Evergy Metro

Volume 5

Demand-Side Resource Analysis

Integrated Resource Plan

20 CSR 4240-22.050

April 2024

Table of Contents

Table Of Tables

Table Of Figures

Table of Appendices

Volume 5: Demand-Side Resource Analysis

Highlights

Evergy completed its Demand-Side Management (DSM) Market Potential Study in May 2023, which included:

- Perform a comprehensive analysis that complies with the statutory requirements of the Missouri Public Service Commission (PSC).
- Four levels of measure-level potential for 2024-2043: technical potential, economic potential, realistic achievable potential (RAP), and maximum achievable potential (MAP) energy efficiency potential.
- Energy efficiency programs, demand response programs and demand-side rate potential. Energy efficiency will be referred as EE, demand response will be referred as DR and demand-side rates will be referred as DSR in this filing.
- All measures were screened for cost effectiveness using the Total Resource Cost (TRC) test, the Societal Cost Test (SCT), the Utility Cost Test (UCT), the Participant Cost Test (PCT), and the Ratepayer Impact Measure (RIM) test.
- Four scenarios of program-level potential including MAP, RAP, RAP+, RAP- and six scenarios for DR and DSR programs.
- A reliable, accurate, and useful residential appliance saturation survey to inform projections of current and future energy consumption and associated DSM potential.

During the DSM Market Potential Study, Evergy received an order from the Missouri PSC to transition all residential customers to TOU rates by October 1, 2023 with the Two-Period TOU rate as the default rate. The DSM Market Potential Study proceeded with this assumption. However, at the end of 2023, the Missouri Commission revised its order, changing the default rate for Missouri residential customers to the Peak Adjustment Rate. Because of the default rate change to the Peak Adjustment Rate after the DSM Market Potential Study had been complete, Evergy estimated Peak Demand savings to be 30% of the Demand-Side Rate projection calculated under the Two-Period TOU rate.

Introduction

Evergy engaged Applied Energy Group (AEG) to conduct a Demand Side Management (DSM) Market Potential Study. The DSM study encompassed the Evergy Missouri Metro and Evergy Missouri West service territories and was delivered to Evergy in May 2023 and included both a RAP and a MAP level of DSM, as defined in the IRP Rules. This Potential Study was used as the basis for the scenarios evaluated in this integrated analysis.

Section 1: Potential Demand-side Resources[1]

1.1 Demand-Side Resource Coverage[2]

1.1.1 Market Segments Coverage[3]

AEG identified Evergy's market segments by categorizing billing and customer data, residential and non-residential customer surveys, and secondary sources to allocate energy use and customers to the various sectors and segments such that the total customer count, energy consumption, and peak demand matched the Evergy system totals from the billing data. The market segments included:

- **Residential:** Single Family, Single Family Low-Income, Multi-family, Multi-family Low-Income
- **Commercial:** Large Office, Small Office, Retail, Restaurant, Grocery, School, College, Healthcare, Lodging, Data Center, Warehouse, Miscellaneous, Opt-Out
- **Industrial:** Food Production, Chemicals/Pharmaceuticals, Electronic Equipment, Primary Metals, Stone/Clay/Glass, Transportation Equipment, Rubber/Plastics, Waste/Wastewater, Other Industrial, Opt-Out

The total number of households and residential electricity sales for the service territory were estimated from AEG's survey and all reported residential energy sales in 2021.
The commercial and industrial sectors were developed for Evergy's entire service territory in Missouri, including Missouri Metro and Missouri West. With no survey carried out for C&I customers and less anticipated heterogeneity among customers, AEG modeled commercial and industrial sectors by using AEG's survey on business type and county-level County Business Pattern data in Evergy Missouri territories.

1.1.2 Decision-Maker Coverage[4]

Evergy Missouri Metro staff meets regularly with customer groups, architects, engineers, trade representatives, contractors, distributors, public agency staff and others to discuss

[1] 20 CSR 4240-22.050 (1)
[2] 20 CSR 4240-22.050 (1)(A)
[3] 20 CSR 4240-22.050 (1)(A)(1)
[4] 20 CSR 4240-22.050 (1)(A)(2)

energy usage issues, energy efficiency and demand response programs, and to elicit feedback and suggestions. Additionally, Evergy promotes demand side programs through awareness marketing in local trade publications, online channels and community events.

AEG facilitated a series of workshops with Evergy stakeholders to solicit feedback on key deliverables throughout the study. Evergy stakeholders included representatives from a variety of organizations with an interest in utility-sponsored DSM activities within the state of Missouri, including representatives from the Missouri PSC, Sierra Club, National Resource Defense Council (NRDC), Renew Missouri, and Missouri Office of Public Counsel (OPC), among others.

1.1.3 Major End Uses Coverage[5]

Evergy Missouri Metro engaged AEG to conduct a DSM Potential Study completed in 2023. AEG developed a comprehensive list of conventional and emerging technologies considering all customer sectors and end uses. The major end uses by sector include:

- **Residential:** cooling, heating, water heating, lighting, appliances, electronics and miscellaneous
- **Commercial:** cooling, heating, ventilation, interior lighting, exterior lighting, refrigeration, food preparation, office equipment and miscellaneous
- **Industrial:** cooling, heating, ventilation, interior lighting, exterior lighting, motors, process, and miscellaneous

1.2 Designing Effective Potential Demand-Side Programs[6]

Evergy Missouri Metro engaged AEG to conduct a DSM Potential Study, which was completed in May 2023. AEG developed highly effective potential DSM programs by grouping market segments and end-use measures into programs. The list of the programs are –

[5] 20 CSR 4240-22.050 (1)(A)(3)
[6] 20 CSR 4240-22.050 (1)(B)

Residential Programs:

- Energy Savings Products
- Heating, Cooling & Weatherization
- Income-Eligible Single Family
- Income-Eligible Multifamily
- Research & Pilot
- New Construction
- Connected Thermostats DLC
- Time-of-Use (TOU) Rate
- Electric Vehicle (EV) TOU Rate

Commercial and Industrial Programs:

- Business Standard
- Business Custom
- Firm Curtailment/Tariff
- Connected Thermostats DLC
- Critical Peak Pricing (CPP) Rate
- Time-Related Pricing (TRP) Rate

Program details for all programs modelled in the potential study including program descriptions, program objectives, program characteristics, as well as implementation strategies can be found in Appendix 5 Exhibit E _ Program Descriptions.

1.3 Demand-side rates for all Customer Market Segments[7]

Evergy Missouri Metro engaged AEG to conduct a DSM Market Potential Study. AEG identified demand-side rates based on options that are designed to reduce, shift, or modify their load. In contrast to energy efficiency, where customers may choose to install energy-efficient technologies in the absence of utility programs, Demand Response (DR) and Demand-Side Rates (DSR) does not exist outside of utility offerings. Therefore, AEG

[7] 20 CSR 4240-22.050 (1)(C)

relied on a programmatic view of DR and DSR to assess the potential as opposed to the technology view used to assess the potential from energy efficiency measures.

AEG used a bottom-up approach to perform the DR and DSR analysis, following these major steps:

1. **Market Characterization:** The segmentation included jurisdiction, sector, and customer size. Key assumptions around equipment saturations and customer counts align with the Energy Efficiency Market Characterization.
2. **Program Characterization**: AEG developed a comprehensive set of program options for the analysis, including direct load control, grid-interactive, manual, and rate-based options.
3. **Baseline Peak and Customer Forecasts:** AEG developed a reference baseline peak projection and customer growth forecast using the class-level MW and customer growth forecasts provided by Evergy.
4. **Potential Estimates** Technical and economic potential is not meaningful because DR/DSR does not exist in the absence of utility programs. Instead, AEG estimated DR/DSR potential for five achievable potential scenarios based upon several assumptions, including:
    - Retention rates on the opt-out Time-of-Use (TOU) rate,
    - Programmatic parameters, including participation and costs, and
    - Adjustments to DR impacts to account for interactions with DSR.

The final list of demand-side programs evaluated in this study are:

Residential

- Time-of-Use (TOU) Rate
- Electric Vehicle (EV) TOU Rate

Commercial

- Critical Peak Pricing (CPP) Rate
- Time-Related Pricing (TRP) Rate

Industrial

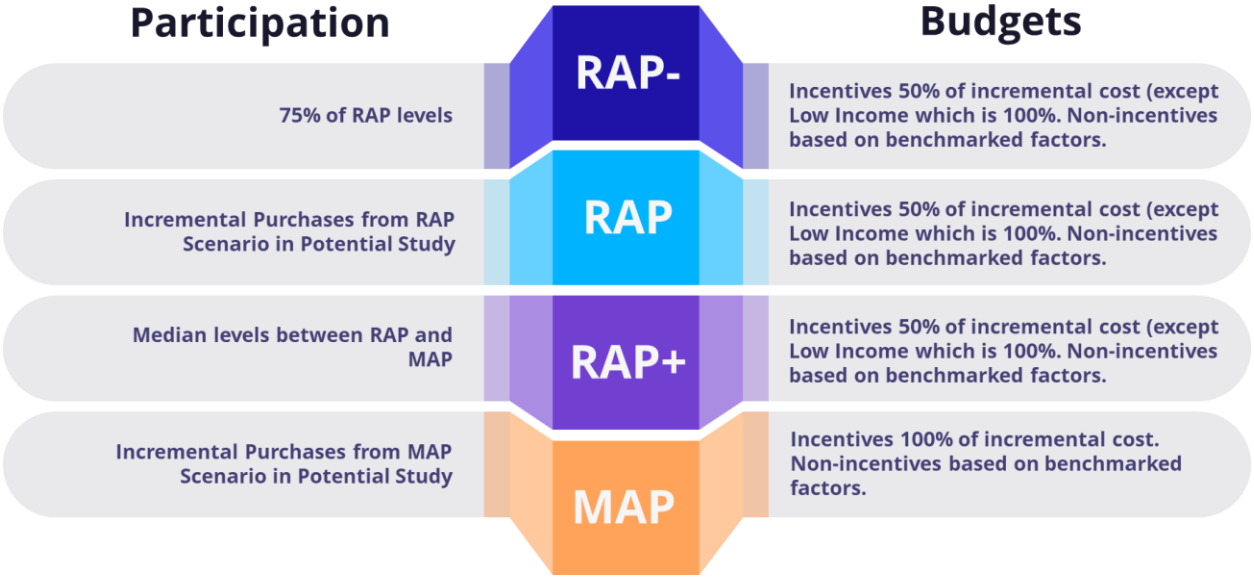
- Critical Peak Pricing (CPP) Rate
- Time-Related Pricing (TRP) Rate

1.4 Multiple designs[8]

Based on the RAP and MAP potential scenario results from the DSM Potential Study, AEG developed four portfolios comprised of cost effective measures. Each of these portfolios was considered during the integration phase of Evergy's IRP process to determine which DSM portfolio was optimal based on Evergy's supply options.

The figure below shows the program buddle design scenarios.

Figure 1: Bundle Design Scenarios



- **Program RAP:** The measure-level RAP candidates from the DSM Potential Study. This portfolio reflects expected program participation given barriers to customer acceptance and non-ideal implementation conditions.
- **Program RAP-:** Set to be 75% of RAP level and a scenario where customer incentives are set to be 50% of incremental cost.

[8] 20 CSR 4240-22.050 (1)(D)

- **Program RAP+:** Alternative portfolio designed to represent approximately the average of RAP and MAP participation levels and a scenario where customer incentives are set to be 50% of incremental cost.
- **Program MAP:** The measure-level MAP candidates from the DSM Potential Study. This portfolio reflects expected program participation given ideal market implementation and few barriers to customer adoption, is a theoretical scenario where all customer incentives are set to 100% of measure incremental costs. Non-incentives are based on benchmarked factors.

AEG estimated DR/DSR potential for two main scenarios:

- Maximum Achievable Potential (MAP) included all cost effective programs, incorporated growth in Evergy's existing programs to benchmarked participation levels (with associated increases in costs) and tested sensitivities around the forthcoming TOU rates for residential customers. During the DSM Market Potential Study, Evergy received an order from the Missouri PSC to transition all residential customers to TOU rates by October 1, 2023 with the Two-Period TOU rate as the default rate. The DSM Market Potential Study proceeded with this assumption. In response to the order, AEG and Evergy modified the MAP analysis to focus on the effect that customer retention in the default TOU rate would have on other DR and DSR program options. Specifically, we expect the average residential customer's peak demand to drop as they respond to pricing signals, which will reduce the amount of demand available for other program options to impact during peak hours. AEG assumed a conservative retention rate of 50% to estimate MAP and then tested the sensitivity of impacts and program costs to changes in the TOU retention rate as shown in *Table 16: MAP Sensitivity Analysis.* For each sensitivity, AEG estimated the weighted impacts of the TOU rates, reduced the peak demand baseline forecast by the TOU impact, and then adjusted the impact assumptions for the other DR/DSR program options. The sensitivities also included increased costs of educating customers to support the increased retention in the TOU default rate. However, at the end of 2023, the Missouri Commission revised its order, changing the default rate for Missouri residential customers to the Peak Adjustment

Rate. Because of the default rate change to the Peak Adjustment Rate after the DSM Market Potential Study had been complete, Evergy estimated Peak Demand savings to be 30% of the Demand-Side Rate projection calculated under the Two-Period TOU rate.

Table 1: MAP Sensitivity Analysis

Sensitivity	(1) TOU Default	(2) TOU for EV Owners	(3) TOU Peak Adjustment Rate	(4) TOU 3-Period
MAP	50% of all residential customers	20% of EV owners who opt out of TOU Default	95% of remaining TOU Default opt-outs	All other TOU Default opt-outs
MAP Medium-Retention	70% of all residential customers	50% of EV owners who opt out of TOU Default	95% of remaining TOU Default opt-outs	All other TOU Default opt-outs
MAP High - Retention	85% of all residential customers	100% of EV owners who opt out of TOU Default	95% of remaining TOU Default opt-outs	All other TOU Default opt-outs

- Realistic Achievable Potential (RAP) included all cost-effective programs (based on the MAP results) restricted participation in Evergy's existing programs to current achieved levels, and tested sensitivities to participation in non-TOU program option. The RAP scenario assumed low retention in the TOU Default rate.

1.5 Effects of Improved Technologies[9]

1.5.1 Reduce or Manage Energy Use[10]

Evergy Missouri Metro engaged AEG to conduct a DSM Market Potential Study, which included the effects of improved technologies expected over the 20-year planning horizon. As a part of the scope of work, AEG selected potential demand-side resources to fulfill the goal of achieving all cost-effective demand-side savings by designing highly

[9] 20 CSR 4240-22.050 (1)(E)
[10] 20 CSR 4240-22.050 (1)(E)(1)

effective potential demand-side programs. AEG included the effects of improved technologies expected over the planning horizon to reduce or manage energy.

The framework for assessing savings, costs, and other attributes of energy efficiency measures involves the following:

- Identifying the list of energy efficiency measures to include in the analysis.
- Determining their applicability to each market sector and segment.
- Fully characterizing each measure.
- Preparing for integration with the greater potential modeling process.

AEG compiled robust lists of energy efficiency measures for each customer sector. The measure lists covered all major types of end-use equipment as well as devices and actions that reduce energy consumption when installed or implemented. Particular focus was given to including the latest available data on emerging technologies from AEG's in-depth research and participation in technical working groups nationwide.

After the lists were finalized, AEG identified the most appropriate source for each parameter and assembled information for all measures to reflect equipment performance, incremental costs, and lifetimes. AEG created a comprehensive measure characterization database to summarize the data. These characteristics form the basis for determining measure-level savings and cost-effectiveness as well as the subsequent build-up to the sector-level potential by scenario.

1.5.2 Improve the Delivery of Programs[11]

There are several components that are considered when developing and implementing DSM bundles. Key considerations, such as budget flexibility, marketing plans, and evaluation plans, are important for designing budgets and selecting delivery methods.

