented, and this section concludes with a description of the DOPE portfolios.

8.3.1 Overview

The 2020 MPS provides the most comprehensive assessment of DSM potential completed to date. The purpose of the study is to assess potential energy and demand savings from energy efficiency, demand response, and distributed energy resources across multiple sectors of the economy.

To complete this analysis, Ameren Missouri worked closely with the stakeholder community to develop a relevant scope of work, select the appropriate contractor team, review methodologies and assumptions, analyze market date, and review draft and final results. To accomplish this task, Ameren Missouri commissioned GDS Associates ("GDS") to serve as the lead author. GDS also completed the 2016 MPS, which allows for a baseline level of consistency and comparison between studies. As described throughout, the 2020 MPS also includes several new scenarios and sensitivities, and methodological advancements, including a detailed assessment of potential by income and building type; detailed consideration of interactive effects; and use of detailed, primary market research data.

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, including an assessment of electric vehicle chargers and battery technologies. The American Council for an Energy Efficient Economy ("ACEEE") partnered on a detailed review of a robust assessment of potential in the income eligible

[13] As described in this section, the DSM portfolios are based on the 2020 MPS developed during the period March 2019 to March 2020. In many instances throughout the process this study was referred to as the 2019 study, when the majority of the work took place. This chapter refers to the study as the 2020 Ameren Missouri DSM Market Potential Study to reflect the title of the final report, which came out in March of that year.

sector, accounting for various policy goals. Together, these partners form the "the GDS Team". In addition, Opinion Dynamics Corp. ("ODC"), Ameren Missouri's current evaluation contractor, conducted primary market research regarding customer attitudes and willingness to participate in demand side programs. The market research also identified baseline levels of end-use penetration and saturation. Both inputs were used to inform the relevant starting point for the MPS. In the residential sector, sample sizes typically allowed for observed differences between market-rate and income-eligible customers.[14] Primary data collection in the business sector reported findings for small vs. medium/large businesses.

The 2020 Market Potential Study was composed of five distinct areas of study:

- Residential sector market-rate energy efficiency
- Business sector energy efficiency
- Income-eligible energy efficiency
- Demand response potential, and
- Distributed Energy Resource

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 2020 MPS reviewed the period from 2022 to 2040. In December 2018, Ameren Missouri received approval for a new 2019-2021 MEEIA cycle in Docket EO-2018-0211. As described below, and throughout this chapter, the starting point for the 2020 MPS in 2022 was calibrated to the approved budget and savings goals outlined in the 2019-2021 plan. The continuation of annual demand side programs creates additional stability and certainty for customers and contractors alike, and a key finding of the MEEIA 2019-21 plan was that continued operation of DSM programs can help protect against changes in future supply conditions.

The 2020 MPS is the first study since 2013 to include primary market research on customer attitudes towards individual energy efficiency measures, including a detailed assessment of customer adoption rates, based on awareness and financial factors. Thus, the study starts where current programs end, providing a realistic assessment of likely adoption and impacts now and into the future.

8.3.1.1 Stakeholder Interactions during DSM Potential Study

The 2020 DSM Market Potential study was completed as a collaborative effort between subject matter expert contractors, Ameren Missouri and implementation staff, and the greater Missouri Stakeholder group. Stakeholders were engaged early on in the process,

[14] Income-eligible was defined by household size and 80% of area median income.

and feedback from those interactions were incorporated at all stages of the process. Stakeholder engagement began before the study was undertaken, in late 2018, during the Request for Proposal planning stage. Ameren Missouri engaged, informed, and updated interested stakeholders throughout the planning process as well. Over the course of the study, the Stakeholder group met officially four separate times to discuss preliminary results from ongoing work, as well as to plan the best course of action for future research. Stakeholder feedback helped inform the final design and determination of market research priorities,[15] measure list qualitative review, sensitivity scenarios, benchmarking[16] and identified additional collaborative opportunities for research purposes. In addition to the four formal meetings, there was significant communication and interaction with interested stakeholders throughout the process.

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[17] and RAP[18] 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.[19]

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.

For the residential, low income 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

[15] Opinion Dynamics presented the planned market research scope of work at an in-person stakeholder meeting on May 6, 2019 and finalized the scope following receipt of stakeholder comments.
[16] The GDS Team sought input from stakeholders to produce additional studies to incorporate into the benchmarking analysis. While a few jurisdictions currently have new market potential analyses underway, no additional studies were offered for review.
[17] 20 CSR 4240-22.050(3)(G)5B
[18] 20 CSR 4240-22.050(3)(G)5B
[19] 20 CSR 4240-22.050(3)(H)

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 and then applied all relevant savings for each definition above to all applicable shares of load by sub-sector.

As a starting point, GDS reviewed the Ameren Missouri load forecast to generate the necessary inputs for the analysis. The study calibrated future load to account for the impact of past MEEIA cycles, since these measures will persist into the future. Load forecasts removed current program impacts, assumes that free-riders will continue to pursue energy efficient upgrades, and that an additional portion of the future population will be transformed from an efficiency perspective. Load was disaggregated across relevant end uses in each sector, in order to calibrate results and account for interactive effects between measures.[20]

Notably, the study also disaggregated load forecast for relevant sub-sectors by housing and income type. This includes a detailed analysis of potential in the residential sector for single family and multi-family housing and for market rate and income-eligible customers (defined as customers at 80 percent of area median income). The study also evaluated potential for 52 different combinations of building types, reflecting the condition of the building shell and heating/cooling end use technology. This whole building analysis is new for 2020, and allows for a granular assessment of both potential and energy use intensity for different customers.

[20] 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[21], the utility cost test ("UCT"), the participant cost test ("PCT"), and the ratepayer impact measure ("RIM") test.[22] 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.[23] 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.[24] The full incremental costs include single upfront costs and operational & maintenance costs where applicable.[25] 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.[26]

The Utility Cost Test measures the costs and benefits from the perspective of the utility administering the program.[27] 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.[28] Programs passing the UCT result in overall net benefits to the utility, thus making the program worthwhile from a utility cost accounting perspective.[29]

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.[30]

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.[31]

[21] 20 CSR 4240-22.050(5)(B)
[22] 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)
[23] 20 CSR 4240-22.050(5)(A);
[24] 20 CSR 4240-22.050(5)(B)2; 20 CSR 4240-22.050(5)(B)3
[25] 20 CSR 4240-22.050(5)(B)1
[26] 20 CSR 4240-22.050(5)(D)
[27] 20 CSR 4240-22.050(5)(C)
[28] 20 CSR 4240-22.050(5)(C)1; 20 CSR 4240-22.050(5)(C)2&3
[29] 20 CSR 4240-22.050(3)(G)5E; 20 CSR 4240-22.050(5)(D)
[30] 20 CSR 4240-22.050(3)(G)5C;20 CSR 4240-22.050(5)(F)
[31] 20 CSR 4240-22.050(5)(F)

Primary Market Research

In order to assess future potential, a clear picture of current market segments must first be established. The 2020 MPS employed new primary market research as a method of achieving that goal.[32] Research objectives were determined based on a gap analysis of available data, and were further prioritized based on potential study team (including ACEEE) input. The research plan was further refined through stakeholder collaboration.[33]

Primary market research activities ultimately involved 1) collecting updated equipment penetration, saturation, and efficiency characteristics, 2) site conditions related to DER, and 3) customer willingness to participate ("WTP") in program offerings across select end-uses/measures, (4) customer demographics, awareness of / interest in energy efficiency programs, and key customer behaviors such as occupancy patterns. These activities were specifically designed to provide updated estimates of baseline equipment saturations, as well as inform long run adoption rates for energy efficiency, demand response, and distributed energy resources.

Relevant market research activities included:

- Residential online surveys: This activity also included isolating representative samples of customers by home type (Single/Multi Family) as well as income-eligible/market rate.

- Nested residential on-site visits were conducted to collect more detailed information than could be collected via the online survey. The site visits also served as an important validation of selected customers online survey responses ("say-do"). On-site visits were evenly distributed between Market Rate and Income Eligible Participants (60 each).

- Multifamily ("MF") property owner surveys collected data to develop adoption curves for shared systems/equipment not typically owned by tenants. The sample frame for the building owner/manager survey included multiple sample sources for the MF owners/managers' survey, including mailing lists from real estate lists, contact lists provided by Ameren Missouri program staff, vendor contacts, as well as Community Development Organizations engaged in outreach and education efforts regarding energy efficiency.

- Business survey did not include on-site data collection. Instead, the study focused on additional online data collection, including medium/large businesses and for the MF building owners.

[32] 20 CSR 4240-22.050(2)

[33] Opinion Dynamics presented the planned market research scope of work at an in-person stakeholder meeting on May 6, 2019 and finalized the scope following receipt of stakeholder comments.

Table 8.2 provides the key household characteristics of residential customers used in this study.[34]

Table 8.2: Household Characteristics, Residential Customers

	Total	Market Rate Single Family (MR-SF)	Income-Eligible Single Family (IE-SF)	Market Rate Multifamily (MR-MF)	Income Eligible Multifamily (IE-MF)
Household Characteristics					
Number of Occupants	2.30	2.50	2.30	1.60	1.70
Year Home Built	1967	1973	1954	1964	1977
Square Footage	1,629	2,054	1,194	1,113	770
Avg. Annual Consumption (kWh)	12,812	14,500	12,100	8,700	7,800
Energy Use Intensity (kWh/Sq. ft)	7.86	7.06	10.13	7.82	10.13
Income Distribution					
Income < $15,000	10%	<1%	19%	<1%	38%
Income < $25,000	21%	<1%	48%	<1%	68%

Source: 2020 MPS, Table 8.3

The end-use characteristic market research identified several important demographic factors:

- Low income customers in either single family and multifamily units rely on electric resistance heating at a much greater rate than other residential customers;
- Efficient lighting (LED and CFL lamps) have increased in both penetration and saturation, but significant gaps remain between market rate and low income customers;[35]
- The vast majority of residential customers across all income levels rely on some type of cooling system; and
- As expected, there exist important differences in equipment penetration and saturation levels for small businesses compared to medium or large facilities.