[11] 20 CSR 4240-22.050 (1)(E)(2)

Bundle Offerings

- Bundle eligibility has been defined broadly to make bundles as inclusive as possible. In general, participation guidelines are designed to include all customer sectors and end uses. Bundle offerings were intending to be broad program designs in order to allow for maximum flexibility for future MEEIA program offerings.

Outreach, Marketing and Communications

- Outreach, marketing and communications are critical mechanisms for ensuring customers and trade allies are aware of, and participate in, the portfolio of bundles. The DSM bundle portfolio relies on a combination of education and customer incentives to advance energy efficiency. The bundles have been designed to maximize participation given industry best practices. Educating customers and trade allies on the benefits of energy efficiency can help speed the adoption of energy efficient measures and promote market transformation.
- Customer incentives are the primary mechanism for bundle delivery. Through this mechanism, customers receive rebates to purchase energy efficient equipment and services through existing market actors including contractors, equipment dealers and retailers. To achieve the portfolio's long-term savings goals, it is necessary for Evergy and the implementation contractors to engage customers, trade allies, and state and local agencies. Targeting trade allies and leveraging relationships with stakeholders increases awareness and promotes the market adoption of high efficiency equipment/systems.

Net-to-Gross Impacts

Net-to-Gross (NTG) ratios adjust the gross energy and demand savings associated with a bundle to reflect the overall effectiveness of the bundle, taking into account free riders and spillover. Free riders and spillover, as determined from an impact evaluation, are defined as:

- Free Riders: Customers who participate in energy efficiency bundles that would have engaged in the efficient behavior in the absence of the bundle. The inclusion

of free riders overestimates the energy and demand savings associated with a bundle.

- Spillover: Customers who engage in energy efficient behavior due to some influence of a bundle but who do not participate in a bundle. For example, if a customer purchases an air purifier through the Energy Savings Products Bundle and then chooses to purchase an ENERGY STAR® clothes dryer after learning about the benefits of energy efficiency.

Spillover and free ridership act in opposing directions, with spillover increasing a bundle's energy and demand savings while free ridership diminishes a program's savings.

Evergy bundle adjustments to address free ridership and spillover should not negatively impact bundle implementation or continuity (e.g., Evergy should not modify incentive levels with a frequency that would compromise bundle stability and the customer experience). Evergy should work with bundle implementation contractors as well as the evaluation contractor(s) to determine if additional action is needed to minimize free ridership and maximize spillover.

Evaluation, Measurement and Verification

Evaluation, measurement, and verification (EM&V) is designed to support the need for public accountability, oversight and cost-effective bundle improvements and documentation of the effects of ratepayer funded efficiency bundles. Evergy engages an EM&V contractor(s) to conduct process and impact evaluations of the EE bundles. It is important in the bundle design phase to allocate a sufficient amount of budget for process and impact evaluations to be performed at appropriate intervals on the relevant portions of the portfolio.

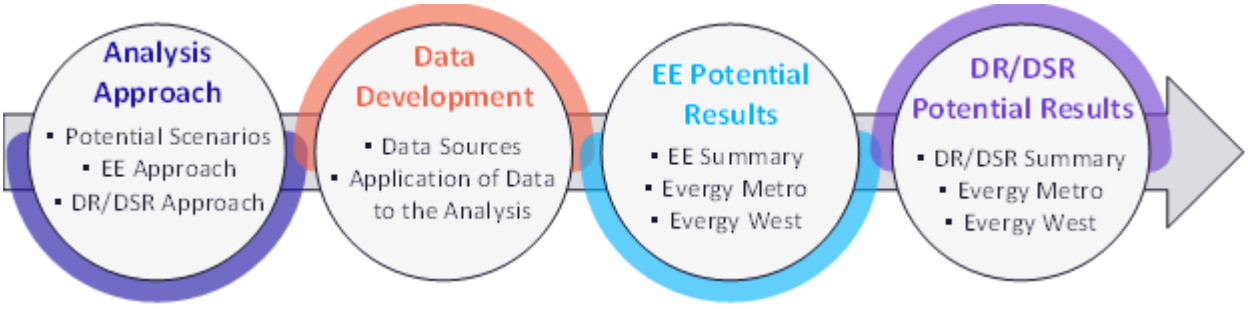
Section 2: Demand-Side Research[12]

2.1 DSM Potential Study

Evergy Missouri Metro engaged AEG to conduct a DSM Market Potential Study completed in 2023. AEG conducted primary market research for the residential sector and utilized previous survey results for non-residential sectors, including end-use equipment saturation data, customer demographics and firmographics.

The figure below presents the DSM Market Potential Study in four sections.

Figure 2: Content of DSM Market Potential Study



AEG performed primary market research of Evergy's residential customers in their Missouri and Kansas service territories. Separate surveys were conducted in each of the four regions of the service area, including: Missouri West, Missouri Metro, Kansas Metro, and Kansas Central. The survey sample was stratified by usage and net metering status within each area. The initial sample consisted of 18,000 mail customers and 46,000 email customers. Due to a low response rate, another 80,003 email customers were added to the sample. Survey results were used to develop the market characterizations for the potential study, especially for segmentation, use per household, and appliance saturations

The entire Appliance Saturation Study can be found in Appendix 5, Exhibit A Evergy Residential Appliance Saturation Survey.

[12] 20 CSR 4240-22.050 (2)

AEG performed a market characterization to describe electricity use for the study's base year for the residential, commercial, and industrial sectors (2021). The market characterization included utility data, primary data collected from the Residential Appliance Saturation Survey, and secondary data sources; developed a reference baseline projection of electricity consumption by jurisdiction, sector, segment, end-use, and technology for 2022 through 2043 without future DSM programs; defined and characterized energy efficiency measures to be applied to sectors, segments, and end-uses and estimated technical, economic, maximum achievable, and realistic achievable energy efficiency potential at the measure level for 2024 through 2043.

In contrast to energy efficiency, where customers may choose to install energy-efficient technologies in the absence of utility programs, DR/DSR does not exist outside of utility offerings. Therefore, AEG relied on a programmatic view of DR and DSR to assess the potential as opposed to the technology view used to assess the potential from energy efficiency measures.

AEG used a bottom-up approach to perform the DR and DSR analysis, aligned with the Energy Efficiency Market Characterization. AEG developed a comprehensive set of program options for the analysis, including direct load control, grid-interactive, manual, and rate-based options; developed a reference baseline peak projection and customer growth forecast using the class-level MW and customer growth forecasts provided by Evergy;

Based on the RAP and MAP potential scenario results from the DSM Potential Study, AEG developed four portfolios comprised of cost-effective measures. Each of these portfolios was considered during the integration phase of Evergy's IRP process to determine which DSM portfolio was optimal based on Evergy's supply options. *Figure 1: Bundle Design* Scenarios shows the scenarios design in the study.

Evergy's proposed DSM bundle portfolio for 2024 through 2043 are comprised of six residential bundles and two non-residential bundles. Each bundle targets multiple end

uses and offers residential, commercial and industrial customers an opportunity to achieve significant energy savings through participation. The proposed bundle design delivers an effective and balanced portfolio of energy and peak demand savings opportunities across all customer segments. Each bundle was designed to leverage the mix of best-practice measures and technologies, delivery strategies, and target markets in order to most effectively deliver bundles and measures to Evergy customers. The bundles were designed to be broad enough to allow for flexibility in nuanced implementation strategies for specific measures or target markets.

AEG prioritized Evergy-specific data, supplemented by regional and national data sources. Where possible, data were adapted to local conditions (e.g., using local weather and local sources for measure data). A wide range of data sources were utilized for all assessment in this study can be found in Section 2.2 Data Development in Appendix 5.

2.2 Electric Power Research Institute

Evergy financially supports research conducted by the Electric Power Research Institute (EPRI). Evergy has access to the EPRI library of energy efficiency and demand response research and data that is available to program participants.

More information about the EPRI energy efficiency and demand response program research can be found on their website, www.epri.com. Additional specific EPRI energy efficiency and demand response programs recently and/or currently supported by the Company are summarized below.

2.2.1 EPRI Program 18: Electric Transportation

Evergy continues its participation in this EPRI research program. This program develops research products that help electric transportation serve as a major electrification driver, with a focus on safe, affordable, reliable electricity with reduced environmental impacts, while at the same time providing increased choice for customers. This research spans the electric transportation domain from high-level strategic intelligence and fundamentals, through technical research and development, to low-level technical deployment. The result of this research effort has been a long-standing and influential

program that provides unbiased and information-rich guidance to utility participants and others and has guided many key EV technologies and systems to commercial adoption.

EPRI research in electric transportation yields data and knowledge beneficial to members of the program. EPRI's products and services are delivered in a variety of ways and generally include the following:

- Facilitated collaboration between the utility industry and major automotive manufacturers, EV infrastructure equipment suppliers, infrastructure operators, and public agencies.
- Analysis of the impacts of EV charging to utility grid systems through laboratory testing and other means.
- Utility-specific analyses of EV market potential, EV-specific load shape and requirements, customer expectations, infrastructure requirements, and informational materials to support utility-internal EV-readiness programs.
- Testing and evaluation of EVs and EV charging equipment, including data collection and analysis of real-world EV operation in utility fleet and other applications.
- Major vehicle and infrastructure demonstration initiatives to collect and analyze real-world operating data on the latest vehicle and infrastructure technologies.
- Development of advanced charging technologies that enable smart integration of EVs into the grid.
- Expanding commercial and industrial electric non-road transport applications and markets through field demonstration, technology development, and assessment.
- Validation of the economic and environmental benefits of EVs to utilities, utility customers, and their communities.

2.3 MEEIA Cycle 3 Research & Pilot initiatives

Evergy is embarking with a handful or more of research and pilot initiatives as part of the approved funding associated with the Evergy MEEIA Cycle 3 demand side management programs.

2.3.1 PAYS®

Evergy PAYS® residential pilot program launched in September of 2021, in response to the Amended Report and Order from the Public Service Commission on April 10, 2020 and is approved to continue through 2024. The Pay as You Save® pilot provides eligible Missouri residential customers with the installation of energy efficient measures with a lesser burden of upfront cost, a common obstacle to participating in energy efficiency programs. The 12-month pilot explores the feasibility of a PAYS® program in the Evergy Missouri Metro and Missouri West jurisdictions. The pilot enables Evergy to understand customer experience and overall satisfaction with the program, to assess valued savings, marking potential and impacts to utility financials and program cost-effectiveness. Pay as You Save® is a trademarked program developed by the Energy Efficiency Institute (EEI). The program allows for building owners and tenants to install energy efficient measures with less upfront payment and debt obligation. The utility recovers its cost through a tariff tied to the utility bill; repayment must be less than the estimated savings.

2.3.2 Products and Services Incubator (PSI)

Products and Services Incubator (PSI) program is intended to capture and research ideas as well as design and test new and experimental programs/measures. ICF (the implementor) manages the Incubator, which serves in the identification, scoring, and scoping of a pipeline of concepts, measures, and programs. ICF provides subject matter expertise, support, and research for design ideas. The PSI process supports both emerging technologies and new program delivery strategies. The process begins with an assessment of the current residential and commercial portfolio's needs, and the incorporation of key Evergy stakeholder inputs to bring the perspective and vision needed to establish a pipeline of pilots that will sustain the portfolio into the future.

The process includes three stages.

Stage 1: Identify – The identify stage is about ideation and determining a minimum viable product. This is a collaborative step in the process obtaining ideas from a wide variety of sources. The following are some tactics we employ to stay informed of the latest industry trends, challenges, and research:

- Assessing the current portfolio
- Sharing knowledge
- Conducting workshops
- Hosting meetings
- Taking in ideas
- Conducting research
- Maintaining the idea repository
- Scoring ideas
- Assigning and tracking Program Readiness Levels (PRL)

Stage 2: Validate – Evergy and ICF work together to validate concepts after receiving a green light in the identify stage. If required, business cases are completed after an idea's viability has been assessed and the concept program's design has been approved. A solid pipeline of ideas and input from Evergy stakeholders is crucial to the process to ensure the pipeline of ideas continues to fuel the validate stage. The validate stage takes the idea from concept to a decision for integration by:

- Assessing viability
- Designing individual pilots
- Developing business cases if needed
- Launching and implementing pilots

Stage 3: Integrate – The integrate stage takes the concept to program by:

- Reviewing
- Knowledge and Infrastructure transfer
- Launch program

2.3.3 Program Readiness Levels (PRLs)

Similar to technology readiness levels used by the DOE and Department of Defense, PRLs indicate where ideas and technology stand in the process. The pilot process also includes opportunities to accelerate ideas based on portfolio and business needs. PRLs are applied to every idea and technology in the pipeline and include:

PRL 0 – Idea is scored (see Scoring Methodology below),

PRL 1 – Viability Assessments and Comparison

PRL 2 – Pilot Design

PRL 3 – Scope Development, Finalize Design

PRL 4 – Establish Plan and Metrics

PRL 5 – Pilot Launch and Review

PRL 6 – Transfer to Program

2.3.4 Scoring Methodology

The concept scoring methodology for ideas is a weighted criterion based on the utility's portfolio and business needs. Each pilot concept is scored by measuring them against the criteria. The considerations standardize the scoring by making qualitative data quantifiable. Weights can be changed at any time based on business needs and each concept is scored on a scale from 1 to 10. One is the worst, 10 is the best and 5 is average.

2.4 MEEIA Cycle 3 - Program Year 1 Pilots

The following section summarizes pilots that launched (PRL 5) in PY1 2020 and are continuing evaluation throughout PY2 2021.

2.4.1 Energy Efficiency for Non-Profits (EENP)

The Energy-Efficiency for Non-Profits (EENP) Pilot targets Evergy commercial or residential customers, specifically nonprofit, 501(c)(3) organizations, that primarily provide lodging and social services to low-income, homeless, and/or at-risk populations. The objective of this pilot was to remove participation barriers for this customer segment, through a simple and streamlined process.

The pilot tested the program's viability for a full-scale offering and informs the design for implementation of a large-scale rollout to commercial customers. The pilot evaluated the following research questions:

1. What are the upgrade opportunities at these facilities?
2. What is the average savings and rebate level of a completed project?
3. What is the average cost of a completed project?
4. What factors lead to customers successfully completing projects?
5. Is this program design and incentive structure more effective, in terms of savings and participation, than current C&I program offerings?
6. Does the program change customers' perceptions of EVERGY?

The pilot provides awareness of energy efficiency opportunities by offering free walk-thru energy assessments, increased Business Standard rebate incentives, and a free Direct Install services which can include the following; free installation of low-flow water showerheads and aerators, advanced power strips, and pipe insulation for Domestic Hot Water Heaters, free common area lighting upgrades to LED, free HVAC tune-ups for eligible equipment, and free insulation and air sealing services if applicable.

This pilot experienced barriers with customers not taking advantage of increased rebate offerings due to budget constraints and the non-profits complicated grant and financing structure. Additional feedback from customers has suggested even larger rebates would be necessary for organizations to move forward with equipment replacements. However, the pilot has experienced immense interest in the free Direct Install services with 100% of the customers receiving walk-thru assessments moving forward with Direct Install services. Specifically, upgrading exterior and interior lighting has proven to be a primary need for the customers that have participated thus far.

Overall, this pilot continued through 2021 and conducted 17 walk-through assessments for each of the 17 initial participants, completed 16 direct install projects for a total of 110.1 kW savings and 549.75 MWh savings for a total incentive spend of $178,359.39.

2.4.2 HVAC Quality Install (QI)

The HVAC Quality Install (QI) Pilot targeted contractors (Trade Allies) that work throughout the Evergy service territory, with a focus on those who already have implemented Measure Quick technology within their business practice. Using Measure Quick (MQ) technology, Trade Allies can quickly test, document and verify that a true quality installation has been performed on a newly installed HVAC system, but with a lesser level of effort. The MQ system automatically collects data and reports findings about the operation of the system to the trade ally technician. This allows the technician to address any issues the diagnostic system identifies and then send the final installation data directly to Evergy via Measure Quick. This data confirms the equipment was installed and running at "quality installation" standards with a relatively minimum effort in comparison to other manual processes. The HVAC QI pilot provided Trade Allies an incentive to perform this deeper retrofit benefiting both the program and the customer with higher modeled energy savings and a more efficient HVAC system with a longer lifespan.

The pilot design tested the program's viability for a full-scale offering and informed implementation into existing MEEIA residential HVAC programs. The pilot evaluated and tested the design as follows:

1. Performed an HVAC QI on up to 200 HVAC units
2. Determined what datapoints can be collected with reasonable effort and meet QI standards
3. Compensated TAs with $50 for each QI retrofit performed
4. Analyzed the values and findings to ensure it all qualifies as a true "quality install"
5. Overall, the pilot helped determine the extra level of effort required during the installation, as well as the level of incentive dollars needed to make the deeper retrofit valuable enough for the Trade Ally to perform regularly.

The QI pilot launched in September of 2020, identifying and training four trade allies that already used Measure Quick within their business practice. The pilot performed a total of six projects before the end of the cooling season, which was enough to beta test the workflows and identify any data transfer problems before pilot relaunch at the start of the

2021 cooling season. In 2021, the pilot completed 29 QI's and logged 5,398.5 kWh savings and 6,195 kW savings, while paying our $1,450 in incentives. Along the way, most participants expressed resistance due to several factors, including most often: (1) incompatibility to business models, (2) entry cost to technicians, (3) learning curve for new technologies, and (4) design conditions required for testing.

2.4.3 KC – Low-Income Leadership Assistance Collaborative (LILAC)

Evergy has identified a gap in connection and collaboration amongst local low-income support channels in the KC area, in which we desire to fill; this is the premise for KC-LILAC. Specifically, as it relates to three different, but interconnected, home components, including: energy efficiency, health, and structural integrity. This pilot is designed to bring local support resources / agencies / associations / corporations together to offer the best and most comprehensive experience for this area's low-income customers.

The pilot design involves research, identification, and coordination of a local collaborative group. This collaborative provides a safe platform where members can share what they have to offer, and network with the other members to create a better, more widespread understanding of what is available. The primary objective for this collaborative is to create a more wholistic support approach for the KC low-income residents focusing on Energy Efficiency, Healthy Homes, and Structural Repairs/Integrity.

The pilot met with various groups in November of 2020 to discuss numerous program offerings and identify resources available to the low-income community. As a result, the collaborative group identified key stakeholders from local organizations that are eager to participate as members of the collaborative. So far, collaborative members include representatives from Evergy, Spire, Elevate Energy, Metropolitan Energy Center, Children's Mercy Hospital, Bridging the Gap, KC Water Department, Westside Housing, and representatives from the Missouri Public Service Commission. The collaborative group met again in January of 2021 to discuss marketing strategies and next steps for the initiative. The pilot continued throughout 2021 and has been incorporated as an continuing initiative in future program years, through 2022.

2.4.4 DBE Accelerator

Evergy deployed a 10-week pilot program led by ICF with outreach support from Elevate Energy to further engage with Diverse Business Enterprises (DBEs) and better understand their unique needs.

ICF carried out an investigation of DBEs in Evergy's service territory focusing on underperforming and non-participating TA's. Due to the limited timeline, the decision was made to focus on HVAC firms that could be brought into programs expeditiously. The project was approached with the following key deliverables and project milestones:

- Identify non-participating DBE residential and commercial contractors (HVAC, lighting, roofing and insulation)
- Survey under-participating residential and commercial contractors with a focus on HVAC
- Understand through qualitative analysis how Evergy can better serve DBEs with the goal of increasing participation, program enrollments and synthesizing future areas of programming growth
- Produce a concise marketing plan outlining pilot deployment schedule and required collateral
- Create a report outlining research, education and marketing steps taken to increase participation, recommended next steps and any results as achieved

To identify nonparticipating DBEs, the research team mined multiple data sets and contributing sources and added 105 new contacts to the HVAC, insulation and electrical databases. Contributing sources included partner organizations and ICFs internal resources (see Methodology for additional information). To identify under-performing residential and commercial contractors, ICF used internal resources and data analytics to compile a list of contacts and analyze the TA's history with Evergy programs. Through our research and contractor mining efforts, ICF added 46 residential and commercial DBE's to Evergy's prospecting CRM list, increasing the database by 17%. We also added over 60 combined electrical and roofing contractors to the CRM for future use in MEEIA 3 programs.

The team developed a survey that addressed specific areas of the DBE business including sales, rebates, business operations and marketing to better understand DBE businesses models and identify areas of opportunity in Evergy's programming. Once a list of perspective DBE dealers was identified and interview questions were completed, ICF lead an outreach effort to find companies that were willing to take the in-person survey. The main source of interviewees came from cold calling and warm introductions from partner organizations to our team. Additional outreach also included cold visits, presentations about Evergy programming to partner organizations and email.

The team analyzed the survey results as well as forwarded leads and TA questions to the Outreach Team, who followed up with calls and site visits with contractors. This feedback helped ICF to add additional participants to the database and referrals to grow it by 17%. Overall, the 21 contractor interviews (with 12 being DBE contractor interviews) yielded qualitative insights across six discreet areas of inquiry: rebates, barriers to participation, business operations, sales process & marketing, customers, and equipment.

These insights helped inform the recommendations for TA outreach and engagement strategies which have been incorporated into standard outreach procedures for the Heating Cooling and Home Comfort program resulting in a current total of 24 DBE contractors and over $650,000 rebates delivered through DBE contractors to 1,300 customers from January 2020 to December 2023.

2.5 MEEIA Cycle 3 - Program Year 2 Pilots

The following section summarizes pilots that were in place in 2021.

2.5.1 Market-Rate Multi-Family Pilot

The Market-Rate Multi-Family Pilot targeted building owners, property managers, and landlords of Market Rate Multi-Family apartments across the Evergy service territory and provided energy efficiency retrofit rebates and services to residentially metered tenant units. AS of 2021, the tenants, building owners, property managers, and landlords of this

multi-family segment are unable to take advantage of available rebates due to current MEEIA program restrictions and eligibility requirements. Specifically, to participate in the existing Business Standard or Custom Rebate program eligibility restrictions require customers to fall under the commercial rate class and be a master metered property to qualify. This restriction typically eliminates Market-Rate tenant units from participating in any Business Rebate offerings as tenant units typically fall under a Residential rate code. Likewise, Market-Rate units would not be eligible for existing Single-Family Residential or Income-Eligible Multi-Family rebate offerings due to various eligibility restrictions. With this gap of customers not currently being served, it provided a need for a Market-Rate Multi-Family rebate program for properties that fall under the above criteria.

The pilot provided Market-Rate Multi-Family customers with rebates for equipment retrofits for measures including heat pumps, air conditioners, clothes washers, refrigerators, and more for their tenant units. Additionally, the program offered tenants the option to purchase a deeply discounted energy efficiency kit which include LED Lighting, Low-Flow Water Products, and Smart Power strips.

The pilot was unsuccessful at providing direct install kits at market rate properties but had 13 participants in HVAC rebates totaling $6,900 in incentives. This level of participation validated that this customer segment is interested in energy efficiency and the need to commercialize.

Further in 2022 a tenant focused limited time offer kit distribution to replace the direct install component was launched. The kit included 12 A19 LED's 2 WiFi Connected A19 LED's, one smart plug, one advanced power strip, and one low flow handheld showerhead at a cost of $10 to tenants. Tenants directly purchased the kit online and the product was shipped. 1,822 kits were shipped in 2022.

Since pilot completion and commercialization, this segment now is able to receive all the same incentives as is offered to the single-family homes and has access to purchase discounted energy efficient products from the online marketplace.

2.5.2 Income-Eligible Multi-Family Commercial Laundry

The Income-Eligible Multi-Family Commercial Laundry Pilot targeted low-income multifamily property managers and building owners, who lease or own commercial washing machines, with incentives to upgrade to high efficiency ENERGY STAR® equipment. The Income-Eligible Multi-Family did not specifically offer incentives for multifamily properties that lease or own commercial laundry equipment. However, within Evergy's service territory a significant portion of multifamily and affordable housing providers offer common area laundry facilities for residents. Property Managers and Owners often lease laundry equipment and provide common area laundry facilities for three reasons; utilizing a route operator allows properties to focus on property management and not worry about laundry services or maintenance, providing in-unit washer and dryers can often lead to more maintenance issues (i.e. water damage), and some common area laundry rooms can generate extra income for properties.

This pilot offered rebates for energy efficient commercial washing machines, as ENERGY STAR does not label commercial clothes dryers. With this pilot design, Evergy provided a specific segment of Income-Eligible Multi-Family customers that lease or own commercial laundry equipment, with retrofit rebates that were not available through the existing MEEIA programs.

The pilot tested the program's viability for a full-scale offering and informed the design for implementation into the existing income-eligible multi-family program. Identified that the incremental cost for equipment is about $700 and to maintain load charges at affordable rates to tenants the incentive needs to cover the full incremental cost. The program identified that leasing companies do procure and stock ENERGY STAR equipment as the machines universally meet ADA requirements and that there tends to be more maintenance of ENERGY STAR machines in affordable housing due to tenants using non-high efficiency soaps which can deter participation.

The pilot yielded one participant and found that while this concept was beneficial to properties, it does not fit well within a Pilot Structure as it requires specific timing to align

with 7 year-long lease contract renewals. Therefore, the pilot was commercialized as additional measures being incentives under the Income-Eligible Multi-Family program.

2.6 MEEIA Cycle 3 - Program Year 3 Pilots

The following section summarizes pilots that were in place in 2022 .

2.6.1 BPI Building Analyst Training

The objective of the BPI Analyst Training Pilot is to fill a gap in available BPI Building Analysts to support Evergy's programs while supporting our local economy with additional technical competencies for the local workforce. Evergy partnered with locally owned and operated Energy and Environmental Training Center of Kansas City (EETCKC) and provided training and exams for BPI Building Analyst certification.

EETCKC is a national BPI testing center and certification training provider. The training provided a thorough understanding of Building Science, with four and a half days of classroom and field training, followed by proctored BPI certification exams. Training was performed at Project Living Proof, which is a 100-year-old home in Kansas City, Missouri that has been transformed and renovated to showcase the latest in energy-efficient and renewable energy technology. Upon completion of the course, candidates who pass both the written and field exams were be awarded certification as a BPI Building Analyst.

10 participants completed the training and achieved BPI Building certification through the pilot. Additional incentives were made available to participants who completed training and achieved BPI Building Analyst certification:

- $3,000 if they submit at least eight qualified Insulation and Air Sealing jobs to the Evergy Insulation and Air Sealing (InAir) program by December 31, 2022.
- An additional bonus of $2,000 was awarded to those who complete at least half of their projects (four of the 8 minimum required jobs) in Evergy's MO West territory.

One participant achieved the bonus incentive for submitting at least eight qualified Insulation and Air Sealing jobs.

2.6.2 Power Check Device ("Kill-A-Watt" Meter)

The Power Check pilot provided electricity usage devices or Kill-A-Watt Meters for utility customers to check out at their local library branch. The Kill-A-Watt Meters provide customers with an easy, no-cost way, to increase utility usage awareness while encouraging energy efficient behaviors and help customers learn how to reduce energy waste.

The meter allows customers to determine their electrical expenses by the hour, day, week, month, and year. With the Kill-A-Watt meter, customers simply plug the device into an electrical and then allow the user to plug in any appliance. The device counts consumption by the Kilowatt-hour, and the customer can calculate their electrical expenses by the day, week, month, even an entire year. Additionally, this pilot could lead to increased energy savings through the cross promotion of other utility programs.

Evergy and the Kansas City Public Libraries and Mid-Continent Public Libraries promoted energy efficiency and the checkout of devices through energy efficiency focused display tables and pop-up tabling events where supportive programs such as the Energy Savings Kit and Thermostat programs were cross-promoted to further energy efficiency. The program yielded over 220 device checkouts in 2022. Currently exploring re-distribution of devices to local Title I schools and school libraries.

2.6.3 Zero Energy Ready New Homes

The Zero Energy Ready New Homes pilot will serve as the Proof of Concept to understand the barriers and incremental costs associated with meeting and exceeding ENERGY STAR 3.1 (increased from 3.0 in 2023) New Homes standards and the feasibility of adopting the Department of Energy's Zero Energy Ready Homes (ZERH) Certification. The target market consists of market-rate and affordable new home builders, energy raters, and other building consultants in the greater Kansas City area.

The first phase of this pilot focused on providing incentives and support to local Kansas City non-profit Good Samaritans Housing Equity (formerly NHCH), which is working with

investors to support the building of 42 high-efficiency, zero energy ready, single-family homes for low-Income individuals and families on urban infill properties on the east side of Kansas City. The innovate building design strategy GSHE is implementing is to create and implement a new residential community construction model that is life cycle cost negative and zero energy ready for low-income families will meet or exceed ENERGY STAR 3.1 New Homes standards. Unfortunately funding and construction delays postponed the project in 2022 and through 2023.

Once it was apparent the project would not occur on the timeline expected additional outreach to HERS raters and homebuilders was conducted identifying a handful of homebuilders interested in participating. Some challenges arose over timing of planning the homes, and clarifying requirements of heating fuel source that further delayed the program and made it to where homes could not finished in 2023 and the pilot was paused.

2.7 MEEIA CYCLE 3 - PROGRAM YEAR 4 pilots

The following section summarizes pilots that were in place in 2023.

2.7.1 Low-Income Leadership Assistance Collaborative ("KC-LILAC")

Evergy has identified a gap in connection and collaboration amongst local low-income support channels in the KC area. KC-LILAC has been developed to fill the gap. This pilot is designed to bring local support resources / agencies / associations / corporations, etc. together to offer the best and most comprehensive experience for the area's low-income customers. The premise is to offer support in three different, but three very interconnected home components:

- Energy Efficiency
- Healthy Homes
- Structural Repairs/Integrity

Because the low-income segment continues to be the greatest at-risk group of residents in the Kansas City area – and the most difficult to reach – KC-LILAC has a three-fold objective to support this group of residents:

- Research, identify and coordinate a local collaborative group that will provide a safe platform where members can share what they have to offer, and network with other members to create a better, more widespread understanding of what is available.
- Offer the most impactful and comprehensive support to those that need it most by working as a team to devise a structured plan for accomplishing the mission of this collaborative which will be determined as a group.
- Create a more wholistic support approach for the KC low-income residents. With a clear path forward, being intentional and structured in the way we provide communication and ultimately home upgrades that will be most impactful.

2.7.2 Appliance Recycling

The Appliance Recycling pilot launched in 2022 Incentivizing customers to retire older, inefficient appliances with an emphasis on removing and recycling secondary refrigerators/freezers from areas without climate control measures (basements and garages). The scope of the program was reduced by limiting eligibility to a specific area of the Evergy MO-West territory. Customers were incentivized to recycle large and small qualified appliances including Room Air Conditioners and Dehumidifiers.

Appliance recycling measures listed in Evergy's existing TRM: Refrigerators, Freezers, Room AC, Dehumidifiers and other appliances collected at events were evaluated for savings potential. In 2022 the program was implemented by ARCA who in addition to residential pickups completed one recycling event, collecting a total of 218 units.

In 2023 the program was implemented through MRC, a MO based recycling contractor and to reduce costs of pick-up services focused on supporting and enhancing community recycling events. MRC partnered with Evergy and the cities of Parkville and Kansas City to complete two recycling events collecting a total of 60 appliances.

2.7.3 Energy Efficient Radon Fans

*T*he Energy Efficient Radon Fans Pilot was launched to determine the potential for high efficiency inline fans for radon mitigation in residential households and provide incentives for customers and contractors/trade allies to install ENERGY STAR rated inline ventilation fans for active radon mitigation. The intent of the Energy Efficient Radon Fans Pilot is to determine:

The network of contractors installing active radon mitigation

- A strong network of installers was identified within the territory.