The 2020 MPS includes additional and similar information for the business sector.[36]

[34] For further detail on the market research objectives, methodologies, and conclusions, see Section 2 of the MPS. Source for Table 8.3: 2020 DSM Market Potential Study (Final Report) See table 2-3: KEY HOUSEHOLD CHARACTERISTICS AND INCOME DISTRIBUTION.

[35] See 2020 MPS, Table 2-5. Nearly 90% of market rate customers have at least one LED bulb in their residence, compared to only 69% low income customers. Across all households, market rate customers have an efficient bulb (LED or CFL) in 61% of total sockets, while low income customers only have an efficient bulb in 44% of sockets. The gap is even greater when focused just on LEDs: 42% (market rate) compared to 19% (low income).

[36] For example, the market research found that smaller businesses were more likely to both lease space and share facilities with other tenants and generally operate fewer hours than medium/large businesses. End use saturation also differs by business size, particularly for lighting and lighting controls.

Market Adoption Rates

In addition to new primary research on building and equipment characteristics in the Ameren Missouri service territory, one of the major objectives of the primary research was to develop measure/program adoption curves in support of measuring achievable potential.[37] Adoption rate calculations were based on a survey questions measuring (1) willingness to participate 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.

For each measure, survey respondents rank their likelihood or WTP of purchasing efficient equipment or enroll in demand response programs at varying incentive levels (from zero to full incremental/or total cost). This forms the basis of a preliminary adoption score to be adjusted based on common mitigating factors. This adjustment is formed initially through a battery of questions intended to measure both financial and non-financial barriers. The final step is to adjust for program awareness, this accounts for the fact that certain customers who might otherwise participate will not be aware of the program or available incentives.[38] Residential and business customers were asked WTP questions for a range of energy efficiency measures, demand response offerings, and distributed energy resources.

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.[39] 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, connected lighting, advanced sensors and controls, and other devices).[40]

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)

[37] 20 CSR 4240-22.050(3)(G)3;
[38] For further detail, see Section 4.7 of the 2020 MPS regarding the utilization of the adoption rate research for assessing achievable savings potential.
[39] 20 CSR 4240-22.050(3);20 CSR 4240-22.050(3)(A); 20 CSR 4240-22.050(3)(B); In addition, Ameren Missouri performed a broad review of programs available around the country through the Energy Star website as part of the measure list review.
[40] 20 CSR 4240-22.050(1)(E)1

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 and implementation vendors, 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 201 residential and 367 business energy efficiency measures, 30 different demand response offerings, and multiple configurations of both combined heat and power ("CHP") and solar photovoltaic ("PV") distributed energy resource offerings.

GDS estimated relevant costs for each measure, as defined by each cost effectiveness test.[41] 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 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 for program years 2016-2018. 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 with 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.[42]

8.3.3 DSM Potential under MAP and RAP[43]

By combining original market research with the detailed assessment of potential DSM measures described above, GDS estimated all cost-effective potential in each year. As a first step, this cost effective potential was used to define the MAP and RAP portfolios. As a second step (discussed in the following section), MAP and RAP were further disaggregated to develop the relevant DOPE portfolios.

Tables 8.3 – 8.6 provide the energy efficiency program MAP and RAP cumulative annual potential by sector for select years. Figures 8.5 and 8.6 provide a more detailed representation of the energy efficiency program RAP and MAP potentials across the 20

[41] 20 CSR 4240-22.050(3)(G)5A-F
[42] 20 CSR 4240-22.050(3)(G)2
[43] EO-2020-0047 1.P; 20 CSR 4240-22.050(6)(A)

year planning horizon for the residential (Market Rate/Income Eligible), commercial/industrial ("C&I") sectors, and DER.[44] Figures 8.7 and 8.8 provides the RAP and MAP potential for demand response and DER, respectively. The 2020 MPS identified significant technical potential for DER. However, only a single 15 MW gas turbine was found to be cost effective under a RAP scenario by 2040. Given the uncertainty and potentially lumpy nature of a single investment such as this, the identified CHP potential was included in the MAP and RAP cases on an incremental and linear fashion, such that the assumed average annual potential equals the total identified potential by 2040.DER potential is discussed in greater detail in section 8.5 below. Collectively, these totals represent the RAP and MAP DSM case included in the 2020 IRP.

[44] 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 individual measures level (2018 Evaluation Portfolio Summaries).

Table 8.3: MAP and RAP Energy Reduction Potential (MWh) and Implementation Budget (NPV $millions)

Potential and Sector	2022	2025	2030	2035	2040	Implementation Budget (NPV $2022 millions)
MAP						
Residential	71,146	277,381	770,922	1,247,763	1,640,784	$792
C&I	248,460	1,080,820	2,321,508	3,219,653	3,697,922	$1,387
Low Income	33,495	142,920	477,000	822,838	1,090,626	$720
Demand Response						$594
DER	5,985	23,940	53,865	83,790	113,715	$5
Total	359,085	1,525,061	3,623,296	5,374,044	6,543,047	$3,498
RAP						
Residential	67,553	232,585	569,703	890,156	1,178,749	$379
C&I	201,715	820,667	1,641,206	2,201,423	2,478,382	$449
Low Income	31,307	114,426	332,011	567,269	786,389	$468
Demand Response						$145
DER	2,879	11,515	25,910	40,304	54,699	$2
Total	303,454	1,179,194	2,568,830	3,699,153	4,498,219	$1,444

Table 8.4: MAP and RAP Coincident Peak Reduction Potential and Implementation Budget (NPV $millions)

Potential and Sector	2022	2025	2030	2035	2040	Implementation Budget (NPV $2022 millions)
MAP						
Residential	31	111	242	335	404	$792
C&I	65	295	705	1,040	1,214	$1,387
Low Income	12	46	139	227	295	$720
Demand Response	178	395	603	736	811	$594
DER	2	6	14	22	30	$5
Total	288	854	1,704	2,360	2,755	$3,498
RAP						
Residential	30	99	191	255	307	$379
C&I	57	238	517	725	819	$449
Low Income	12	38	103	167	222	$468
Demand Response	144	240	335	385	438	$145
DER	1	3	7	11	15	$2
Total	244	618	1,153	1,542	1,801	$1,444

Table 8.5: MAP and RAP Energy Reduction Potential (MWh)
Percent of Forecasted Load

Potential and Sector	2022	2025	2030	2035	2040
MAP					
Residential	0.23%	0.88%	2.30%	3.56%	4.49%
C&I	0.79%	3.43%	6.93%	9.20%	10.13%
Low Income	0.11%	0.45%	1.42%	2.35%	2.99%
Demand Response					
DER	0.02%	0.08%	0.16%	0.24%	0.31%
Total	1.14%	4.83%	10.82%	15.35%	17.92%
RAP					
Residential	0.21%	0.74%	1.70%	2.54%	3.23%
C&I	0.64%	2.60%	4.90%	6.29%	6.79%
Low Income	0.10%	0.36%	0.99%	1.62%	2.15%
Demand Response					
DER	0.01%	0.04%	0.08%	0.12%	0.15%
Total	0.96%	3.74%	7.67%	10.57%	12.32%

Table 8.6: MAP and RAP Coincident Peak Reduction (MW) Potential
Percent of Forecasted Load

Potential and Sector	2022	2025	2030	2035	2040
MAP					
Residential	0.46%	1.63%	3.42%	4.58%	5.36%
C&I	0.95%	4.32%	9.97%	14.20%	16.10%
Low Income	0.18%	0.68%	1.97%	3.10%	3.92%
Demand Response	2.61%	5.79%	8.53%	10.06%	10.76%
DER	0.02%	0.09%	0.20%	0.30%	0.40%
Total	4.22%	12.52%	24.09%	32.23%	36.53%
RAP					
Residential	0.44%	1.45%	2.71%	3.48%	4.07%
C&I	0.83%	3.49%	7.31%	9.90%	10.86%
Low Income	0.17%	0.55%	1.45%	2.28%	2.94%
Demand Response	2.12%	3.52%	4.74%	5.26%	5.81%
DER	0.01%	0.05%	0.10%	0.15%	0.20%
Total	3.57%	9.05%	16.31%	21.06%	23.88%

Figure 8.5: Cumulative Annual RAP/MAP Energy Efficiency Savings (MWh)

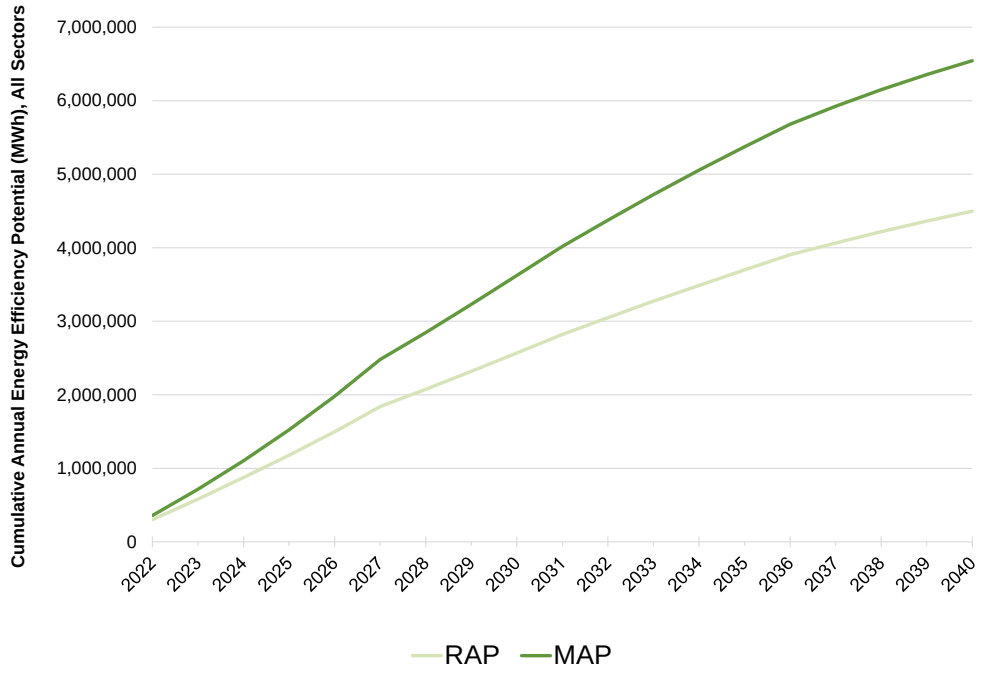


Figure 8.6: Cumulative Annual RAP/MAP Coincident Peak Reduction (MW)

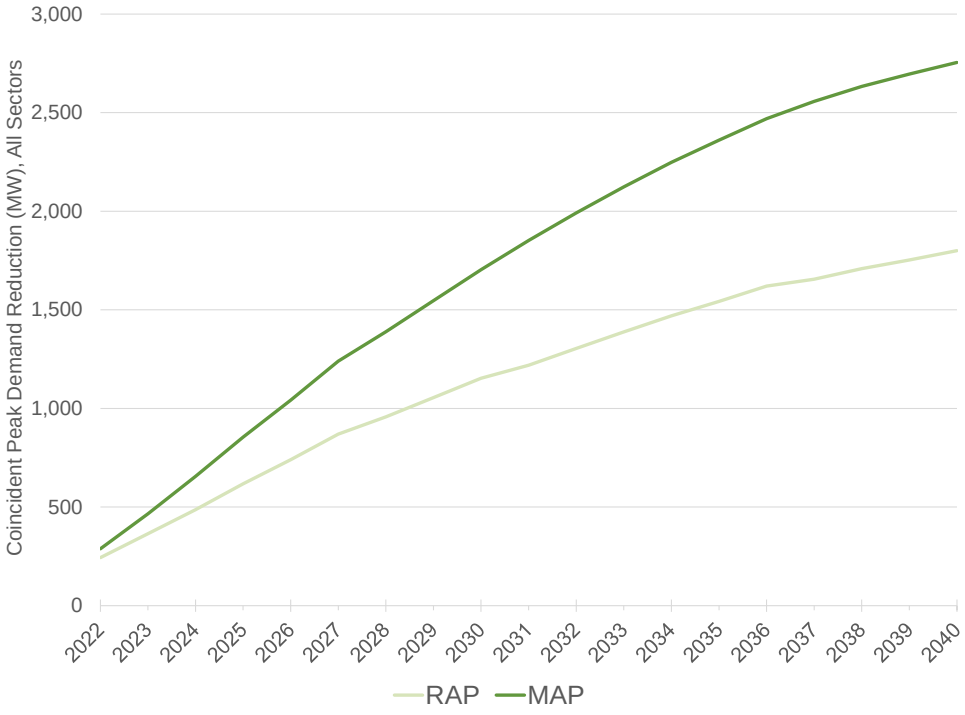


Figure 8.7: Cumulative Annual RAP/MAP Demand Response Savings (MW)

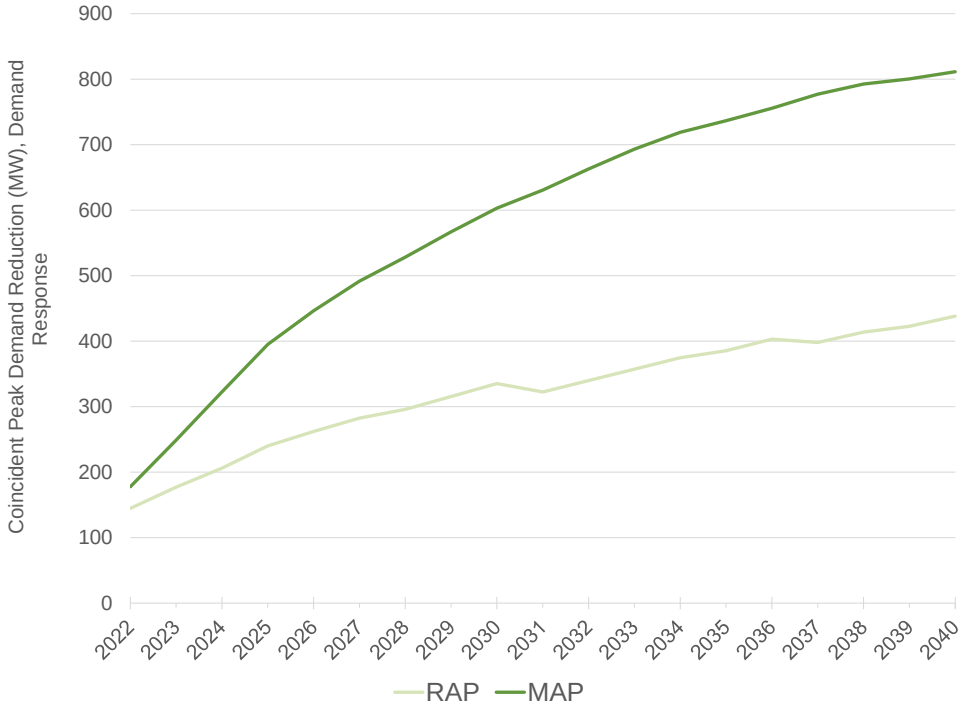
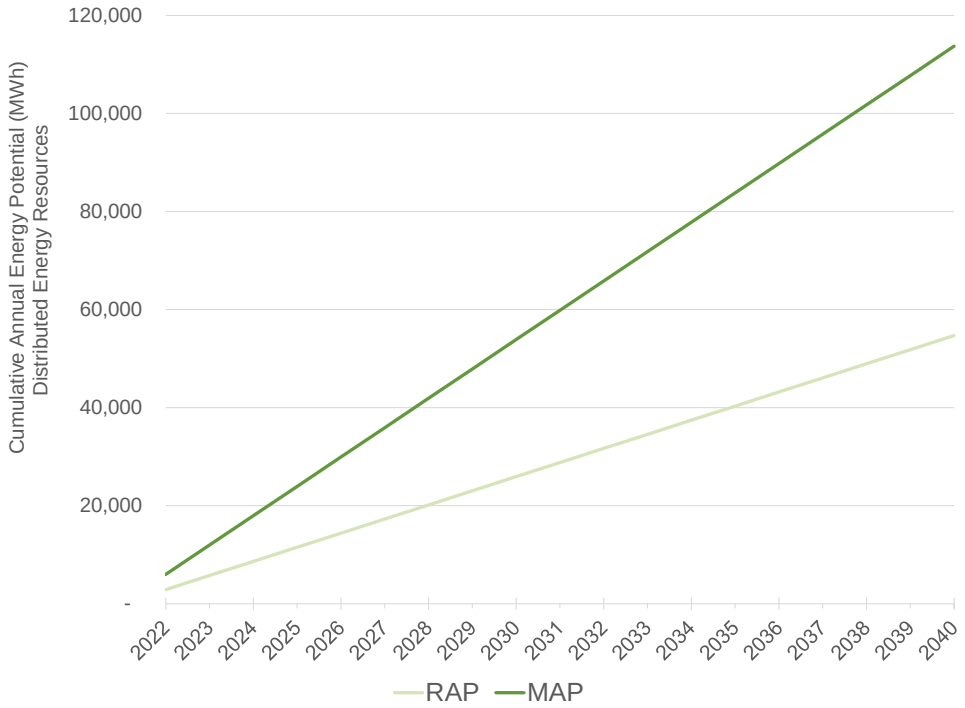


Figure 8.8: Cumulative Annual RAP/MAP Distributed Energy Resources Energy Efficiency Savings (MWh)



8.3.3.1 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.[45]

The national comparison was made using the U.S. Department of Energy catalog of state and local potential studies with comparable study horizons (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 consistent with other 20-year potential studies.

Table 8.7: Comparison of Potential Study MAP/RAP across DOE Archive

	Department of Energy	Ameren Missouri
Achievable Potential (as a % of sales)	**20 YR**	**20 YR**
Maximum Achievable Potential (MAP)	25%	24%
Realistic Achievable Potential (RAP)	17%	17%

Source: 2020 MPS, Table 8.4

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

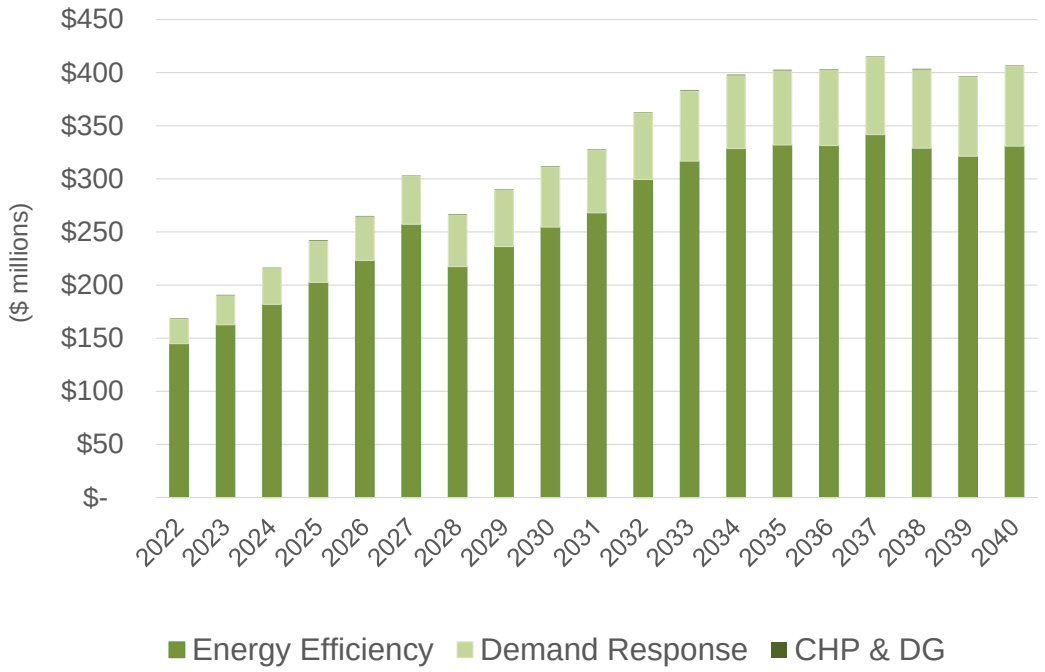
8.3.4 Portfolio Impacts and Costs[46]

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.