The variety of Energy Star rated fans available and standard efficiency fans available.

- There are currently two ENERGY STAR certified Radon Fans on the market. The manufacturers of these fans report that they have no plans to submit additional fans for certification.

The price difference between ENERGY STAR rated inline ventilation fans and standard efficiency ventilation fans.

- One Manufacturer reported that they do not charge a premium price for their Energy Star certified fans.
- Market research supports there not being a price difference on the ENERGY STAR rated fans.

The mix of professionally installed active radon mitigation vs DIY active radon mitigation installation to determine if a trade ally driven, realtor, retail, point of purchase, marketplace driven, or end customer driven incentive program may be most appropriate or a blended approach.

- One Manufacturer reported that sales of their fans through the retail channel have been growing, but the majority of sales are driven by the distributor channel.

Appropriate channels to support this technology/pilot, which may include real estate agents, as this may be the optimal point when customers are most interested - when purchasing a home.

Two applications were received for the pilot, each rebate application was flawed for the installed measure not being ENERGY STAR certified.

2.7.4 Virtual Energy Management for Small Businesses (VEM-SmB)

The objective of the VEM Pilot is to engage the hard-to-reach small business market and empower owners and managers to take control of their operational expenses and improve their bottom line. Additionally, the pilot provides resources, trainings, and best practices that were previously only offered to large commercial and industrial customers by offering walk-through energy assessments and workshops.

This pilot enrolled 12 eligible Small Business participants in GridPoint's energy management platform (EMP), a subscription service purchased for a set term through a contract executed between the customer and GridPoint. The incentives provided by Evergy covered 70% of the subscription cost. Part of the GridPoint subscription includes the installation of various measures such as GridPoint's EC-2000 Controller, GridPoint's Thermostat, HVAC Zone Sensors, and an option for lighting controls. The subscription fee varies per customer as is based on the number of HVAC units and the type of controls installed. The pilot will complete prior to a customer's three-year subscription term ending. SMB SEM pilot will help Evergy evaluate the following:

- Is 70% incentive the right target for SMB incentives?
- Do SMBs worry about long term (3-year) commitments to energy management given the uncertainty of the economy? Do any customers commit to more than 3 years?
- Do businesses effectively save energy through the VEM program?
- Are businesses interested in a broader offering, such as refrigeration monitoring, plug load control, etc.?
- Will customers stay engaged through monthly meetings, workshops over the course of a year?
- Can this be successful for the target customers with one or two site "mom-and-pop" businesses or is it more suited to enterprise SMB customers (like national accounts).

- How engaged will SMB employees be in strategic energy management in support of their employer's energy management goals?
- What is the conversion rate from leads to participants?
- Is there an opportunity for broader utilization of the GridPoint platform for DR/Flexible Load Management?
- Does this serve as a good cross-promoter for other C&I (or residential) programs?
- Is the achievable savings compared to incremental cost likely to evaluate with a positive TRC?

The total claimed savings for the 12 participants is 173,840 kWh as of 12/20/2023.

2.8 Pilots in Research Phase

2.8.1 Panel Upgrades Research

Homes with amperage services of 150 or less will increasingly encounter the need to upgrade their electric services if they elect to increase the electrical load of their home through the integration of electric appliances, such as dryers, washers, stovetops, heat pumps, and electric vehicle chargers. This research project seeks to better understand these panel capacity barriers Evergy homeowners face, particularly:

- What are the barriers to replacing existing heating systems with air-source heat pumps in low-income residential buildings in Evergy territory?
- What is the general capacity of electric panels in Evergy territory- will many just need reconfiguration or a full upgrade in order to accommodate air-source heat pump installations?
- What is the estimated cost of installation and labor for electric panel upgrades or reconfigurations in Evergy's territory?
- What are the non-financial barriers and benefits of electric panel upgrades and reconfigurations?

This pilot is designed to conduct local outreach to Evergy contractors to identify common infrastructure needs for converting residential electric heating systems and explore how Evergy can support customers in overcoming this barrier.

Additional analysis on the energy savings from heating system conversions will be conducted to explore the cost-effectiveness of providing additional incentives for this electric infrastructure work during heat pup conversions.

2.8.2 Residential Battery Energy Storage Pilot

Evergy recently launched a residential battery energy storage pilot to evaluate the role of residential battery energy storage systems in producing customer savings and providing benefits to Evergy's electrical system. The pilot consists of 50 battery energy storage systems at residential sites across Evergy's Missouri jurisdictions. The battery sizes have a capacity of approximately 4.5 kW or 6 kW and 19.4 kWh each. Evergy evaluated selected batteries that align with the participant's load and demand response potential.

The pilot builds on Evergy's Integrated Distribution Planning discussion shared in its Integrated Resource Plan filed in Case Docket Nos. EO-2021-0035 and EO2021-0036. Volume 8, Section H describes Evergy's study program with Sunverge, a provider of "intelligent energy storage systems" which combines behind the-meter ("BTM") energy storage with advanced control capabilities through their energy management system. Evergy began working to explore benefits of combining BTM storage with distributed energy resources ("DER").

The residential battery energy storage project has three phases:

- Phase 1: Lab Testing. Install two battery storage systems to test and evaluate each system's functionality and operation under various grid conditions.
- Phase 2: Field Trial. Install 4-6 units at customer locations, deploy the required field and local communications network, and implement integrations between the storage system provider and Evergy's DERMS
- Phase 3: BTM Storage Pilot Program. Based on the knowledge gained during the successful execution of Phases 1 and 2, Evergy sought and received regulatory approval for a BTM Storage Pilot Program.

As a pilot, the RBES program will advance Evergy's operational knowledge of how battery energy storage systems can be utilized to achieve customer savings and grid benefits. The battery energy storage system under the pilot is used to "shift" energy use from periods of high prices to periods of low prices, creating opportunities for customers on a TOU rate program to achieve retail savings.

The battery energy storage systems include a "smart" home energy control system that is programmed to charge during lower "off-peak" rate periods, and to discharge the stored energy during higher "peak" rate periods, supplementing home energy consumption. In addition to having the ability to optimize customer's retail consumption patterns, battery energy storage systems can also provide operational benefits for the utility as well as deliver customer benefits.

The pilot is also consistent with the objectives of Senate Bill 564, (Section 393.1610 RSMo.) which provides for the utility to implement pilots such as this and allows for Commission approval. Section 393.1610 states, "The commission may approve investments by an electrical corporation in small scale or pilot innovative technology projects, including but not limited to renewable generation, micro grids, or energy storage, if the small scale or pilot project is designed to advance the electrical corporation's operational knowledge of deploying such technologies, including to gain operating efficiencies that result in customer savings and benefits as the technology is scaled across the grid or network."

2.8.3 Energy Storage Use Cases

Benefits of energy storage to customers will be influenced by several factors, including the customer's energy use profile, customer rate schedule, presence of customer-owned smart technology, and customer behavior and preferences.

To evaluate these benefits across a range of factors, Evergy would seek program participants which have a combination of the following characteristics:

- **Customers enrolled in TOU rates** - A battery storage device for a customer enrolled in TOU rates would typically be charged during the off-peak period, when energy prices are lower, and discharged during on-peak periods when energy prices are higher. The energy produced by the battery when discharging would be used to supplement household consumption, reducing the amount of retail electricity purchased during peak pricing periods.
- **Customers seeking to integrate storage with solar rooftop photovoltaic (PV) systems** - Installation of a battery storage system would allow some of the solar energy to be diverted to charge the battery, when solar generation exceeds household consumption. By minimizing power injection to the grid or reducing peak energy draw, the customer's load profile would be flattened, which could reduce the impacts of distributed generation on the existing distribution system.
- **Customers which own electric vehicles or other smart home devices** – Installation of battery storage system may shed insights on current customer perceptions of the need/value of resiliency. For example, storage might be desirable for customers who are interested in having access to a back-up power source for critical loads during short-term outages and EV charging. In addition, Evergy will also seek to identify distribution feeders on which storage systems can be utilized to improve distribution system reliability.

Section 3: Development of Potential Demand-Side Programs[13]

AEG's approach to estimating the potential for energy efficiency, demand response, and demand-side rates is to begin with an overview of the potential scenarios assessed in the DSM Market Potential Study, then detail the analysis approach by resources:

Potential Scenarios

- Technical Potential: considers all feasible potential, regardless of cost or potential customer uptake. Technical potential is a theoretical construct, assuming that all equipment is upgraded to the most efficient option at the time of replacement and that all retrofit measures are installed over time, regardless of what might be achievable in the market.
- Economic Potential: includes all cost-effective opportunities without adjusting for expected customer uptake. Measure-level cost-effectiveness was measured by the Total Resource Cost (TRC) Test.
- Maximum Achievable Potential (MAP): is a subset of economic potential that attempts to identify maximum savings realized under ideal market, implementation, and customer preference conditions.
- Realistic Achievable Potential (RAP): is a subset of economic potential that reflects expected program participation given barriers to customer acceptance, non-ideal implementation conditions, and limited program budgets. RAP- scenario is set to be 75% of RAP level and a scenario where customer incentives are set to be 50% of incremental cost. RAP+ scenario is an alternative portfolio designed to represent approximately the average of RAP and MAP participation levels and a scenario where customer incentives are set to be 50% of incremental cost.
- Demand response and demand-side rate resources do not exist in the absence of utility programs, and estimating technical and economic potential does not provide meaningful information on the available resource size. Therefore, these resources are excluded from the technical and economic potential.

[13] 20 CSR 4240-22.050 (3)

3.1 Energy Efficiency Analysis Approach

Energy efficiency resources reduce the energy required to power end-use technologies while providing the same level of service to the customer. AEG used a bottom-up approach to perform the potential analysis, following these major steps:

1. Residential Appliance Saturation Survey (RASS). Conducted primary market research of Evergy's residential customers in their Missouri and Kansas service territories.
2. Market Characterization. Performed a market characterization to describe electricity use for the study's base year for the residential, commercial, and industrial sectors (2021). The market characterization included utility data, primary data collected from the RASS, and secondary data sources.
3. Baseline Projection. Developed a reference baseline projection of electricity consumption by jurisdiction, sector, segment, end-use, and technology for 2022 through 2043 without future DSM programs.
4. Measure Development. Defined and characterized energy efficiency measures to be applied to sectors, segments, and end-uses.
5. Calculation of Energy Efficiency Potential. Estimated technical, economic, maximum achievable, and realistic achievable energy efficiency potential at the measure level for 2024 through 2043.

3.1.1 Step 1. Market Characterization

To estimate the potential impacts of energy efficiency, it is first necessary to understand how much energy is used today and what equipment is currently in service. The market characterization began with a segmentation of each jurisdiction's footprint to quantify electricity use by sector, segment, end-use application, and the current set of technologies in use in 2021. For this, AEG relied on information from Evergy and the RASS, augmented with secondary sources. The segmentation scheme is presented in the table below.

For Opt-Out Customers, some of Evergy's largest Commercial and Industrial customers are eligible to opt-out of the utility's energy efficiency program and manage their energy independently. To reflect this situation, AEG separated opt-out customers into a segment

and removed them from the potential, as they will not contribute savings to Evergy's program portfolio.

Table 2:Overview of Evergy Missouri Analysis Segmentation Scheme

Dimension	Segmentation Variable	Description
1	Jurisdiction	Evergy Metro, Evergy Missouri West
2	Sector	Residential, Commercial, Industrial
3	Segment	**Residential:** Single Family, Single Family – Low Income, Multi-Family, Multi-Family – Low Income **Commercial:** Large Office, Small Office, Retail, Restaurant, Grocery, School, College, Healthcare, Lodging, Data Center, Warehouse, Miscellaneous, Opt-Out **Industrial:** Food Production, Chemicals/Pharmaceuticals, Electronic Equipment, Primary Metals, Stone/Clay/Glass, Transportation Equipment, Rubber/Plastics, Waste/Wastewater, Other Industrial, Opt-Out
4	Vintage	Existing and new construction
5	End-uses	Cooling, space heating, lighting, water heater, motors, etc. (as appropriate by sector)
6	Appliances/End-Uses and Technologies	Energy efficiency technologies, such as lamp and fixture type, central air conditioner type, motors by application, etc.
7	Equipment Efficiency for New Purchases	Baseline and higher-efficiency options as appropriate for each technology

For Demand Response (DR) and Demand-Side Rate (DSR) analysis, AEG segmented Evergy's customers by jurisdiction, sector, and customer size. Commercial and industrial (C&I) customers were segmented based on their non-coincident peak load, reflecting how programs are generally offered to customers. In general, the DR and DSR segmentation aligns with the energy efficiency segmentation, which allows the DR/DSR analysis to incorporate and properly weight segment-level saturations of enabling technologies (such as central cooling systems and water heating) and factor in the adoption of efficient equipment when determining customer eligibility for program options.

3.1.2 Step 2. Develop Baseline Projection

The baseline projection describes forecasted energy consumption in the absence of future Evergy DSM programs and provides the foundation against which potential savings are measured. AEG developed a reference baseline in alignment with Evergy's

anticipated annual customer growth by sector and incorporated current and known future building codes and equipment efficiency standards to avoid overstating the potential that could be realized through new programs. AEG checked the baseline projection against each jurisdiction's official load forecast for reasonableness. However, the baseline projection was developed as an independent projection for the potential model to ensure that baseline assumptions were consistent with those used to assess measure savings and applicability.

For DR and DSR, AEG developed a reference baseline peak projection and customer growth forecast using the class-level MW and customer growth forecasts provided by Evergy. AEG developed the baseline peak demand forecast as follows:

1. Allocated system peak demand to each sector using base-year hourly peak demand data. Evergy provided customer forecasts by territory.
2. Segmented the non-residential peak load and customer forecasts by size based on an analysis of Evergy billing data.
3. Removed the peak demand savings potential generated through energy efficiency adoption forecasted in the MAP and RAP scenarios. The removal of the demand savings from the energy efficiency analysis was done to reduce any possible double counting and to account for energy efficiency savings before the DSR and DR savings are estimated.
4. Adjusted the peak demand baseline to reflect the estimated impacts of the TOU rates under various retention scenarios (discussed below). This adjustment lowers the impacts of DR programs to account for the preexisting impact (and interaction) from the TOU rate.

3.1.3 Step 3. Define and Characterize Energy Efficiency Resources

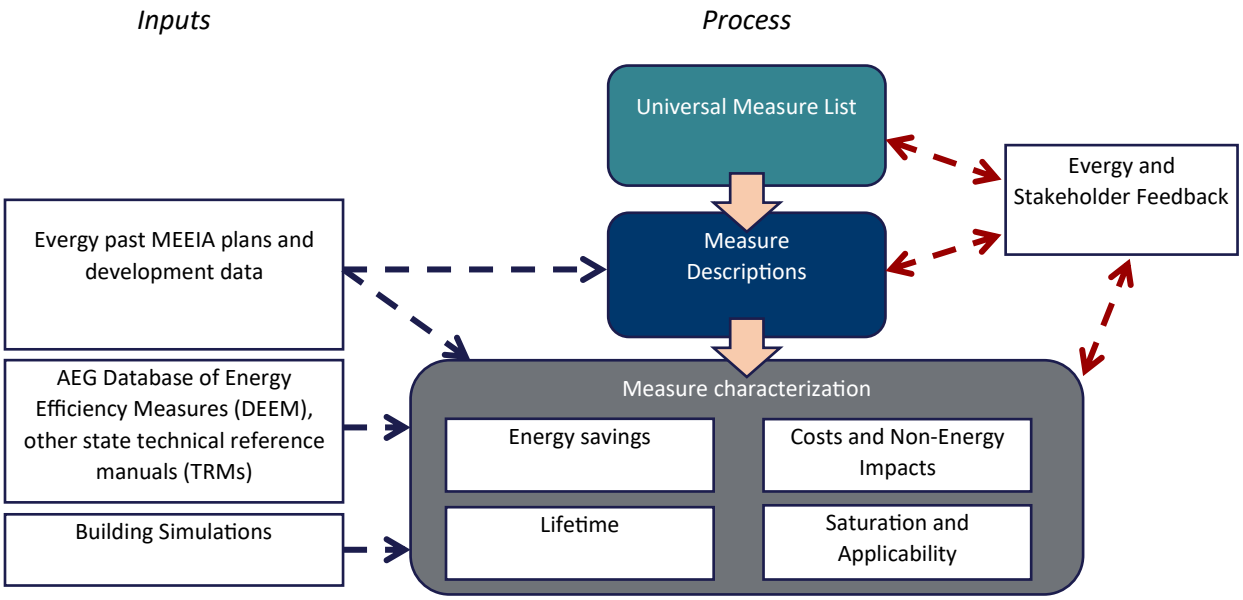
The framework for assessing savings, costs, and other attributes of energy efficiency measures involves the following:

- Identifying the list of energy efficiency measures to include in the analysis.