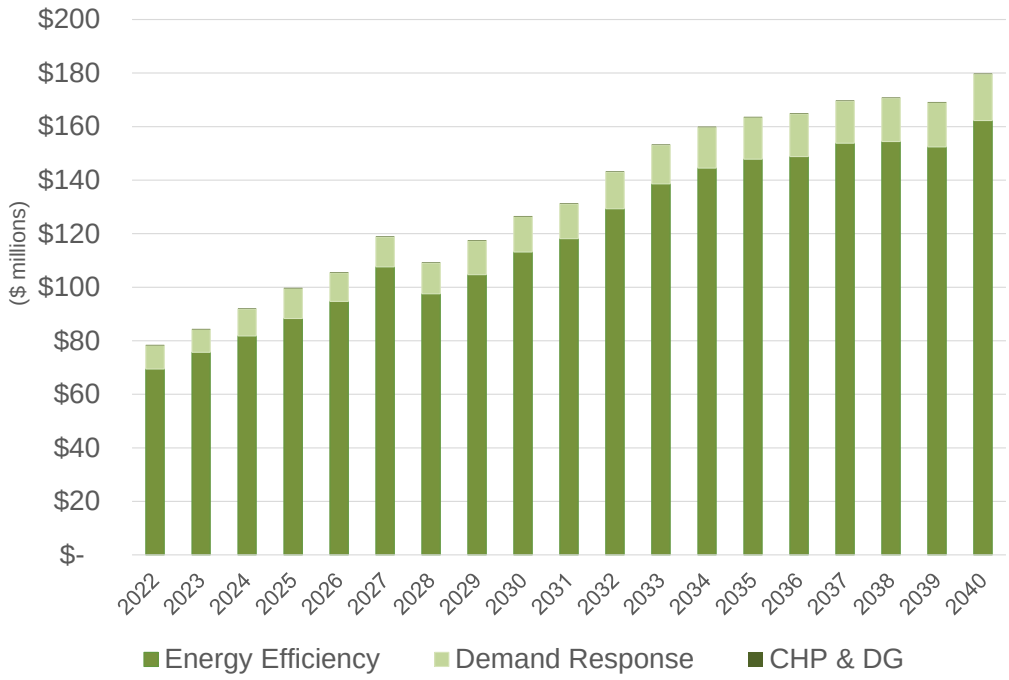
Figure 8.9 shows the projected annual budget for the MAP portfolio while Figure 8.10 shows the projected annual budget for the RAP portfolio. All costs are expressed in nominal terms.

Figure 8.9: Portfolio Budget, MAP ($Millions)



[46] 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 8.10: Portfolio Budget, RAP ($Millions)



8.3.5 Dynamically Optimized Portfolio Extension

In addition to the cost-effective RAP and MAP portfolio outlined above, the Company also engaged GDS Associates to seek feedback from stakeholders and develop a DOPE for consideration in this Integrated Resource Plan. That is, the DOPE portfolios are optimized to defer future resource needs on a just in time basis. In contrast to RAP and MAP, the DOPE portfolios *do not* assume continued DSM program operations in 2022. Instead, each program or measure is re-introduced to the market at a later date, such that the cumulative demand reduction equals the resource need. (The exception is low income programs, which do continue as-is in the RAP scenario.) Thus, DOPE considers the appropriate timing for the full suite of residential and business efficiency and demand response offerings.

GDS developed two distinct DOPE portfolios for consideration in the IRP. Both portfolios were selected based on their ability to meet the first identified resource need, which was defined to be approximately 1000 MW (measured at the meter) during the 2034 to 2036 period.[47] These portfolios rely on the RAP portfolio presented above as a starting point. Thus, DOPE portfolios are best understood as a subset of RAP, screened by time and by measure.

- **Portfolio Level DOPE:** Recognizes that DSM programs can not necessarily start and stop on an annual basis and recognizes that a certain level of market certainty and continuity is required by customers, contractors, and regulatory stakeholders to implement a successful program. Each program (Res EE, Business EE, Res DR, and Business DR) was viewed in its entirety, and programs were shifted by year.

- **Measure Level DOPE:** Takes a more targeted look, and considers the timing of each DSM measure (or group of measures). Selected measures are assumed to start in 2022 and run for the duration of the study.

GDS developed multiple candidate options for each DOPE. This reflects the finding that for any single optimization, there are multiple packages that achieve the same aim. GDS ranked each option, based on an assessment of the levelized cost of capacity; utility cost ratio; net capacity position at the second potential resource need; net present value of net benefits; and the net lifetime MW reduction.

A key challenge in constructing any DOPE portfolio are the range of potential optimization parameters and considerations inherent within a multidimensional program. To this end, GDS met with stakeholders in May and June 2020, to present methodology, assumptions, and candidate portfolio options. The final DOPE portfolios reflect feedback provided by

[47] This position is designed to approximate the capacity need under a wide range of resource plans.

stakeholders, and were constructed to help bound the potential range of impacts from an "optimized" approach, given available resources.

To meet the first resource need, the Portfolio Level DOPE first includes all low income RAP. It then adds business demand response programs starting in 2026 and residential demand response programs in 2029. This timing takes into account the shape of the market adoption curve for demand response, such that these programs are targeted to match the year of need at the same time that the market adoption curve begins to reach maturation. The Portfolio Level DOPE then fills out the remainder of the portfolio with residential and business energy efficiency programs. Based on the remaining need, these programs are started in 2028.

The Portfolio Level DOPE includes two "ramp up" years, to return to the full adoption curve levels. Said another way, the RAP totals for Res/Bus energy efficiency ("EE") in the Portfolio Level DOPE in year 2030 are equal to the 2022 RAP levels from the MPS. In 2028, total demand reduction and costs were set to 1/3 of the 2022 level. In 2029, total demand reduction and costs were set to 2/3 of the 2022 level. The same pattern holds for residential and business demand response. These ramp years reflect the change in program awareness and market availability, following the gap in program operation.

In contrast, for the Measure Level DOPE, GDS developed a supply curve based on the utility cost test of each measure, and then selected the RAP level investment for the top measure groupings.

Figure 8.1 and 8.2 (presented in section 8.1 above) compare the results of each DOPE portfolio to both the RAP and MAP for energy and demand reductions, respectively.

8.4 DSM Potential Uncertainty

8.4.1 Risk and Uncertainty Analysis[48]

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.[49] Ameren Missouri therefore categorized the uncertainty in its DSM potential estimates into two broad categories to help inform the risk assessment of the DSM potential. The first category 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 second category, described further below in this section, assumes the estimated DSM load impacts are achievable but the costs to obtain the savings are uncertain.

It is also important to note some of the nuances of the study which differ from the prior study methodology, namely a separate and specific set of uncertainty analyses performed for the Income Eligible (low income) customer subgroup as well as for Distributed Energy Resources. The separate set of assumptions take into account the unique set of circumstances and or priorities of those subsectors.

The first category of uncertainty analysis, as described above, was analyzed for both RAP and MAP scenarios.[50] The 2020 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

[48] 20 CSR 4240-22.050(4)(C);
[49] 20 CSR 4240-22.050(6)(C); 20 CSR 4240-22.050(6)(C)1; 20 CSR 4240-22.050(6)(C)2
[50] 20 CSR 4240-22.050(6)(C)1 through 2

- **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[51]
- **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
- **Utility attribution (NTG uncertainty)**[52]: 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
- **Continued Residential LED Lighting Opportunities**: Assumes continued repeal of the EISA back-stop, with ongoing upstream lighting program for all residential customers
- **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**[53]**:** Assumes program participation is moved to the most efficient technology with a 1/3 decrease in costs and incentives over the study period

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 the these sensitivities, but also included a specific scenario accounting for additional program options rate options with enabling technology and other emerging DR program. The Income Eligible uncertainty analysis compares different sets of program designs/ goals, (what we call "Scenarios"), rather than the variance risk from exogenous influences. The approach to Income Eligible base potential is explained in greater detail in Section 8.5 below. It should be noted that although these subsectors are examined separately, their respective uncertainty probabilities are ultimately factored in with the overall section measuring the impact on savings and cost. The uncertainty analysis for the IRP, examines Scenario 2

[51] 20 CSR 4240-22.050(1)(E)2
[52] 20 CSR 4240-22.050(1)(C)
[53] 20 CSR 4240-22.050(1)(E)1

("Comprehensive Direct Install") as the High Case, and the Supply Curve sensitivity as the low case.

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 T&D costs, reflecting locational value of DER, removal of opt-out customers, decreasing technology costs, and alternative cost-effectiveness criteria for CHP technologies.

Also consistent with the prior study, the 2020 MPS analyzed scenarios as independent uncertainties. An overall risk assessment that incorporates these individual uncertainties 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. The individual uncertainties, associated favorable and unfavorable ranges, subjective weights, and overall uncertainty ranges are presented in Appendix A for both load and budget impacts.

The second uncertainty category assumes the estimated DSM load impacts are achievable but the cost to obtain the savings is uncertain. To assess the cost uncertainty, the Project Cost Uncertainty Grid in Table 8.8 below was used. The grid below demonstrates that as the cost estimate quality increases and the maturity of the technology increases then the uncertainty decreases; and vice versa.[54]

Table 8.8: Project Cost Uncertainty Grid

Estimate Class	Degree of Project Definition (% complete)	Established Standard (Low to High)	Maturing (Low to High)	Evolving (Low to High)	Emerging (Low to High)
Class 5	0% to 2%	-20% to +30%	-25 to +45%	-30% to +75%	-35% to +120%
Class 4	1% to 15%	-15% to +20%	-20% to +35%	-25% to +55%	-30% to +90%
Class 3	10% to 40%	-10% to +10%	-15% to +25%	-20 to +45%	-25 to +70%
Class 2	30% to 75%	-5% to +5%	-10% to +15%	-15% to +35%	-20% to +55%
Class 1	65% to 100%	-3% to +3%	-5% to +8%	-10% to +17%	-15% to +40%

[54] 20 CSR 4240-22.050(6)(C)(2)

Consistent with the prior IRP, Ameren Missouri determined the combination of quality of cost estimate and maturity of technology for both its energy efficiency and demand response base case estimates. Both energy efficiency and demand response were determined to be “maturing” for purposes of project costs uncertainty because there is significant uncertainty about the future cost of new and existing technologies. Ameren Missouri relied on the same cost factors as used in the prior study, including different cost estimates for energy efficiency and demand response.

In contrast to the base RAP and MAP sensitivities, the DOPE portfolios are defined to be "optimized" to meet the required system resource need – and as such, the program would be actively managed in such a manner to avoid a higher or lower than necessary load impact. In contrast, implementation risks would be managed through the implementation budget, either by increasing budgets (if implementation lags DOPE savings goals) or by decreasing budgets (if implementation exceeds DOPE savings goals). This implementation budget risk would be incremental to any uncertainty inherent in cost estimates, even for the forecasted base case implementation forecast. Thus, for the DOPE portfolios only consider cost sensitivities.

Given this level of uncertainty, Ameren Missouri first set the sensitivities equal to class 3, emerging cost factors of +70%/-25%. In the second step, the lower bound cost savings were limited to the lower bound cost savings from the actual input MAP/RAP scenarios for energy efficiency and demand response of -20% and -15%, respectively. That is, the lower bound estimate cost savings would be bounded by the potential cost uncertainty in the underlying measures.

Table 8.9: Project Cost Uncertainty Factors Applied to DSM Portfolios

	Unfavorable	Base	Favorable	Estimate Quality/Maturity
EE-RAP	35%	0%	-20%	Class 4 / Maturing
EE-MAP	35%	0%	-20%	Class 4 / Maturing
DR-RAP	25%	0%	-15%	Class 3 / Maturing
DR-MAP	25%	0%	-15%	Class 3 / Maturing
EE- DOPE-1	70%	0%	-20%	[Class 3 / Emerging] & [Class 4 / Maturing]
EE- DOPE-2	70%	0%	-20%	[Class 3 / Emerging] & [Class 4 / Maturing]
DR- DOPE-1	70%	0%	-15%	[Class 3 / Emerging] & [Class 3 / Maturing]
DR- DOPE-2	70%	0%	-15%	[Class 3 / Emerging] & [Class 3 / Maturing]

Tables 8.10 thru 8.12 provide the high and low results for the MAP and RAP scenarios, for energy (MWh), demand (MW), and budget ($millions), respectively.

Table 8.10: DSM Portfolio Sensitivities, Energy Reduction Potential (MWh)

MWh	2022	2025	2030	2035	2040	NPV Budget ($Millions)
MAP						
Low	304,129	1,296,403	3,095,013	4,585,134	5,586,237	$ 2,966
Base	359,085	1,525,061	3,623,296	5,374,044	6,543,047	$ 3,498
High	389,193	1,663,749	3,987,659	5,903,249	7,201,643	$ 3,727
RAP						
Low	267,490	1,038,461	2,258,050	3,252,595	3,953,639	$ 1,211
Base	303,454	1,179,194	2,568,830	3,699,153	4,498,219	$ 1,444
High	354,387	1,403,588	3,170,602	4,541,419	5,567,383	$ 1,617
DOPE 1						
Low						
Base	31,307	114,426	840,690	2,408,977	3,477,667	$ 896
High						
DOPE 2						
Low						
Base	137,083	571,226	1,370,630	2,094,890	2,549,054	$ 762
High						

Table 8.11: DSM Portfolio Sensitivities, Coincident Peak Reduction (MW)

MW	2022	2025	2030	2035	2040
MAP					
Low	268	776	1,523	2,096	2,441
Base	288	854	1,704	2,360	2,755
High	324	949	1,880	2,599	3,034
RAP					
Low	230	570	1,052	1,401	1,634
Base	244	618	1,153	1,542	1,801
High	279	702	1,314	1,763	2,069
DOPE 1					
Low					
Base	12	38	428	1,046	1,440
High					
DOPE 2					
Low					
Base	50	206	628	961	1,137
High					

NOTE: There are no cost & load sensitivities for the DOPE portfolios. By definition, the DOPE portfolios are "optimized" to hit a threshold load target. Any deviations in load would be proactively managed through the budget and are presented as cost only sensitivities in table 8.12.

Table 8.12: DSM Project Cost Only Uncertainties ($ Millions)

	2022	2025	2030	2035	2040	NPV Project Cost Uncertainty Only
MAP						
Low	$ 136	$ 195	$ 252	$ 325	$ 329	$ 2,824
Base	$ 169	$ 242	$ 312	$ 403	$ 407	$ 3,498
High	$ 225	$ 323	$ 415	$ 536	$ 541	$ 4,656
RAP						
Low	$ 63	$ 80	$ 102	$ 132	$ 145	$ 1,161
Base	$ 78	$ 100	$ 127	$ 164	$ 180	$ 1,444
High	$ 105	$ 133	$ 169	$ 219	$ 241	$ 1,932
DOPE 1						
Low	$ 13	$ 21	$ 87	$ 115	$ 129	$ 720
Base	$ 16	$ 26	$ 108	$ 143	$ 160	$ 896
High	$ 27	$ 44	$ 184	$ 243	$ 272	$ 1,524
DOPE 2						
Low	$ 27	$ 38	$ 57	$ 70	$ 83	$ 611
Base	$ 34	$ 48	$ 72	$ 87	$ 103	$ 762
High	$ 58	$ 81	$ 122	$ 149	$ 175	$ 1,295

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, ODC, is currently 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 ultimately files a report each year with its findings.

The 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.

On August 5, 2020, the Commission approved a stipulation and agreement, accepting the 2019 Final EM&V Reports completed by ODC. At that time, Ameren Missouri and regulatory stakeholders also committed to convene two technical workshops to

proactively address unresolved comments raised by the Company and the state Auditor during the 2019 review process.

Given any level of DSM budget and resources, Ameren Missouri and its stakeholders must 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 would 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.[55]

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.[56]

The impact evaluation helps measure and verify energy savings.[57] 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

[55] 20 CSR 4240-22.070(8)(C); 20 CSR 4240-22.050(7)
[56] 20 CSR 4240-22.070(8)(A); 20 CSR 4240-22.050(7)
[57] 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. 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. In many instances, this annual variability has no bearing on the overall cost-effectiveness of the programs.

Given the time and resources to develop these estimates, many EMV&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.

Outreach, Marketing and Communications[58]

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 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 Account Executives and Customer Service Advisors. 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 also a combination of internal and external activities.

[58] 20 CSR 4240-22.050(3)(E)

8.5 Additional Detail by Study Sector

This section provides additional detail on the Demand Response ("DR"), DER, and Low Income study components of the 2020 MPS.

8.5.1 Foreseeable Demand Response Technologies,[59] including Demand-Side Rate Potential[60]

8.5.1.1 Overview

The 2020 MPS identified nearly 440 of peak demand MW from measure implementation (base case) and an additional 156 MW of peak demand reduction from rate sensitivities for a total DR RAP potential of 594 MW.[61] Table 8.14 provides an overview of the DR potential by sector and measure. The total DR potential identified in the 2020 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.[62]

Within the 2020 MPS, demand response is defined consistent with applicable FERC rules as:[63]

> "[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 2020 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 smart meters. The 2020 MPS explicitly accounted for this effect, with different adoption rates and savings estimates for measures with and without this enabling technology.[64] Assumptions in the study relied on

[59] EO-2020-0047 1.A(i)
[60] 20 CSR 4240-22.050(4);
[61] 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.
[62] 20 CSR 4240-22.050(1)(E);20 CSR 4240-22.050(1)(E)1; 20 CSR 4240-22.050(1)(E)2
[63] 20 CSR 4240-22.050(4)(F); for more detail see 2020 MPS Section 6.6.1 (Definition of Demand Response).
[64] 20 CSR 4240-22.050(3)(D)

Ameren Missouri's current forecast of smart meter 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.[65]

8.5.1.2 Foreseeable Demand Response Measures and Technologies

Table 8.13 describes the DR measures included in the base case analysis. This includes direct load control and aggregator options. The program option list largely follows the same categories included in the 2016 MPS.

The current study also included a peak time rebate option. Ameren Missouri began to offer peak time savings program in the current PY 2019-2021 MEEIA cycle, designed as a fully integrated energy efficiency and demand response program.[66] In the current peak time savings program, customers receive an incentive for a qualifying smart thermostat and an additional fixed payment for allowing control over the thermostat to reduce demand during curtailment events. Participating thermostat manufacturers also rely on energy optimization algorithms to help reduce energy use throughout the year. In its first year of operation in 2019, the program exceeded its goals and enrolled nearly 12,000 residential customers, with a total resource capability of more than 16 MW and more than 400 MWh of energy savings.

[65] 20 CSR 4240-22.050(4)(D)(2). For example, the study assumed that customers on a TOU rate could not or would not participate in a standard behavioral program at deemed levels. Similarly, both TOU rates and direct load control programs seek to impact the timing and duration of HVAC use. The 2020 MPS assumes that customers can only participate in one program.

[66] In a review of more than 20 integrated utility demand response programs, the ACEEE found that Ameren Missouri was only one of five utilities to offer a fully integrated energy efficiency/demand response program. See York, D., Relf, G., and C. Waters. "Integrated Energy Efficiency and Demand Response Programs," Sept. 2019, Report No. U1906.

Table 8.13: Demand Response Options, Base Case 2020 MPS

DR Program Option	Program Description	Eligible Markets	In 2016 MPS?
DLC AC (Thermostat)	The system operator can remotely raise the AC's thermostat set point during peak load conditions, lowering AC load.	Residential and Business Class Customers	Yes
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 Business Class Customers	Yes
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 Business Class Customers	Yes
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	Yes
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.	Business Class Customers	Yes
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	Yes
Peak Time Rebates	A program where customers are rewarded if they reduce electricity consumption during peak times with monetary rebates.	Residential and Business Class Customers	**No**
Capacity Bidding Programs (Large C&I Aggregator)	CBP is a flexible bidding program offering qualified businesses payments for agreeing to reduce when a CBP event is called. Businesses make monthly nominations and receive capacity payments based on the amount of capacity reduction nominated each month, plus energy payments based on your actual kilowatthour (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.	Business Class Customers	Yes
Demand Bidding Programs (Small C&I Aggregator)	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.	Business Class Customers	Yes

Source: 2020 MPS, Table 6-1.