- Determining their applicability to each market sector and segment.
- Fully characterizing each measure.
- Preparing for integration with the greater potential modeling process.

The figure below outlines the framework for measure analysis.

Figure 3: Approach for Energy Efficiency Measure Assessment



AEG compiled robust lists of energy efficiency measures for each customer sector. The measure lists covered all major types of end-use equipment as well as devices and actions that reduce energy consumption when installed or implemented. Particular focus was given to including the latest available data on emerging technologies from AEG's in-depth research and participation in technical working groups nationwide.

After the lists were finalized, AEG identified the most appropriate source for each parameter and assembled information for all measures to reflect equipment performance, incremental costs, and lifetimes. AEG created a comprehensive measure characterization database to summarize the data. These characteristics form the basis for determining measure-level savings and cost-effectiveness as well as the subsequent build-up to the sector-level potential by scenario.

The table below presents the measure source hierarchy.

Table 3: Energy Efficiency Measure Source Hierarchy

Priority Level	Resource	Details/Examples
1	Evergy program data	Reports, Evaluations, Installation Data
2	Well-Vetted Sources Within Region	Illinois Technical Reference Manual (TRM), Missouri TRM
3	National Department of Energy (DOE) Sources	Annual Energy Outlook, ENERGY STAR, DOE Technical Documents, etc.
4	Well-Vetted Sources Outside Region	State-wide technical reference documents, etc.
5	AEG Technical Research	Various Resources, as Required

3.1.4 Step 4. Estimate Technical and Economic Potential

AEG's approach to estimating energy efficiency potential aligns with industry-standard practice and terminology. Energy efficiency potential is estimated by developing an alternate projection of energy consumption if efficient measures are adopted and calculating the difference from the baseline projection. In these alternate projections, measures are adopted only where they are applicable (e.g., insulation will only save electricity in homes with electric heating or cooling) and where they are not already installed (e.g., if a home already has high levels of insulation, there is no potential associated with installing insulation). For this study, AEG estimated four levels of potential:

Technical Potential

The calculation of technical potential is a straightforward algorithm, aggregating the full, energy-saving effects of all individual energy efficiency measures included in the study at their maximum theoretical deployment levels, adjusting for technical applicability, stacking of measures, and interactive effects. Equipment replacement measures are naturally constrained by the lifetime and decay rate of the units being replaced. While all retrofit resources could theoretically be acquired in the first year, this would skew the potential for equipment measures and provide an inaccurate picture of measure-level potential. Therefore, the study assumes these opportunities will occur over 20 years, a common timeframe for complete retrofit realization in potential studies.

Stacking of Measures

It is important to consider interactions between measures when applied within the same space to avoid double counting, which could result in savings greater than 100% of equipment consumption. These interactions are automatically handled within LoadMAP; for these measures, the baseline is modified for each subsequent measure. First, LoadMAP computes the total savings of each measure on a standalone basis, then assigns a stacking priority such that "integrated" or "stacked" savings are calculated as a percent reduction to the running total of baseline energy remaining in each end-use after the previous measures have been applied. This ensures that the available baseline energy shrinks in proportion to the number of measures applied, as it would in reality. The stacking priority is based on the levelized cost of conserved energy, such that the most economical measures that are more likely to be cost-effective and offered to customers through programs will be the first to be applied to the modeled population.

Related and Exclusive Measures

AEG's modeling approach also accounts for the exclusivity of certain measure options. For instance, if a SEER 18 central air conditioner is installed in a single-family home, the model will not allow that same home to install another central air conditioning until the new option has reached the end of its useful life. For non-equipment measures, base saturations and applicability are defined such that measures do not overlap. For example, we model two applications of ceiling insulation – the first assumes the installation of insulation where there previously was none, while the second upgrades pre-existing insulation if it falls under a certain threshold. AEG leveraged a variety of resources to estimate the appropriate remaining markets for measures, including the 2022 Residential Appliance Saturation Survey (RASS), market research from Evergy's past potential study reports, the US Energy Information Administration's (EIA) Residential Energy Consumption Survey (RECS) and Commercial Building Energy Consumption Survey (CBECS), and utility-provided program achievements.

Economic Potential

To estimate economic potential, AEG performed measure-level cost-effectiveness screening each year of the analysis using the TRC test. Costs included the full or incremental cost of the measure (depending on the application) and an assumed program administration cost. Benefits included (1) the avoided cost of electric generation, transmission, and generation; and (2) quantifiable water and operations and maintenance savings.

AEG's LoadMAP model performs the cost-effectiveness screening dynamically and on an annual basis, considering changing savings, costs, and benefits over time. Thus, measures can pass the economic screen for some, but not all, of the years in the forecast.

It is important to note the following about the economic screen:

- Cost-effectiveness was assessed at the measure level based on gross savings (i.e., not adjusted for potential free-ridership), reflecting that the potential study is attempting to assess cost-effectiveness without assuming or prescribing specific acquisition strategies or delivery mechanisms. Net-to-gross adjustments are applied during the development of program offerings.
- The economic evaluation of each measure was conducted relative to a baseline condition, such as minimum federal standard equipment or average existing building shell conditions.
- The economic evaluation was conducted only for measures applicable to each building type and vintage. Thus, measures deemed not applicable to a building type and vintage were excluded for that application.

3.1.5 Step 5. Estimate Achievable Potential

Achievable Potential

To develop achievable potential estimates, AEG applied market adoption rates for each measure to estimate the percentage of customers that may elect to adopt each measure. The market adoption rates consider barriers such as imperfect information, supplier constraints, technology availability, and individual consumer preferences.

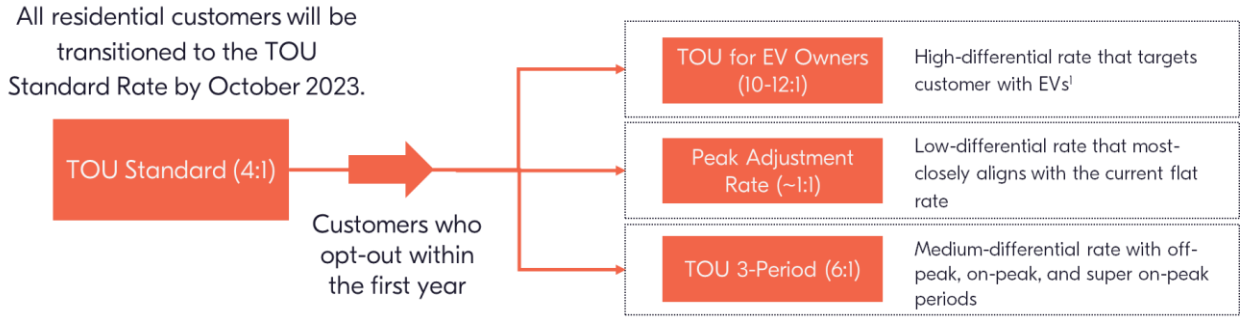
Market adoption rates intend to establish a path to full market maturity for each measure or technology group and ensure resource planning stays within acquisition capabilities. Customer adoption rates were applied to economic potential to estimate two levels of achievable potential:

Maximum Achievable Potential (MAP)
AEG calculated a maximum adoption rate that included ideal program considerations and the additional lift possible from enhanced incentives (up to 100% of incremental cost) for energy efficiency potentials. Maximum achievable adoption rates were held constant throughout the study, as they already represent the best-case adoption for each measure.

DR and DSR potential analysis included all cost-effective programs, incorporated growth in Evergy's existing programs to benchmarked participation levels (with associated increases in costs), and tested sensitivities around the forthcoming TOU rates for residential customers. MAP analysis focuses on the effect that customer retention in the default TOU Default rate would have on other DR and DSR program options.

As shown in the figure below, there are four residential TOU rates are modeled in the Potential Study. Residential customers will be placed on the TOU Default (Standard) rate and then have the option to move to one of three other TOU rates. AEG assumed that (1) customers who opt out of the TOU Default rate would do so within the first year, and (2) the majority would move into the Peak Adjustment Rate because of its familiarity and relatively low risk, especially since Evergy will not be offering any bill protection.

Figure 4: TOU Rates Descriptions



AEG assumed a conservative retention rate of 50% to estimate MAP and then tested the sensitivity of impacts and program costs to changes in the TOU retention rate as shown in the table below. For each sensitivity, AEG estimated the weighted impacts of the TOU rates, reduced the peak demand baseline forecast by the TOU impact, and then adjusted the impact assumptions for the other DR/DSR program options. The sensitivities also included increased costs of educating customers to support the increased retention in the TOU Default rate.

Table 4: MAP Sensitivity Analysis

Sensitivity	(1) TOU Standard	(2) TOU for EV Owners	(3) TOU Peak Adjustment Rate	(4) TOU 3-Period
MAP	**50% of all residential customers**	**20% of EV owners who opt out of TOU Standard**	**95% of remaining TOU Standard opt-outs**	**All other TOU Standard opt-outs**
MAP Medium-Retention	70% of all residential customers	50% of EV owners who opt out of TOU Standard	95% of remaining TOU Standard opt-outs	All other TOU Standard opt-outs
MAP High - Retention	85% of all residential customers	100% of EV owners who opt out of TOU standard	95% of remaining TOU Standard opt-outs	All other TOU Standard opt-outs

Realistic Achievable Potential (RAP)

AEG established a base take rate from measure and program interest questions in surveys AEG has performed in nearby territories, which asked residential and business participants about their willingness to adopt or install several different kinds of measures under business-as-usual incentives. To capture adoption over time, AEG applied diffusion curves to the base adoption rates, reflecting the time required to develop stand-up programs, build customer awareness, and address potential barriers to participation. The

curve's endpoint is calculated with a multiplier on the base rate and is constructed as a near-ideal case of customer participation. It still assumes business-as-usual incentives but posits optimal delivery structure, marketing, customer awareness, financial situation, and non-energy differences based on AEG's research into customer adoption rates and how these factors influence program participation. By combining the best-case factors from each category, AEG developed a combined lift factor for each segment.

DR and DSR potential analysis included all cost-effective programs (based on the MAP results), restricted participation in Evergy's existing programs to current achieved levels, and tested sensitivities to participation in non-TOU program options. Like the MAP scenario, the RAP scenario assumed low retention in the TOU Default rate. However, sensitivities around RAP focused on the effects of increasing or decreasing participation in the remaining DR and DSR program options. The table below shows that RAP Plus increased participation in non-TOU program options by 10% while RAP Minus decreased participation by 15% (including for the TOU Default rate). AEG did not adjust marketing or incentive cost assumptions for the RAP Minus and RAP Plus scenarios.

Table 5: RAP Sensitivity Analysis

Sensitivity	Participation Adjustments	Cost Adjustments	TOU Standard Retention	TOU Impacts
RAP	**n/a**	**n/a**	**50% of all residential customers**	**4-year learning curve[1]**
RAP Plus	10% increase from RAP	No cost adjustment	50% of all residential customers	4-year learning curve[1]
RAP Minus	15% decrease from RAP	No cost adjustment	43% of all residential customers (15% decrease from RAP)	4-year learning curve[1]

[1]25% of impacts realized in Year 1, 50% of impacts realized in Year 2, 75% of impacts realized in Year 3, and 100% of impacts realized by Year 4 of being on a TOU rate.

3.1.6 Step 6. Program Bundle Development

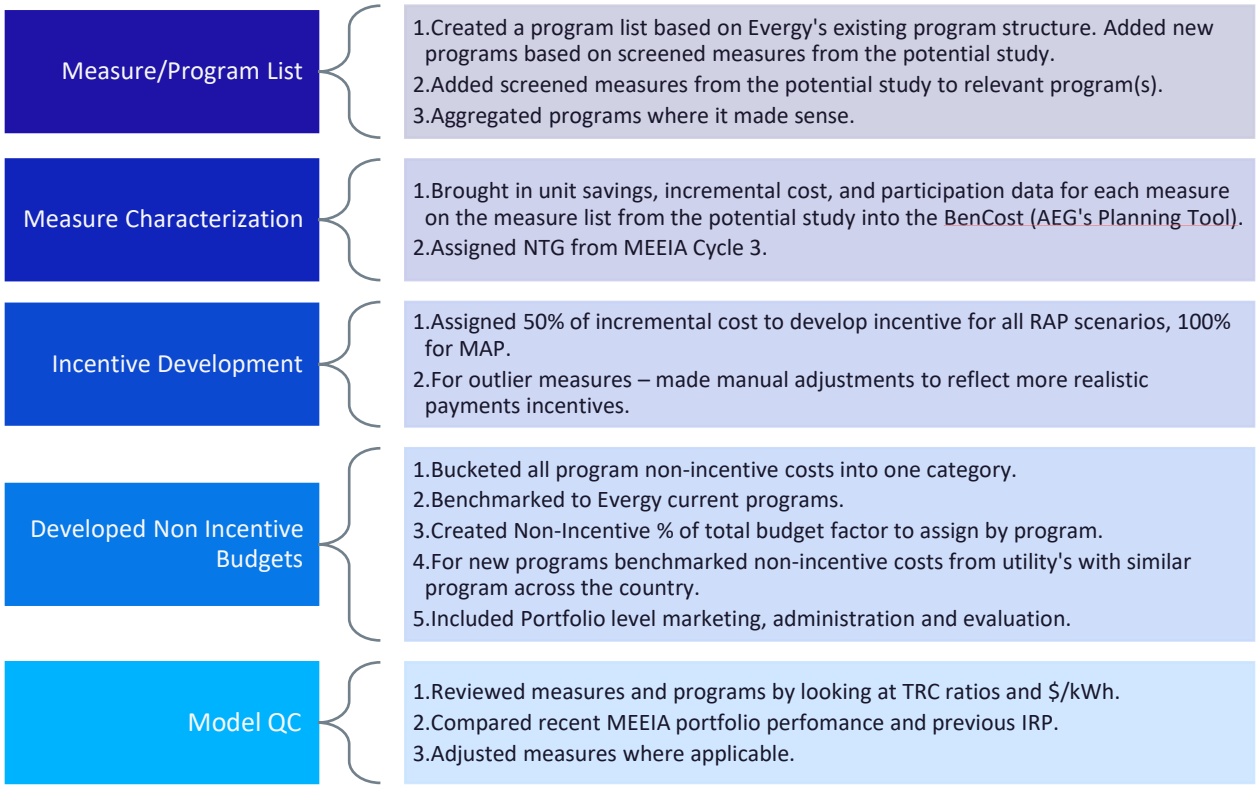
AEG used a bottom-up approach to develop the IRP bundles, incorporating the findings from the measure-level EE potential. The analysis conducted for the energy efficiency potential study reflects a measure-level approach to cost-effectiveness and potential estimation. Measures are combined into program bundles based on target market and delivery method, as well as to assign program costs.

AEG developed the program bundles using the maximum and realistic achievable measure-level potential results, working closely with Evergy to develop cost-effective bundles. Multiple program bundle scenarios were developed to support Evergy's Demand-Side Resource Analysis.