The 2020 MPS also assessed the resource potential and economic cost effectiveness for electric vehicles as a demand response resource (that would shift load to off peak periods) and as a two-way resource that could provide stored energy back to the system through vehicle-to-grid ("V2G") interactions. An electric vehicle demand response program would require a Type II vehicle charger with smart technology. A demand response resource could occur through either a specific electric vehicle ("EV") rate option or as a direct load control event. The study identified a RAP of 51 MW by 2040, with TRC cost effectiveness largely driven by the avoided energy benefits of charging off peak. The study found that the population of eligible vehicles may be limited over much of the study horizon (reaching 125,000 vehicles by 2040, assuming 15.5% compound annual growth) and as such, recommended including potential in the sensitivities as a rate option.

V2G represents an important foreseeable technology that will be monitored by the industry going forward. However, the study found that there is "insufficient information to accurately support inclusion" in the 2020 MPS at this time.

8.5.1.3 Review of Demand Side Rate Sensitivities[67]

Within the 2020 MPS, demand side rate options were assessed as an additional set of sensitivities to the base case described above. (In contrast, the 2016 MPS included demand side rate options and potential in the base case analysis). This included: Time of Use Rates (with/without Enabling Technology), Critical Peak Pricing (with/without Enabling Technology), Inclining Block Rates, and Electric Vehicle Charging Rates.[68] The study further included additional TOU rate options for Business customers: Interruptible Rates, Thermal Storage Rates, and Golf Cart off-peak charging. Table 8.14 provides the MAP and RAP steady state adoption levels for each rate class, with and without enabling technology.[69]

Table 8.14: Adoption Rates (MAP and RAP) by Rate Option With and Without Enabling Technology

Sector	Program	Adoption Rate (MAP)	Adoption Rate (RAP)
Residential (MR)	Time of Use with Enabling Technology	38%	14%
	Time of Use without Enabling Technology	8%	4%
	Critical Peak Pricing with Enabling Technology	16%	8%
	Critical Peak Pricing without Enabling Technology	12%	6%
	Inclining Block Rate	All Customers not on DR rate (assumed default)	All Customers not on DR rate (assumed default)
	Electric Vehicle Charging Rate	94%	57%
Residential (IE)	Time of Use with Enabling Technology	12%	5%
	Time of Use without Enabling Technology	2%	1%
	Critical Peak Pricing with Enabling Technology	5%	3%
	Critical Peak Pricing without Enabling Technology	4%	2%
	Inclining Block Rate	All Customers not on DR rate (assumed default)	All Customers not on DR rate (assumed default)
Business	Interruptible Rate	21%	3%
	Time of Use with Enabling Technology	20%	7%
	Time of Use without Enabling Technology	6%	5%
	Critical Peak Pricing with Enabling Technology	17%	7%
	Critical Peak Pricing with Enabling Technology	15%	6%
	Thermal Electric Storage Cooling Rate	20%	7%
	Golf Cart Charging Rate	20%	7%
	Utility Fleet Vehicle Charging Rate	20%	7%

Source: 2020 MPS, Table 6-12

[67] 20 CSR 4240-22.050(2); 20 CSR 4240-22.050(4)(A); 20 CSR 4240-22.050(4)(B);
[68] 20 CSR 4240-22.050(3)(D) 20 CSR 4240-22.050(4)(D)(2)
[69] 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) for more detail see 2020 MPS at Sections 4.5 Sensitivities (Residential), 5.4 Sensitivities (Income Eligible) & Section (6.3.2 Sensitivities (C&I).

8.5.1.4 Implementation of Demand Side Rates

In the stipulation and agreement set out in File No. ER-2019-0335,[70] Ameren Missouri agreed to several key deliverables related to demand side rates. Ameren Missouri committed to make available a residential default time of use rate for AMI phase in, as well several other TOU options.[71] Within six billing months after an existing customer receives a smart meter, Ameren Missouri will communicate to the customer a billing comparison under available rate options, and will shift the customer to being billed on the default TOU rate (known as the "Evening/Morning Savers") rate going forward. Customers will have the option to elect another available rate option if they so choose. The rate design plan includes four TOU rate options with varying peak, intermediate & off peak times designed to suit customer preferences and needs.

As a starting point, and while customers gain experience with new TOU rate options, the stipulation and agreement defined the difference between on and off peak periods such that it will differ by less than $0.01/kWh. The stipulation and agreement also authorized the implementation of an optional EV TOU rate class and optional three part rate with a demand charge and TOU energy charge. In addition to the consumer education steps identified above, Ameren Missouri has committed to developing a report for stakeholders within 6 months after 500 TOU customers have interval data for one year prior and one year after being on the three part demand charge rate. This report will assess energy and demand reductions and potential bill impacts compared to other available rate options.

In contrast, the 2020 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 2020 MPS assumed the hierarchy as shown in table 8.15.

[70] Corrected Non-Unanimous Stipulation and Agreement (filed February 28, 2020).
[71] 20 CSR 4240-22.050(4)(C)

Table 8.15: DR Hierarchy by Sector (including Rate Programs)

Order	Residential (MR) Hierarchy	Residential (IE) Hierarchy	Small Business Class Hierarchy	Large Business Class Hierarchy
1	Direct Load Control	Peak Time Rebates	Peak Time Rebates	Capacity Bidding
2	Peak Time Rebates	Direct Load Control	Direct Load Control	Interruptible Rate
3	Time of Use	Time of Use	Demand Bidding	Critical Peak Pricing
4	Critical Peak Pricing	Critical Peak Pricing	Time of Use	
5	Inclining Block Rate	Inclining Block Rate	Critical Peak Pricing	

Source: 2020 MPS, Table 6-10

In total, the rate sensitivities identified an additional 98 MW of RAP potential for the Residential sector and 58 MW of RAP potential for the Business sector. EV charging (51 MW) identified the greatest total reduction, followed by critical peak pricing (42 MW).

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 2020 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 DER Potential and Deployment of Solar PV with and without Battery Technology, and CHP[72][73]

The 2020 MPS included more than 30 different combinations of solar PV configurations and sizes in both the residential and C&I sectors, with and without battery storage. This included both residential roof-mounted systems (system size ranges from 3 kW to 20 kW) and roof, fixed ground, and tracking ground mounted non-residential systems (10kW to 2,000 kW).

The study relied on a bottoms up approach to estimate potential for each technology.[74] This included an assessment of applicable premises within each market sector (and associated energy use per premise); detailed assessment of hourly generation profiles,

[72] EO-2020-0047 1.A.iii
[73] EO-2020-0047 1.Q
[74] 20 CSR 4240-22.050(3)(I); 20 CSR 4240-22.050(6)(B);20 CSR 4240-22.050(5)

hourly avoided costs, and installed and operating costs; analysis of cost-effectiveness as measured by the TRC and other tests as applicable; assessment of likely adoption based on market research described in section 8.2 above; and sensitivity analysis for alternative risk/uncertainties, including a detailed assessment of locational value for each technology.

A key conclusion of this robust DER analysis is that while significant technical potential exists – nearly 5,000 MW of peak capacity by 2050 -- no technologies were cost effective as measured by the TRC under base case avoided costs.[75] 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 & maintenance costs with system size, and relied on the existing federal investment tax credit schedule.

The study found that this result was largely driven by the mismatch between hourly profiles of solar PV generation and existing avoided energy profiles. The study also assessed the economic impact of pairing solar and storage, to better align these system peaks.[76] However, the additional benefits did not outweigh the additional costs.

In contrast, certain larger C&I configurations were found to be cost-effective from the participant perspective, using the PCT.[77] Solar PV systems were also found to be cost-effective under the TRC for sensitivities[78] looking at higher avoided T&D costs. In this scenario, more than 4,000 MW of capacity were found to be economic by 2040, which reflects the potential for locational demand and locational value under reliability and resiliency criteria. The study notes:

> "While the participant cost test is not an exact replica of a customer choice criteria, like a pay-back period, it is a reasonable proxy for customer decision making. With many technologies passing the participant cost test, this is congruent with industry interest and adoption of solar PV systems, in particular for large business sector customers … [W]hile these customer-owned, behind-the-meter systems do not pass cost-effectiveness, readers should not conclude that solar PV is a resource where Ameren should not consider

[75] The lone exception is a single configuration of large CHP natural gas reciprocating turbine, with capacity greater than 15 MW. However, the study found that based on likely measure adoption, the total RAP would be limited to a single 15 MW turbine by 2040. Sensitivities included alternative cost effectiveness testing criteria for CHP technologies.

[76] Specifically, the study assessed an 85 percent round trip efficiency battery with up to four hours of operation. Economic dispatch was assumed to maximize participant benefits. The battery was assumed to be charged by the solar PV system and not by the electric grid during off-peak hours.

[77] Market research further confirmed that both residential and business customers remain interested in solar PV, but only if it can be provided at low or no cost. Indeed, only 5% of residential customers said they would purchase solar with no incentives; in contrast, 74% of surveyed residential customers indicated a willingness to participate if incentives were available to offset 100% of incremental costs. Similarly, less than 5% of business customers surveyed would purchase or lease solar with a payback of 15 years or greater; only 30% would purchase solar if the payback was immediate at installation. Customers cited additional non-financial barriers as limiting likely participation.

[78] 20 CSR 4240-22.050(6)(C)(1); 20 CSR 4240-22.050(6)(C)2

> investment as there are alternative cost-effectiveness perspectives outside of the MEEIA framework."

Thus, the 2020 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 has developed 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.[79]

8.5.3 Low Income Scenarios and Sensitivities[80]

Based on stakeholder feedback, and in partnership with ACEEE, the 2020 MPS assessed the implication of market potential and total costs for alternative delivery and program goals within the low-income program.[81]

Within the MPS, and consistent with current MEEIA 2019-21 program guidelines, low income customers were defined as any household with estimated earnings at or below 80 percent of area median income ("AMI"). The low income studies also included non-profit business customers. Market research, conducted by Opinion Dynamics, was used to assess the low-income population size, typical household size, average annual kWh consumption, and end-use efficiency characteristics and equipment penetration/saturation for both single family and multifamily homes. ODC found that 48% of single family low income customers and 68% of multifamily customers – or more than 200,000 customers -- have a household income below $25,000. These low income customers were found to account for approximately 40% of all residential customers and 35% of all residential sales in 2022.[82] Market research also estimated end use specific adoption rates for low income single- and multi-family customers. Equally important, the low-income study also used the same whole building approach outlined above, to estimate potential by housing and income type. This more granular approach allows the study to assess the differences in outcomes for different delivery channels and program targets.

As a starting point, the MPS estimated two scenarios for the delivery of low income programs.

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[79] 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.
[80] For additional detail, see Chapter 5 of the 2020 MPS, pp. 62 to 81.
[81] In this manner, the low-income scenarios and sensitivities are similar to the Dynamically Optimized Portfolio Extension ("DOPE") discussed below. Both seek to answer the question: what are the impacts to customers of targeting cost-effective DSM implementation to explicitly defined policy goals?
[82] See MPS, Table 3-1.

- **Scenario 1**: A "business as usual" scenario, based on current and approved 2019-21 program delivery. This assumes the direct install of currently offered measures at no incremental cost to the customer, with all other residential measures offered assuming a more traditional rebate-based delivery approach. Scenario 1 is included in the MAP and RAP estimates presented above.

- **Scenario 2**: A high touch, deep savings delivery channel that assumes all available energy efficiency measures are installed at no cost to the income-eligible customer.

Scenarios 1 and 2 differ significantly in both the cost and savings potential, based on the number of measures included, assumed customer adoption[83] and the assumed cost of those measures. As expected, significantly expanding the breadth of direct install measures increases both total energy savings and total costs.

Table 8.16: Market Potential and Total Costs, Low Income Sector, Scenarios 1 and 2

	Cumulative MWh, 2040	Percent of Sales	NPV Costs (TRC, millions)	NPV Benefits (millions)	Net
Scenario 1	843,401	20%	$511.8	$588.6	$76.8
Scenario 2	1,444,067	30%	$1,089.8	$1,089.8	($758.9)

The MPS used these two scenarios as inputs into a more detailed sensitivity analysis, to assess the implications of "targeting" either of the two program delivery channels against different criteria or policy goals. These sensitivities included:

- **Marginal Cost Supply Curve Target:** Uses a pre-defined measure level cost per kWh threshold, to identify the most efficient way to achieve the greatest amount of savings. This sensitivity identifies that the incremental cost of savings increases at an increasing rate, at about 90% of cumulative savings. By limiting to these measures, a supply curve target could achieve 90% of the total savings at only 70% or 57% of the total first year cost for scenarios 1 and 2, respectively.

- **Energy Burden Mitigation Target:** Energy bills greater than 6% of income are defined to be unaffordable[84]; the study found that all households with an average income of $10,000 or less have an excessive energy burden, as do all single family homes with an average income of $20,000 or less. Most homes with an income of

[83] The low income study relied on the market adoption rates identified through the baseline market research. Low income measures and all of scenario 2 assume that incentives cover 100% of the measure cost. In the low-income scenarios, the program awareness factor was set to 85% (compared to a 73% awareness for MAP in the market rate studies).
[84] See 2020 MPS, p. 76. The 6% threshold is based on classification by the U.S. Department of Health and Human Services, and includes both electric and gas bills.

more than $30,000 do not have an excessive energy burden, except for certain single-family homes with electric furnaces.

Using a direct install/rebate hybrid approach as contemplated in scenario 1 would lower the average energy burden from 5.6% to 4.7%. In contrast, using a comprehensive direct install approach as contemplated in scenario 2 would lower the average energy burden to 4.7% and bring nearly all single family homes with incomes under $20,000 below the target. In both scenarios, customers with incomes below $10,000 would continue to face average energy burdens of 11.2% and 9.5% (down from 13.6%), respectively.

- **Energy Use Intensity Target:** Low income homes typically have a higher energy use intensity than comparable market rate units, as measured on a kWh per square foot basis.[85] This higher energy use intensity leads to higher energy bills (and a greater energy burden), all else equal. The energy use intensity target sensitivity compares estimated energy use by income and building type against an average energy use intensity, for single family and multifamily buildings, respectively.

  In scenario 1, most single family homes and some multifamily homes with electric heat reach the EUI target, while all gas heated homes remain well above the target. In contrast, in scenario 2, all single family homes and most multifamily homes with electric heat reach the target, and single family gas heated homes begin to approach the EUI targets.

These additional sensitivities highlight several important considerations for the delivery of low-income programs. First, the selection of a program delivery target and delivery channel presents important choices and tradeoffs related to equality, equity, and efficiency.[86]

For example, a direct install low income program, coupled with a defined target and focus on either an energy burden or energy use intensity target, addresses important equity concerns regarding energy use between customers. If rolled out to all low income customers, it would achieve equality goals. Achieving these goals through a purely direct install channel would require total budgets that are nearly 4 times greater than the current approach (scenario1).

In contrast, establishing a focus on the most cost-effective resources (sensitivity 1, marginal cost supply curve) would reduce overall budgets by 30 to 43 percent while only

[85] The market research confirmed this finding within Ameren Missouri's service territory. See MPS, Table 2-3. Income eligible single family and multifamily customers have an average energy use intensity of 10.13 while market rate customers have an energy use intensity of 7.06 and 7.82 for SF and MF, respectively.
[86] Here, equality is defined as having equal access to demand side investment measures; equity is defined as ensuring all customers meet a threshold of baseline energy use (in cost or quantity); and efficiency is defined as meeting those needs in the most cost-effective manner possible, subject to resource availability.

reducing total energy saved by 10 percent.[87] This represents a more efficient delivery of resources. Unfortunately, such an approach cannot address the equity needs of all customers.

To best balance these considerations, Ameren Missouri has adopted a targeted neighborhood approach within its Single Family Low Income program for program years 2019-21. Each year, Ameren Missouri identifies the most at-risk and highest need neighborhoods and communities that could benefit from a targeted direct install program. These neighborhoods are identified based on the percentage of population below 80% of area median income; the density, age, and condition of the housing stock; and the presence and strength of community partners that can help engage customers. One set of neighborhoods is selected in each of St. Louis City, St. Louis County, and surrounding jurisdictions. Customers in each targeted community are automatically qualified to participate in the program, which offers comprehensive direct install measures, with a goal to save each customer a minimum of 15% on their energy bill. This approach helps create equity in energy use for the most at risk customers, while most efficiently leveraging program delivery costs and relationships by region. However, approved budget levels represent just a fraction of the total potential need.[88]

Second, the energy burden and energy use intensity sensitivities highlight the importance of defining the target population with respect to both household income and building type/condition. For example, the MPS found that nearly all customers with household income above $30,000 and multi-family customers with incomes greater than $20,000 already meet an energy burden target of 6 percent. This suggests that future program delivery may need to focus direct install programs on a narrower segment of the customer population. The PAYS program represents one new opportunity to provide energy efficiency measures for any customers (independent of income level) that can pay their energy bills but may not have sufficient capital to finance and purchase new measures through a rebate program. By implementing and expanding this program, future low income program delivery can focus on reaching the most vulnerable customers, facing the highest energy burden, with a direct install program. Successful program designs will need to accommodate both home owners and renters.

Third, the energy burden and energy use intensity sensitivities also highlight the role that building type and condition plays in meeting an equity target. Simply put, electric DSM programs – in isolation – cannot bring all customers to a defined burden or EUI target. This is particularly true for the most poorly insulated buildings and for those with gas furnaces. Comprehensive and custom solutions including building shell measures,

[87] See 2020 MPS, Table 5.9.

[88] For example, Ameren Missouri recently received approval to spend between $10 and $14 million as part of its Program Year 2022 offering. In contrast, the MPS estimated a "scenario 2" direct install budget of $50 million (see MPS, Figure 5-9).

manageable financing programs like PAYS, and effective co-delivery programs will be important.

Fourth, the marginal cost sensitivity highlights that the most cost effective measures should be widely deployed before offering more comprehensive direct install. To this end, in 2022, Ameren Missouri will transition and pivot its retail lighting LED program to focus addressing the penetration and saturation gap of LED lighting between low income and market rate customers.[89] LED lighting will only be offered in retail stores located in the zip codes of highest need and will include expanded incentives for customers in those locations.

Finally, the low income specific scenarios and sensitivities highlight 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.

Scaling programs that rely on capitalized investments with minimal to no program costs (such as PAYS) will certainly help address the needs of some low income customers and meeting program potential in an equitable manner. However, as demonstrated in the 2020 MPS, significant potential for direct install programs will remain. A commitment to serving these customers will require dedicated and expanded program funding.

8.6 Other Special Contemporary Issues and Policy Considerations

8.6.1 Potential Benefits of Co-delivery of DSM programs[90]

Effective co-delivery of utility DSM programs (across electric, gas, and water) presents unique challenges and opportunities, for program administrators, utility contractors, and customers. Co-delivery of programs can create additional complexity and coordination between utilities, which may operate with different goals, budgets, contracts, schedules and data contracts. This includes developing effective cross-training platforms for contractors that may – or may not – serve both markets. And for the average customer, co-delivery may simply shift the cost of program delivery from one program to another – without necessarily reducing overall costs to the customer.

These challenges must be balanced against the important fact that effective co-delivery can create significant and meaningful benefits for certain customers. Co-delivering

[89] See MPS, Table 2-5. 87% of market rate customers have at least one LED bulb in their residence, compared to only 69% low income customers. Across all households, market rate customers have an efficient bulb (LED or CFL) in 61% of total sockets, while low income customers only have an efficient bulb in 44% of sockets. The gap is even greater when focused just on LEDs: 42% (market rate) compared to 19% (low income).
[90] 20 CSR 4240-22.050(3)(F);

electric and gas programs provide cost efficiencies by avoiding duplication of cost and resources. This may include fewer site visits, integrated advertising and marketing, less overhead per unit of energy saved and reduced coordinated administration from the customer's perspective. An additional benefit is sharing the appropriate cost of dual energy efficiency measures (i.e. smart thermostats, ceiling insulation, air sealing, and etc.).