The DSM Potential Study measure-level MAP and RAP results served as the foundation for the development of the bundles. In order to maintain alignment, results from the potential study were exported into the DSM Bundles Design. The measures were vetted for inclusion in a DSM program bundle and re-screened for cost-effectiveness.
Measures were added to bundles as they became cost-effective throughout the timeframe.

The figure below outlines the framework for developing the IRP Bundles.

Figure 5: Analysis Framework



All bundles were designed with cost-effective measures. Measures were bundled based on the end-use, sector, and implementation strategy. Incentive costs and non-incentive costs were assigned to bundles. Options were rescreened after measure bundling and cost assignment. Cost effectiveness at the option level was balanced with implementation considerations. AEG reviewed current programs and recently filed plans for utilities across the country. The review informed the design of the bundles and identified new opportunities. Results of the utility program review can be accessed in Appendices 5 Exhibit D_Evergy_Utility Program Review.

Based on the RAP and MAP potential scenario results from the DSM Potential Study, AEG developed four portfolios comprised of cost-effective measures. Each of these portfolios was considered during the integration phase of Evergy's IRP process to determine which DSM portfolio was optimal based on Evergy's supply options. The four portfolios are shown in *Figure 1: Bundle Design* Scenarios.

3.2 Previously implemented Demand-Side programs from Other Utilities[14]

Evergy Missouri Metro engaged AEG to conduct a DSM Potential Study. AEG reviewed current programs and recently filed plans for utilities across the country. The review informed the design of the bundles and identified new opportunities.

AEG took the following steps in the review:

1. Compared potential study results to other utility offerings to assess new opportunities that filled gaps in the current MEEIA portfolio.
2. Searched for utilities with comparable programs targeting a new measure or customer segment.
3. Assessed the applicability of each option for the IRP bundle development and potential future MEEIA application.
4. Added measures to existing bundles (i.e., LED Grow Lights for Indoor Agriculture) or created new programs (i.e., Residential New Construction) that integrated learnings from the review and

[14] 20 CSR 4240-22.050 (3)(A)

Results of the utility program review can be accessed in in Appendices 5 Exhibit D_Evergy_Utility Program Review

3.3 Market Segment Identification[15]

AEG performed primary market research of Evergy's residential customers in their Missouri and Kansas service territories. Separate surveys were conducted in each of the four regions of the service area, including: Missouri West, Missouri Metro, Kansas Metro, and Kansas Central. The survey sample was stratified by usage and net metering status within each area. The initial sample consisted of 18,000 mail customers and 46,000 email customers. Due to a low response rate, another 80,003 email customers were added to the sample. Survey results were used to develop the market characterizations for the potential study, especially for segmentation, use per household, and appliance saturations.

The Residential Appliance Saturation Survey (RASS) can be found in Appendix 5 Exhibit A.

3.3.1 RASS Results

To estimate the potential impacts of energy efficiency, it is first necessary to understand how much energy is used today and what equipment is currently in service. The market characterization began with a segmentation of each jurisdiction's footprint to quantify electricity use by sector, segment, end-use application, and the current set of technologies in use in 2021. For this, we relied on information from Evergy and the RASS, augmented with secondary sources. The segmentation scheme is presented in the table below.

3.3.2 Opt-Out Customers

Some of Evergy's largest Commercial and Industrial customers are eligible to opt-out of the utility's energy efficiency program and manage their energy independently. To reflect

[15] 20 CSR 4240-22.050 (3)(B)

this situation, AEG separated opt-out customers into a segment and removed them from the potential, as they will not contribute savings to Evergy's program portfolio.

Table 6: Overview of Energy Efficiency Segmentation Scheme

Dimension	Segmentation Variable	Description
1	Jurisdiction	Evergy Metro, Evergy Missouri West
2	Sector	Residential, Commercial, Industrial
3	Segment	**Residential:** Single Family, Single Family – Low Income, Multi-Family, Multi-Family – Low Income **Commercial:** Large Office, Small Office, Retail, Restaurant, Grocery, School, College, Healthcare, Lodging, Data Center, Warehouse, Miscellaneous, Opt-Out **Industrial:** Food Production, Chemicals/Pharmaceuticals, Electronic Equipment, Primary Metals, Stone/Clay/Glass, Transportation Equipment, Rubber/Plastics, Waste/Wastewater, Other Industrial, Opt-Out
4	Vintage	Existing and new construction
5	End-uses	Cooling, space heating, lighting, water heater, motors, etc. (as appropriate by sector)
6	Appliances/End-Uses and Technologies	Energy efficiency technologies, such as lamp and fixture type, central air conditioner type, motors by application, etc.
7	Equipment Efficiency for New Purchases	Baseline and higher-efficiency options as appropriate for each technology

With the segmentation scheme defined, AEG performed a high-level market characterization of electricity sales and customers by jurisdiction, sector, and segment in the base year. Then detailed market profiles were developed to fully describe electricity consumption in the base year at each level of the segmentation.

In general, the DR and DSR segmentation aligns with the energy efficiency segmentation, which allows the DR and DSR analysis to incorporate and properly weight segment-level saturations of enabling technologies (such as central cooling systems and water heating) and factor in the adoption of efficient equipment when determining customer eligibility for program options. The table below presents the segmentation scheme. AEG segmented Evergy's customers by jurisdiction, sector, and customer size. Commercial and industrial (C&I) customers were segmented based on their non-coincident peak load, reflecting how programs are generally offered to customers.

Table 7: Overview of DR/DSR Segmentation Scheme

Dimension	Segmentation Variable	Description		
1	Jurisdiction			Evergy Metro, Evergy Missouri West
2	Sector			Residential, Commercial, Industrial
3	Size (by maximum peak demand)			**Residential:** all customers
		C&I:	Small C&I	≤30 kW
			Medium C&I	>30 kW and ≤500 kW
			Large C&I	>500 kW and ≤1,000 kW
			Extra-large C&I	>1,000 kW

3.4 Development of End Use Measures[16]

The framework for assessing savings, costs, and other attributes of energy efficiency measures involves the following:

- Identifying the list of energy efficiency measures to include in the analysis.
- Determining their applicability to each market sector and segment.
- Fully characterizing each measure.
- Preparing for integration with the greater potential modeling process.

Figure 3: Approach for Energy Efficiency Measure Assessment outlines the framework for measure analysis.

AEG compiled robust lists of energy efficiency measures for each customer sector. The measure lists covered all major types of end-use equipment as well as devices and actions that reduce energy consumption when installed or implemented. Particular focus was given to including the latest available data on emerging technologies from AEG's in-depth research and participation in technical working groups nationwide.

After the lists were finalized, AEG identified the most appropriate source for each parameter and assembled information for all measures to reflect equipment performance,

[16] 20 CSR 4240-22.050 (3)(C)

incremental costs, and lifetimes. AEG created a comprehensive measure characterization database to summarize the data. These characteristics form the basis for determining measure-level savings and cost-effectiveness as well as the subsequent build-up to the sector-level potential by scenario. *Table 3: Energy Efficiency Measure Source Hierarchy* presents the measure source hierarchy.

The modeled measures fall into two types based on their application:

- **Equipment measures** are efficient energy-consuming equipment that save energy by providing the same service with a lower energy requirement than a standard unit. An example is a residential central air conditioner (SEER 18) that replaces a standard efficiency central air conditioner (SEER 14). For equipment measures, many efficiency levels may be available for a given technology, ranging from the baseline unit to the most efficient commercially available product. These measures are applied on a stock-turnover basis and, in general, are referred to as lost opportunity measures because once a purchase decision is made, there will not be another opportunity to improve the efficiency of that equipment (absent early replacement at increased cost) until the end of its useful life.
- **Non-equipment** measures save energy by reducing the need for delivered energy but do not involve replacing or purchasing major end-use equipment (such as an air conditioner or water heater). Measure installation is not tied to equipment reaching the end of useful life, so these are generally categorized as “retrofit” measures. An example is insulation that modifies a household’s space heating consumption but does not change the heating system efficiency. The existing insulation can be upgraded without waiting for existing equipment to malfunction and save energy used by the heating system. Non-equipment measures typically fall into one of the following categories:
    - Building shell (windows, insulation, roofing material)
    - Equipment controls (smart thermostats, lighting motion controls, water heater setback)

- Equipment maintenance (heat pump commissioning, setpoint adjustments)
- Displacement measures (destratification fan to reduce the use of HVAC systems)
- Whole-building design (advanced new construction design)
- Commissioning, retro-commissioning, and energy management
- Behavioral actions

Unlike energy efficiency, DR and DSR does not exist in the absence of utility programs. Therefore, AEG characterized a set of program options to reflect how Evergy might acquire DR and DSR potential. *Table 7: Overview of DR/DSR Segmentation Scheme* provides a list of the DR and DSR program options considered and notes which Evergy is currently offering to customers.

AEG characterized each program option by:

- Defining the eligible pool of customers by controllable equipment,
- Gathering estimates of participation and peak demand reductions, and
- Assessing competition with other program options.

The following sections describe these steps in detail.

3.4.1 Controllable Equipment

Most program options rely either on grid-interactive technologies or separate equipment (e.g., a switch) that allows Evergy or a third-party to control load during an event. AEG developed forecasts of controllable equipment adoption through the energy efficiency assessment. The table below provides the program options dependent on controllable equipment. AEG assumed that the advanced metering infrastructure (AMI) rollout was complete. Therefore, program options were not limited with regards to metering infrastructure.

Table 8: DR Enabling Equipment by Program Option

Source	Controllable Equipment	Program Option
Energy Efficiency Assessment	Central Air Conditioner, Heat Pump, Rooftop Units, Electric Furnace	HVAC DLC, Connected Thermostat DLC
	Connected Thermostat	Connected Thermostat DLC
	Electric Water Heater	DHW DLC, Grid-Interactive Water Heaters[1]
	Home Energy Management System	Smart Homes DLC
	Electric Vehicle Connected Charger	EV Managed Charging
	Batteries[2]	Battery Energy Storage DLC

[1] AEG assumed that a conservative portion of electric water heaters were grid-interactive.

[2] To estimate the saturation of batteries, AEG used the solar PV saturation provided through the energy efficiency study as an upper bound.

3.4.2 Participation and Peak Impacts

If the program option is a current Evergy offering, AEG used actual participation rates and third-party evaluated savings. For program options not currently offered, AEG compiled secondary data to define the following parameters for each program option:

- Steady-State Participation Rate: the percentage of eligible customers expected to participate in the program option once it is fully up and running.
- Peak Load Reduction: the expected impact for an average participant during a system peak event.

For DR programs, AEG relied primarily on evaluation reports covering Evergy's existing program options (Residential and Business Demand Response), studies performed for other utilities in the Southwest Power Pool, and other nationally-cited research when more regional content was not available.

For DSR programs, AEG developed estimates for customer eligibility, participation, and impacts for each rate option based on an extensive review of enrollment in full-scale, time-varying rates offered in the United States published by the Brattle Group and benchmarked those results against findings from regional utilities.

Because Evergy needs to design, contract for, and market new offerings, most program options are expected to take several years to grow to their steady-state participation rate. AEG relied on the observed ramp rates from existing programs to forecast this growth. In the absence of an existing program, AEG referenced similar program options or assumed constant incremental growth through the ramp period. Most programs were assumed to fully mature in about five years.

3.4.3 Competition Between DR Program Options

Some of the program options target the same peak load. For example, the HVAC DLC and Connected Thermostat DLC programs target central cooling load in the summer. To avoid double-counting DR potential for these competing resources, AEG worked with Evergy to develop a program hierarchy or "loading order." In general, the hierarchy prioritized customers for existing programs over other DR resources by removing participants of programs higher in the hierarchy from the pool of customers eligible for programs lower in the hierarchy. The table below provides an example of this loading order for Evergy's programs.

Table 9: Example DR/DSR Program Option Hierarchy

	Program Option	Residential	Commercial	Industrial
Loaded First	Firm Curtailment		X	X
	Connected Thermostats	X	X	
	Domestic Hot Water Heater DLC	X	X	
	Grid-Interactive Water Heaters	X	X	
	EV Managed Charging	X		
	Smart EV	X		
	Connected Homes DLC	X		
	HVAC DLC	X	X	
	C&I Automatic DR		X	X
	Battery Energy Storage DLC	X	X	
	Smart Solar PV Inverter	X		
	Thermal Energy Storage DLC		X	X
	Critical Peak Pricing		X	X
	Time-Related Pricing		X	X
Loaded Last	Residential Behavioral DR	X		

Not all program options compete for the same peak load. AEG allowed dual enrollment in program options targeting separately metered equipment (e.g., EV Managed Charging) or distinct end uses (e.g., Connected Thermostat DLC and DHW DLC).

3.5 Advanced Metering and Distribution Assessment[17]

Evergy Missouri Metro engaged AEG to conduct a DSM Potential Study. Advanced Metering Infrastructure (AMI) rollout in the entire Evergy Missouri Metro's service territory is complete. For the potential study, AEG assumed that AMI is fully available in all years of interest (2024-2043). Therefore, measures or programs relying on AMI meters will have no limitations with regards to metering infrastructure for the study period.

3.6 End-Use Measures Marketing Plan[18]

The marketing and customer communication plan and delivery process will be designed to inform customers of the DSM programs, the benefits of each program and how they can participate in a program. The plan will include a combination of strategies to reach all market segments and decision-makers. The Evergy website content and functionality will be a crucial component of the marketing plan, as the website directs customers to information about the DSM programs.

A strategy will be developed to move customers along the marketing funnel from awareness to education to conversion to engagement. Key points of the strategy and ensuing marketing campaigns will be to:

1. Develop a set of campaigns driven by seasonal timeliness and opportunities during and immediately after customers' engagement with each product to generate leads for the portfolio, especially the priority programs.
2. Drive customers from awareness to conversion by matching campaign elements to customers' informational needs at various points within the marketing funnel. Continue supporting customers through the engagement portion of the funnel via cross-promotion.

[17] 20 CSR 4240-22.050 (3)(D)
[18] 20 CSR 4240-22.050 (3)(E)

3. Ensure planned campaigns remain flexible and responsive to shifts in program strategy, program performance or based on current unknowns becoming clearer, the need to balance costs versus participation through the year, and other unanticipated variables.
4. Implement analytics across all marketing tactics to measure responsiveness, make adjustments as needed to in-market items, and understand ROI.
5. Craft malleable and creative approaches for planned campaigns, preserving our ability to complement and roll up to new creative strategy that will be developed for the general awareness advertising campaign.
6. Engage Evergy employees through communications campaigns that will increase employee awareness of products so they can help tell our story to customers, and encourage participation among eligible employees.

Tactics that can help move customers to participation include the following:

- Evergy website content providing program information resources, contact information, and links to other relevant service and information resources.
- Digital channels (like Pandora, Hulu and Youtube).
- Search engine marketing, Google Ads, paid social, retargeting, email
- Program brochures or direct mail marketing that describe the benefits and features of the program.
- Bill inserts, on-bill messages and targeted email messages.
- Print and paid media advertisements.
- Direct customer outreach (e.g., Evergy customer representatives and/or an implementation contractor).
- Presence at conferences and public events used to increase general awareness of the program and distribute promotional materials.
- Partnerships with local contractors/businesses.
- Customized emails.

3.7 Statewide Marketing and Outreach Program Evaluation[19]

Challenges definitely exist with an overall statewide marketing plan considering the variety of program offerings across the state and within service territories. Evergy Missouri Metro saw this in the degree of effort and diligence in MEEIA Cycle 1 and MEEIA Cycle 2 needed to properly educate customers and promote programs in the Missouri Metro territory vs. the Missouri West territory based on slightly different vintages of the programs. That being said, we continue to engage with peer utilities across the state at least once per year to identify opportunities with programs that are similar to evaluate the effectiveness in delivery.

Evergy has embarked on a demand side program co-delivery model with Spire for two of the MEEIA Cycle 3 programs. Both Evergy and Spire expect to see a reduced overall cost of administration of the programs by joint delivery. The resulting program is also planned to provide some additional boost to participation by allowing for multiple marketing channels and enhanced total rebate available.

An additional area of cooperation includes efforts Evergy has undertaken to market programs jointly run with outside organizations, such as non-profit organizations and state agencies.

Evergy also currently has engaged in upstream energy efficiency programming in both the residential lighting sector as well as for a couple commercial standard measures, pumps and nozzles. In the residential sector, midstream lighting (i.e. instant discount at retailer) has been effective for many years in driving customer demand for efficient lighting products. Evergy is deploying commercial midstream measures, and hope that with time and market adoption those measures can become a strong contributor to the demand side management program portfolio.

[19] 20 CSR 4240-22.050 (3)(F)

3.8 Cost-Effectiveness of Potential Demand-Side Programs[20]

3.8.1 Stand-Alone Demand and Energy Reduction Impacts[21]

The framework for assessing savings, costs, and other attributes of energy efficiency measures involves the following:

- Identifying the list of energy efficiency measures to include in the analysis.
- Determining their applicability to each market sector and segment.
- Fully characterizing each measure.
- Preparing for integration with the greater potential modeling process.

AEG compiled robust lists of energy efficiency measures for each customer sector. The measure lists covered all major types of end-use equipment as well as devices and actions that reduce energy consumption when installed or implemented. Particular focus was given to including the latest available data on emerging technologies from AEG's in-depth research and participation in technical working groups nationwide. After the lists were finalized, AEG identified the most appropriate source for each parameter and assembled information for all measures to reflect equipment performance, incremental costs, and lifetimes. AEG created a comprehensive measure characterization database to summarize the data. These characteristics form the basis for determining measure-level savings and cost-effectiveness as well as the subsequent build-up to the sector-level potential by scenario.

3.8.2 Impact of Bundling End-Use Measures[22]

It is important to consider interactions between measures when applied within the same space to avoid double counting, which could result in savings greater than 100% of equipment consumption. These interactions are automatically handled within LoadMAP; for these measures, the baseline is modified for each subsequent measure. First, LoadMAP computes the total savings of each measure on a standalone basis, then assigns a stacking priority such that "integrated" or "stacked" savings are calculated as a

[20] 20 CSR 4240-22.050 (3)(G)
[21] 20 CSR 4240-22.050 (3)(G)(1)
[22] 20 CSR 4240-22.050 (3)(G)(2)

percent reduction to the running total of baseline energy remaining in each end-use after the previous measures have been applied. This ensures that the available baseline energy shrinks in proportion to the number of measures applied, as it would in reality.

The stacking priority is based on the levelized cost of conserved energy, such that the most economical measures that are more likely to be cost-effective and offered to customers through programs will be the first to be applied to the modeled population.
AEG's modeling approach also accounts for the exclusivity of certain measure options. For instance, if a SEER 18 central air conditioner is installed in a single-family home, the model will not allow that same home to install another central air conditioning until the new option has reached the end of its useful life. For non-equipment measures, base saturations and applicability are defined such that measures do not overlap. For example, we model two applications of ceiling insulation – the first assumes the installation of insulation where there previously was none, while the second upgrades pre-existing insulation if it falls under a certain threshold. AEG leveraged a variety of resources to estimate the appropriate remaining markets for measures, including the 2022 Residential Appliance Saturation Survey (RASS), market research from Evergy's past potential study reports, the US Energy Information Administration's (EIA) Residential Energy Consumption Survey (RECS) and Commercial Building Energy Consumption Survey (CBECS), and utility-provided program achievements.

For DR and DSR programs, AEG developed estimates for customer eligibility, participation, and impacts for each rate option based on an extensive review of enrollment in full-scale, time-varying rates offered in the United States published by the Brattle Group and benchmarked those results against findings from regional utilities.
Some of the program options target the same peak load. For example, the HVAC DLC and Connected Thermostat DLC programs target central cooling load in the summer. To avoid double-counting DR potential for these competing resources, AEG worked with Evergy to develop a program hierarchy or "loading order." In general, the hierarchy prioritized customers for existing programs over other DR resources by removing

participants of programs higher in the hierarchy from the pool of customers eligible for programs lower in the hierarchy.

Table 9: Example DR/DSR Program Option Hierarchy provides an example of this loading order for Evergy's programs.

Not all program options compete for the same peak load. AEG allowed dual enrollment in program options targeting separately metered equipment (e.g., EV Managed Charging) or distinct end uses (e.g., Connected Thermostat DLC and DHW DLC).

3.8.3 Change in Participants and Installations[23]

An estimate of the potential DSM Program incremental and cumulative end-use measure installations and participants can be found in the workpaper "Exhibit E_Evergy Metro 2023 IRP Data.xlsx".

3.8.4 Demand Reduction And Energy Savings[24]

The table below presents the incremental annualized energy savings due to the potential demand-side programs for Evergy Missouri Metro.

[23] 20 CSR 4240-22.050 (3)(G)(3)
[24] 20 CSR 4240-22.050 (3)(G)(4)

Table 10: Evergy Missouri Metro Incremental Energy Savings (MWH)

Year	RAP	RAP-	RAP+	MAP
2025	29,398	22,049	39,983	50,544
2026	32,554	24,416	44,052	55,538
2027	32,596	24,447	43,634	54,654
2028	32,584	24,438	43,146	53,684
2029	33,214	24,911	43,603	53,960
2030	32,376	24,282	42,058	51,702
2031	34,508	25,881	44,405	54,258
2032	34,989	26,242	44,653	54,266
2033	35,357	26,518	44,702	53,989
2034	35,677	26,758	44,688	53,635
2035	34,629	25,972	43,178	51,658
2036	35,359	26,520	43,761	52,090
2037	35,437	26,578	43,531	51,547
2038	35,339	26,504	43,030	50,640
2039	35,209	26,407	42,576	49,858
2040	31,445	23,583	36,512	41,492
2041	30,797	23,098	35,368	39,848
2042	29,786	22,339	33,993	38,108
2043	28,674	21,221	32,047	35,094
2044	29,091	21,492	31,958	34,271

The table below presents the incremental annual demand savings due to the potential demand-side programs for Evergy Missouri Metro.

Table 11: Evergy Missouri Metro Incremental Demand Savings (MW)

Year	RAP	RAP-	RAP+	MAP(Low)	MAP(Med)	MAP(High)
2025	96	81	107	130	140	148
2026	34	29	39	33	32	31
2027	29	24	33	30	29	29
2028	17	13	19	15	15	15
2029	10	8	13	16	16	16
2030	10	7	13	15	15	15
2031	11	8	14	16	16	16
2032	11	8	13	16	16	16
2033	11	8	13	16	16	16
2034	11	8	13	16	16	16
2035	9	7	11	14	14	14
2036	9	7	12	14	14	14
2037	9	7	11	14	14	14
2038	9	7	11	13	13	13
2039	9	7	11	13	13	13
2040	8	6	9	11	11	11
2041	8	6	9	10	10	10
2042	7	5	8	9	9	9
2043	7	5	7	8	8	8
2044	7	5	8	8	8	8

The table below presents the cumulative annual energy savings due to the potential demand-side programs for Evergy Missouri Metro.

Table 12: Evergy Missouri Metro Cumulative Energy Savings (MWH)

Year	RAP	RAP-	RAP+	MAP
2025	29,398	22,049	39,983	50,544
2026	61,953	46,465	84,034	106,082
2027	94,549	70,912	127,669	160,737
2028	124,960	93,720	168,140	211,252
2029	155,265	116,448	208,189	261,014
2030	184,162	138,121	246,002	307,708
2031	215,302	161,477	286,336	357,189
2032	246,772	185,079	326,754	406,504
2033	278,792	209,094	367,438	455,796
2034	310,801	233,101	407,715	504,279
2035	335,340	251,505	437,902	540,051
2036	358,643	268,982	466,155	573,187
2037	382,956	287,217	495,657	607,808
2038	407,681	305,761	525,550	642,796
2039	432,158	324,118	554,995	677,137
2040	448,192	336,144	571,807	694,656
2041	462,420	346,815	586,038	708,820
2042	473,558	355,169	596,335	718,212
2043	482,115	361,302	603,042	722,774
2044	490,621	367,354	609,321	726,309

The below presents the cumulative annual demand savings due to the potential demand-side programs for Evergy Missouri Metro.

Table 13: Evergy Missouri Metro Cumulative Demand Savings (MW)

Year	RAP	RAP-	RAP+	MAP(Low)	MAP(Med)	MAP(High)
2025	96	81	107	130	140	148
2026	131	110	146	163	172	179
2027	160	134	180	193	202	208
2028	176	148	199	208	217	223
2029	186	155	212	224	232	239
2030	196	163	224	239	248	254
2031	207	171	238	255	264	270
2032	218	179	252	272	280	286
2033	229	187	265	288	296	303
2034	240	195	278	304	312	319
2035	249	202	290	318	326	332
2036	259	209	302	331	340	346
2037	268	216	313	345	354	360
2038	278	223	324	358	367	373
2039	287	230	336	372	380	386
2040	296	237	345	383	391	397
2041	304	243	354	393	401	407
2042	311	248	362	402	410	416
2043	318	253	369	410	418	424
2044	325	258	377	418	426	432

The estimate of the incremental and cumulative demand and energy savings by each of the potential demand-side program by sectors can be found in the workpaper “Exhibit E_Evergy Metro 2023 IRP Data.xlsx”.

3.8.5 Cost Estimates[25]

The table below presents the total portfolio budget by year for each of the program design scenarios.

[25] 20 CSR 4240-22.050 (3)(G)(5)

Table 14: Energy Missouri Metro Program Costs (Nominal Dollars, 000$)

Year	RAP	RAP-	RAP+	MAP
2025	$ 16,900	$ 13,576	$ 21,621	$ 46,845
2026	$ 16,602	$ 12,873	$ 21,795	$ 49,615
2027	$ 17,467	$ 13,536	$ 22,789	$ 51,698
2028	$ 17,682	$ 13,647	$ 23,012	$ 52,810
2029	$ 18,490	$ 14,251	$ 23,887	$ 54,715
2030	$ 19,106	$ 14,713	$ 24,503	$ 56,006
2031	$ 19,724	$ 15,179	$ 25,122	$ 57,281
2032	$ 20,038	$ 15,414	$ 25,337	$ 57,456
2033	$ 20,292	$ 15,604	$ 25,458	$ 57,416
2034	$ 20,634	$ 15,862	$ 25,694	$ 57,725
2035	$ 20,692	$ 15,896	$ 25,604	$ 57,325
2036	$ 20,814	$ 15,988	$ 25,559	$ 56,887
2037	$ 20,810	$ 15,986	$ 25,380	$ 56,187
2038	$ 20,814	$ 15,989	$ 25,214	$ 55,525
2039	$ 20,848	$ 16,016	$ 25,098	$ 55,000
2040	$ 19,594	$ 15,076	$ 22,877	$ 48,532
2041	$ 19,059	$ 14,674	$ 21,902	$ 45,620
2042	$ 18,901	$ 14,555	$ 21,630	$ 45,087
2043	$ 17,561	$ 13,551	$ 19,901	$ 40,982
2044	$ 18,313	$ 14,116	$ 20,454	$ 41,843

The breakdown of total costs by program, incremental costs, incentive costs, costs to the customer, and the utilities costs to administer the programs are located in the workpaper "Exhibit E_Evergy Metro 2023 IRP Data.xlsx".

The incremental cost of each stand-alone energy use measure are located in the workpaper "Exhibit E_Evergy Metro 2023 IRP Data.xlsx".[26]

ICF considered multiple levels of incentives in the development of the program design scenarios.

- MAP scenario incentives are approximately 100% of the incremental cost
- RAP scenario incentives are approximately 50% of the incremental cost.

[26] 20 CSR 4240-22.050 (3)(G)(5)(A)

- RAP+ scenario incentives are approximately 50% of the incremental cost.
- RAP- scenario incentives are approximately 50% of the incremental cost.

Customer incentives can be found in the workpapers “Exhibit E_Evergy Metro 2023 IRP Data.xlsx”.[27]

There were no assumptions made that any incentives would be paid by entities other than the utility.[28]The cost to the customer and the utility to implement the potential DSM programs can be found in the workpaper “Exhibit E_Evergy Metro 2023 IRP Data.xlsx”.[29] The utility’s cost to administer the potential DSM programs can be found in the workpaper “Exhibit E_Evergy Metro 2023 IRP Data.xlsx”.[30] AEG did not identify other utility costs.

3.9 Tabulation of Participants, Impact, & Costs[31]

The incremental and cumulative participations, load impacts, utility costs and program participant costs in each year for the potential DSM programs can be found in the workpaper “Exhibit E_Evergy Metro 2023 IRP Data.xlsx”.

3.10 Sources and quality of information[32]

AEG prioritized Evergy-specific data, supplemented by regional and national data sources. Where possible, data were adapted to local conditions (e.g., using local weather and local sources for measure data). AEG utilized various data sources including Evergy data, Residential Appliance Saturation Survey data which can be found in Appendix 5 “Exhibit A Evergy Residential Appliance Saturation Survey”, Regional and national data sources, AEG’s databases-analytics tools and other secondary data and reports. Detailed data sources used can be found in Appendix 5 section 2.2 Data Development.

AEG used a bottom-up approach to develop the program bundles, incorporating the findings from the measure-level EE potential. The analysis conducted for the energy

[27] 20 CSR 4240-22.050 (3)(G)(5)(B)
[28] 20 CSR 4240-22.050 (3)(G)(5)(C)
[29] 20 CSR 4240-22.050 (3)(G)(5)(D)
[30] 20 CSR 4240-22.050 (3)(G)(5)(E)
[31] 20 CSR 4240-22.050 (3)(H)
[32] 20 CSR 4240-22.050 (3)(I)

efficiency potential study reflects a measure-level approach to cost-effectiveness and potential estimation. An additional set of steps were required to combine measures into program bundles based on target market and delivery method, as well as to assign program costs.

AEG developed the program bundles using the maximum and realistic achievable measure-level potential results, working closely with Evergy to develop cost-effective bundles. Multiple program bundle scenarios were developed to support Evergy's Demand-Side Resource Analysis under 4 CSR 240-22.050.

AEG utilized measure and participation data from the comprehensive DSM Potential Study to inform and develop the proposed DSM IRP Bundles Design.

As part of the potential study, AEG:

- Developed a comprehensive list of EE measures
- Characterized each measure with energy and demand savings, incremental cost, service life, and other performance factors.
- Screened the measures for cost-effectiveness dynamically, taking into account changing savings and cost data over time. Thus, some measures pass the economic screen (i.e., a TRC benefit-cost ratio greater than or equal to 1.0) for some — but not all — of the years in the projection.