Providing comprehensive and deep retrofit upgrades at the same time reduces the burden on the household and creates more opportunities to achieve deep savings for homes that face higher than baseline energy use or costs. Effective co-delivery remains one of the most effective mechanisms to support equity goals within the low income program. To this end, contractors that enter a low-income multifamily building are required to include an evaluation of the feasibility of both electric and gas measures, and help customers obtain rebates from both electric and gas programs.[91]

Ameren Missouri's has been co-delivering its Low Income and School Kit energy efficient programs with natural gas utilities since 2013 and 2015 respectively. During this span Ameren Missouri has partnered with natural gas utilities to complete co-delivered energy efficiency upgrades to over 20,000 multifamily low income tenant units (over 40,000 units total completed) and distributed over 75,000 school kits to dual fuel homes. Recognizing the benefits and synergies, Ameren Missouri currently co-delivers its Low Income, School Kit, and HVAC/Heating programs with its internal natural gas business.

8.6.2 DSM Opportunities for Providing Customer Financing[92]

Starting in 2021, Ameren Missouri will begin to directly offer residential customers new on-bill tariff options, through the new PAYS program. The PAYS program will include $5 million in customer financing in 2021 and $10 million in customer financing in 2022. This makes Ameren Missouri one of the first investor-owned utilities to offer this program to its customers.

PAYS is a trademarked program licensed by Energy Efficiency Institute, Inc., and Ameren Missouri will partner with a qualified implementer to administer this program. The PAYS program is designed to provide immediate annual on-bill savings for customers through the installation of custom and comprehensive measures, subject to qualifying program rules. Under PAYS, all interested customers qualify to receive a comprehensive tier 1 assessment, to identify potential energy efficiency upgrades and the estimated bill savings. Customers that meet qualifying guidelines are then presented with a detailed tier 2 assessment. To qualify, on-bill repayments are set to no more than 20 percent of the

[91] See "Unanimous Stipulation and Agreement Regarding The Implementation Certain MEEIA Programs Through Plan Year 2022," EO-20180-0211, Filed July 10, 2020, at ¶12.
[92] 20 CSR 4240-22.050(3)(E)

estimated annual energy savings, and measures must be able to be paid back in 12 years or less.

Measures are purchased and owned by Ameren Missouri and installed on the customer premises. The total cost of the measure package to the participant includes a fixed four percent financing cost. At the same time, customers can also qualify for existing Ameren Missouri rebates and incentives for qualifying measures, such as HVAC units, further reducing the total cost.[93] Qualifying Tier 2 customers can then decide whether or not to engage a contractor to perform the necessary work. In contrast to PACE, there is no lien or legal obligation for repayment attached the individual property. Instead, the obligation for repayment is tied to the meter and electric account. This allows both renters and homeowners to more easily participate in the program, and allows energy efficiency upgrades to be seamlessly transitioned between occupants.

It is important to note that the PAYS program will be financed through the Company's cost of capital. This ensures that direct demand side investments owned by the Company create the same opportunity and return as supply side investments, consistent with the overall mandate of MEEIA. Program administration costs, including incentives and rebates, will be recovered through the existing MEEIA tariff. The difference between the Company's cost of capital and participating customers finance rate will be collected from all residential customers through an annual true-up mechanism and then included in rate base at the next customer rate case.[94]

The PAYS program represents an important opportunity to develop and install comprehensive, custom solutions for each residential customer. For example, the PAYS assessment will provide an opportunity to pair building shell measures, such as insulation, at the same time as any necessary heating and cooling upgrades. By combining all cost-effective measures as a package, PAYS will further improve the performance and payback of each measure in isolation.

The PY 2021 and PY 2022 evaluations will focus on process and implementation and quantification of ex post gross savings for these custom measures. Ameren Missouri will combine these findings with additional research to develop a PAYS-specific potential study to inform its next MEEIA cycle.

[93] A customer can pay down a portion of the upfront cost, to the extent that the Tier 2 package does not meet the necessary payback guidelines. This would allow customers to then use the PAYS program to finance the remainder.

[94] Specifically, the Company will collect the difference between its Plant In Service Accounting ("PISA") rate and the four percent financing cost. Existing PAYS regulatory assets will be transferred into rate base during the next rate case, at whatever cost of capital is decided at that time.

8.6.3 Considerations regarding a High Performance Building Hub[95]

As described in Section 8.2, nearly two thirds of all near term DSM potential is to be found in the commercial and industrial sector. The diversity of industries leads to a wide range of cost effective measures, which can differ significantly for small, medium, and large businesses. At the same time, primary market research clearly identified financial and non-financial barriers to adoption.[96]

Existing Ameren Missouri MEEIA programs are designed to help address this gap. The programs maintain a robust trade ally network of contractors in the market to help educate and inform customers, while also offering tailored incentives for custom projects. Beginning with the 2016-2018 MEEIA programs, Ameren Missouri established the ability for customers to engage and develop long-lead projects. This creates additional avenues for commercial and industrial customers to work with partners and holistically address financial and non-financial barriers.

Ameren Missouri continues to collaborate with stakeholders on several new concepts that are intended to drive and incentive greater efficiency reductions in large commercial and industrial buildings. These are described below.

First, it is important to note that the efficiency-as-a-service model will be introduced starting in PY 2021 (through the Residential PAYS program) and will likely offer one method in the future to address information and financing constraints in the commercial sector. The application of efficiency-as-a-service may be particularly relevant for small and medium business customers that use and install similar efficiency measures as the residential customer class. Ameren Missouri will continue to rely on EM&V findings to share learnings across sectors as it develops program plans in this area.

In addition to Ameren Missouri's MEEIA programs, emerging high performance local codes and standards will drive further gains in the C&I sector. It will be critical for all parties to understand the relationship and tradeoff between these codes and standards and the design of MEEIA programs, and to ensure that regulatory and program design complement efforts to achieve this potential. In early 2020, the City of St. Louis passed a landmark Building Energy Performance Standard ("BEPS"). This makes St. Louis the first city in the Midwest and only the fourth city nationally to pass a dedicated BEPS. Under this ordinance, C&I buildings greater than 50,000 square feet will need to meet site specific energy use intensity targets, where "energy" includes electric, gas, steam, and any other energy source either delivered or generated on-site. Initial targets are designed to be set at the 65th percentile of comparable buildings based on energy benchmarking

[95] EO-2020-0047 1.H

[96] For example, only 36% of small businesses indicated that they would be willing to make a major HVAC investment, even with a payback period of 0 years, compared to 55% of medium/large businesses. See Table 32 of Appendix B ("Baseline Study") to the 2020 MPS.

data and will decline over time. Owners will demonstrate compliance in five year cycles, or may seek an extended compliance waiver for earlier, deeper energy retrofits.

The BEPS will be administered by the Office of High Performance Buildings, a newly formed division in the City government. In coordination with this division, the BEPS also establishes a 9-person Building Energy Improvement Board ("BEIB"). The BEIB remains responsible for setting BEPS policy and code and confirming compliance by building owners. The BEIB must establish the first set of compliance targets, for May 2025, by May 2021.

Building owners can demonstrate compliance through one of three pathways. The first is to demonstrate compliance through the code, based on benchmarked and actual energy usage. The second is through a custom application, based on building specific modeling and quantification of potentially mitigating economic hardship factors. The third is through the use of an Alternative Compliance Payment ("ACP") to the building division.

When developing the BEPS, the City of St. Louis acknowledged the important role that utility demand side management programs, including the availability of incentives and rebates, plays for customers. Simply put, the BEPS anticipates and assumes continued utility involvement, to help customers meet these goals in the most cost effective manner.

Broadly speaking, increasing standards and codes typically make it more difficult to assess and demonstrate utility attribution during EM&V and to determine the appropriate baseline when assessing ex post gross impacts. This consideration is particularly important in jurisdictions with earnings opportunities tied to net savings, but may be less of a confounding issue when the utility earning opportunity is based on gross savings or on other metrics, such as implementation spend.

Notably, the St. Louis BEPS and the PY 2022 program year modifications unanimously agreed to by stakeholders address both issues. First, the City of St. Louis intentionally included multiple compliance paths – including an ACP – to ensure that customers using utility programs to achieve compliance would not have done so but for the program intervention, including incentives, education, and program contractor support. Second, a simplified earnings opportunity with a gross demand component aligns incentives of the utility and building owners seeking deep retrofits. In this framework, both parties stand to benefit by identifying the most cost-effective measures that will drive deep building retrofit opportunities. In this fashion, the earnings opportunity structure introduced in PY 2022 will likely prove to be a necessary step that align interests of multiple parties and creates incentives that will maximize the likelihood of success for BEPS customers and any other customer seeking deep energy savings.

In July 2020, the Missouri Gateway Chapter of the U.S. Green Building Council launched a Request for Quotation for the design and implementation of a high performance building

center in the St. Louis region. Ameren Missouri participated in the search and evaluation process.

This hub would create a one stop resource for building owners, and help aggregate and present comprehensive information related to the assessment, financing, and implementation of energy efficiency measures. Such a hub is also expected to help better connect customers, contractors, distributors, financers, and utility staff. This type of collaboration is expected to help all parties to focus on a holistic assessment of energy use. In addition to demand side efficiency measures that help meet future BEPS standards, this could include opportunities that further decarbonize end-uses, through the beneficial electrification of transportation or other uses or the installation of onsite renewable energy, either owned by the customer or owned at no cost to the customer through the Ameren Missouri Neighborhood Solar Program.

The concept of a technical customer center offers one potential model that could be used to best integrate such a high performance building hub with existing Ameren Missouri products and services. For example, two subsidiaries of Southern Company (Georgia Power and Alabama Power) operate and maintain robust education and demonstration centers. In these centers, customers can come to the facility to see, touch, observe and test various end-use electrification and efficiency products. For example, a large commercial restaurant could come see – in one place – various electric fryers and cookers and other cooking equipment, before committing to a large capital investment decision.

A fully integrated solution could pair a similar physical space hosted by Ameren Missouri for the benefit of its customers, with a dedicated space for a third party high performance building center. In this fashion, customers could both test and sample products, while also talking with both a utility key account representative and a third party resource. This one stop shop would be able to help connect customers to a broad set of MEEIA contractors, distributors, and financing, to help implement those solutions. Those contractors and financing solutions could come from a utility sponsored MEEIA program, such as PAYS or the BizSavers program, or could come through a third party option such as PACE or non-incentivized measures.

8.7 Compliance References

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