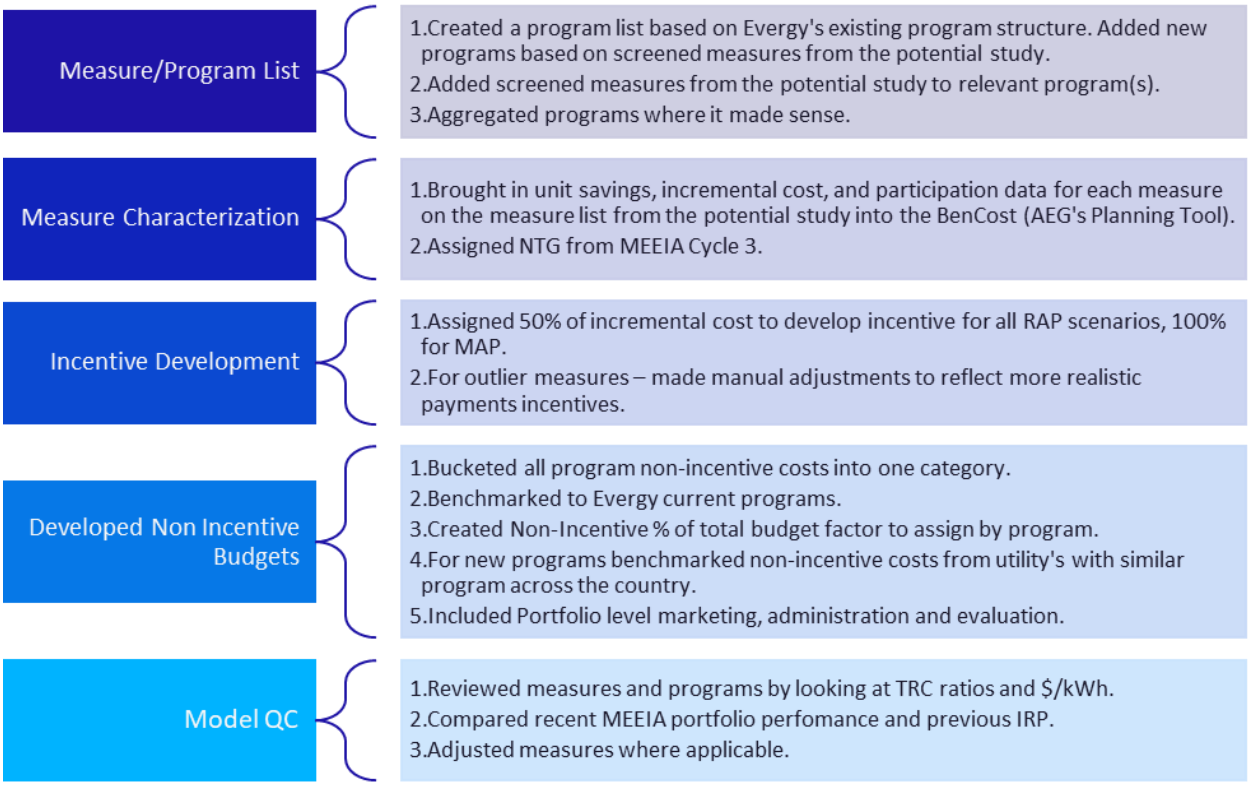
The DSM Potential Study measure-level MAP and RAP results served as the foundation for the development of the bundles. In order to maintain alignment, results from the potential study were exported into the DSM Bundles Design. The measures were vetted for inclusion in a DSM program bundle and re-screened for cost-effectiveness. Measures were added to bundles as they became cost-effective throughout the timeframe.
There are several differences between measure-level and bundled savings and general considerations to note that occur when translating the measure-level potential to bundles. These differences and considerations are as follows:

- May include multiple efficiency levels for a specific technology over the projection.

- May exclude some measures with very small potential or implementation challenges, such as stoves, microwaves, monitors, laptops, and TVs.
- Addition of administrative & delivery costs may render certain measures or bundles not cost-effective.
- Participation rates adjusted to reflect different IRP scenarios.
- Net to gross and realization rates impact savings.

The figure below outlines the framework for developing the program bundles

Figure 6: Analysis Framework



All bundles were designed with cost-effective measures. Measures were bundled based on the end-use, sector, and implementation strategy. Incentive costs and non-incentive costs were assigned to bundles. Options were rescreened after measure bundling and cost assignment. Cost effectiveness at the option level was balanced with implementation considerations.

Section 4: Demand-Side Rate Development[33]

4.1 Demand-Side Rate Review[34]

AEG reviewed current programs and recently filed plans for utilities across the country. The review informed the design of the bundles and identified new opportunities.

AEG took the following steps in the review:

1. Compared potential study results to other utility offerings to assess new opportunities that filled gaps in the current MEEIA portfolio.
2. Searched for utilities with comparable programs targeting a new measure or customer segment.
3. Assessed the applicability of each option for the program bundle development and potential future MEEIA application. Added measures to existing bundles (i.e., LED Grow Lights for Indoor Agriculture) or created new programs (i.e., Residential New Construction) that integrated learnings from the review

Results of the utility program review can be accessed in Appendix 5 “Exhibit D_Evergy Utility Program Review”.

4.2 Identify Demand Side Rates[35]

In contrast to energy efficiency, where customers may choose to install energy-efficient technologies in the absence of utility programs, DR/DSR does not exist outside of utility offerings. Therefore, AEG relied on a programmatic view of DR/DSR to assess the potential as opposed to the technology view used to assess the potential from energy efficiency measures.

AEG used a bottom-up approach to perform the DR/DSR analysis, following these major steps:

[33] 20 CSR 4240-22.050 (4)
[34] 20 CSR 4240-22.050 (4)(A)
[35] 20 CSR 4240-22.050 (4)(B)

1. Market Characterization. The segmentation included jurisdiction, sector, and customer size. Key assumptions around equipment saturations and customer counts align with the Energy Efficiency Market Characterization.
2. Program Characterization. AEG developed a comprehensive set of program options for the analysis, including direct load control, grid-interactive, manual, and rate-based options.
3. Baseline Peak and Customer Forecasts. AEG developed a reference baseline peak projection and customer growth forecast using the class-level MW and customer growth forecasts provided by Evergy.
4. Potential Estimates. Technical and economic potential is not meaningful because DR/DSR does not exist in the absence of utility programs. Instead, AEG estimated DR/DSR potential for five achievable potential scenarios based upon several assumptions, including:
    a. Retention rates on the opt-out Time-of-Use (TOU) rate,
    b. Programmatic parameters, including participation and costs, and
    c. Adjustments to DR impacts to account for interactions with DSR.

Unlike energy efficiency, DR and DSR programs does not exist in the absence of utility programs. Therefore, AEG characterized a set of program options to reflect how Evergy might acquire DR and DSR potential. The table below provides a list of the DR and DSR program options considered and notes which Evergy is currently offering to customers.

Table 15: Overview of DR/DSR Program Options Assessed

Program Option	Eligible Customers	Description	Currently Offered
Demand Response			
Firm Curtailment/Tariff	Medium C&I, Large C&I, Extra-Large C&I	Customers volunteer a specific amount of capacity during economic or emergency events called by the utility in return for a financial incentive. Customers must reduce to a specific level (i.e., a firm service level). Penalties apply for non-performance. Response times are usually 15 to 30 minutes.	√
C&I Automatic DR (ADR)	All C&I	Participating customers respond automatically to events using existing ADR-enabled equipment (BMS/EMS) or one purchased with incentives provided by the program.	
Residential Behavioral DR	Residential	Voluntary demand reductions in response to targeted behavioral messaging. Requires AMI technology.	
HVAC Direct Load Control (DLC)	Residential, Small C&I, Medium C&I	DLC switch installed on heating and/or cooling equipment.	
Domestic Hot Water Heater (DHW) DLC	Residential, Small C&I, Medium C&I	DLC switch installed on customer's equipment.	
Grid-Interactive Water Heaters	Residential, Small C&I, Medium C&I	CTA-2045 or other integrated communication port	
Connected Homes DLC	Residential	Internet-enabled control of operational cycles of white goods appliances, electronics, and lighting. Controlled by a central smart hub or smart speaker.	
Electric Vehicle (EV) Managed Charging	Residential	Control EV charging using (1) vehicle telematics and APIs through a third-party vendor or (2) traditional DLC of EV chargers.	
Connected Thermostat DLC	Residential, Small C&I, Medium C&I	Internet-enabled control of thermostat set points.	√
Smart Solar PV Inverter	Residential	Internet-enabled control that responds to grid fluctuations. Control can execute complex functions that support grid maintenance, including active power curtailment, voltage controls, and frequency controls.	
Battery Energy Storage DLC	Residential, All C&I	Internet-enabled control of battery charging and discharging.	√
Thermal Energy Storage DLC	All C&I	Internet-enabled control of thermal charging and discharging.	
Demand-Side Rates			
Critical Peak Pricing Rate	C&I	Charges customers higher rates during a particular block of hours that occurs only on event days.	
Time-Related Pricing Rate	Large C&I, Extra-Large C&I	Hourly rates vary by season and day-type based on historical locational marginal prices. Customers benefit from having visibility to hourly pricing for predefined periods. Requires AMI technology.	
TOU Rate	Residential	Charges customers higher rates during particular blocks of hours that occur every day (typically 2-3 blocks).	
TOU Rate for EV Owners	Residential	Customers must own and charge an EV. The EV would be an "enabling technology" that would enable customers to shift usage and demand off-peak during periods of higher rates.	

AEG characterized each program option by:

- Defining the eligible pool of customers by controllable equipment,
- Gathering estimates of participation and peak demand reductions, and
- Assessing competition with other program options.

All program details including program descriptions, target market, implementation strategies, elegible mearures, cost-effectiveness as well as estimlated savings and budget can be found in Appendix 5 Exhibit E_Program Descriptions.

4.3 Assess Technological Advancements[36]

AEG compiled robust lists of energy efficiency measures for each customer sector. The measure lists covered all major types of end-use equipment as well as devices and actions that reduce energy consumption when installed or implemented. Particular focus was given to including the latest available data on emerging technologies from AEG's in-depth research and participation in technical working groups nationwide.

After the lists were finalized, AEG identified the most appropriate source for each parameter and assembled information for all measures to reflect equipment performance, incremental costs, and lifetimes. AEG created a comprehensive measure characterization database to summarize the data. These characteristics form the basis for determining measure-level savings and cost-effectiveness as well as the subsequent build-up to the sector-level potential by scenario.

Advanced Metering Infrastructure (AMI) rollout in the Evergy Missouri Metro's service territory is complete. For the potential study, AEG assumed that AMI is fully available in all years of interest (2024-2043). Therefore, measures or programs relying on AMI meters will have no limitations with regards to metering infrastructure for the study period.

[36] 20 CSR 4240-22.050 (4)(C)

4.4 Estimate Input Data and Other Characteristics[37]

4.4.1 Demand and Energy Reduction Impact [38]

Table 15: Overview of DR/DSR Program Options Assessed provides a list of the DR and DSR program options considered and notes which Evergy is currently offering to customers.

Most program options rely either on grid-interactive technologies or separate equipment (e.g., a switch) that allows Evergy or a third-party to control load during an event. AEG developed forecasts of controllable equipment adoption through the energy efficiency assessment.

If the program option is a current Evergy offering, AEG used actual participation rates and third-party evaluated savings. For program options not currently offered, AEG compiled secondary data to define the following parameters for each program option:

- Steady-State Participation Rate: the percentage of eligible customers expected to participate in the program option once it is fully up and running.
- Peak Load Reduction: the expected impact for an average participant during a system peak event.

For DSR programs, AEG developed estimates for customer eligibility, participation, and impacts for each rate option based on an extensive review of enrollment in full-scale, time-varying rates offered in the United States published by the Brattle Group and benchmarked those results against findings from regional utilities.

Because Evergy needs to design, contract for, and market new offerings, most program options are expected to take several years to grow to their steady-state participation rate. AEG relied on the observed ramp rates from existing programs to forecast this growth. In the absence of an existing program, AEG referenced similar program options or assumed

[37] 20 CSR 4240-22.050 (4)(D)
[38] 20 CSR 4240-22.050 (4)(D)(1)

constant incremental growth through the ramp period. Most programs were assumed to fully mature in about five years.

Some of the program options target the same peak load. For example, the HVAC DLC and Connected Thermostat DLC programs target central cooling load in the summer. To avoid double-counting DR potential for these competing resources, AEG worked with Evergy to develop a program hierarchy or "loading order." In general, the hierarchy prioritized customers for existing programs over other DR resources by removing participants of programs higher in the hierarchy from the pool of customers eligible for programs lower in the hierarchy. *Table 9: Example DR/DSR Program Option Hierarchy* provides an example of this loading order for Evergy's programs.

AEG developed the baseline peak demand forecast as follows:

1. Allocated system peak demand to each sector using base-year hourly peak demand data. Evergy provided customer forecasts by territory.
2. Segmented the non-residential peak load and customer forecasts by size based on an analysis of Evergy billing data.
3. Removed the peak demand savings potential generated through energy efficiency adoption forecasted in the MAP and RAP scenarios. The removal of the demand savings from the energy efficiency analysis was done to reduce any possible double counting and to account for energy efficiency savings before the DSR and DR savings are estimated.
4. Adjusted the peak demand baseline to reflect the estimated impacts of the

TOU rates under various retention scenarios (discussed below). This adjustment lowers the impacts of DR programs to account for the preexisting impact (and interaction) from the TOU rate.

AEG estimated DR and DSR potential for two main scenarios:

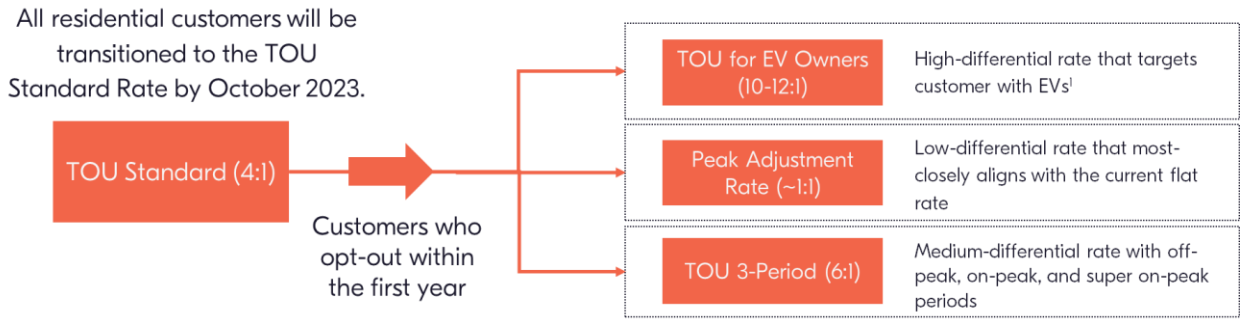
- Maximum Achievable Potential (MAP) included all cost-effective programs, incorporated growth in Evergy's existing programs to benchmarked participation

levels (with associated increases in costs), and tested sensitivities around the forthcoming TOU rates for residential customers (see the MAP Scenario section below for details)

- Realistic Achievable Potential (RAP) included all cost-effective programs (based on the MAP results), restricted participation in Evergy's existing programs to current achieved levels, and tested sensitivities to participation in non-TOU program options.

As shown in the figure below, Evergy plans to offer four residential TOU rates. Residential customers will be placed on the TOU Default (Standard) rate and then have the option to move to one of three other TOU rates. AEG assumed that (1) customers who opt out of the TOU Default rate would do so within the first year, and (2) the majority would move into the Peak Adjustment Rate because of its familiarity and relatively low risk, especially since Evergy will not be offering any bill protection.

Figure 7: TOU Rate Descriptions



Research shows that higher rate differentials (i.e., the difference in on-peak to off-peak rates) tend to elicit stronger customer responses and lead to larger decreases in on-peak hour consumption than rates with lower pricing differentials. Therefore, the effect of Evergy's TOU rates on residential customer peak demand will be driven by the TOU Default rate's ability to retain customers and which TOU rate opt-out customers choose to move towards.

AEG assumed a conservative retention rate of 50% to estimate MAP and then tested the sensitivity of impacts and program costs to changes in the TOU retention rate as shown in the table below. For each sensitivity, AEG estimated the weighted impacts of the TOU rates, reduced the peak demand baseline forecast by the TOU impact, and then adjusted the impact assumptions for the other DR/DSR program options. The sensitivities also included increased costs of educating customers to support the increased retention in the TOU Default rate.

Table 16: MAP Sensitivity Analysis

Sensitivity	(1) TOU Standard	(2) TOU for EV Owners	(3) TOU Peak Adjustment Rate	(4) TOU 3-Period
MAP	**50% of all residential customers**	**20% of EV owners who opt out of TOU Standard**	**95% of remaining TOU Standard opt-outs**	**All other TOU Standard opt-outs**
MAP Medium-Retention	70% of all residential customers	50% of EV owners who opt out of TOU Standard	95% of remaining TOU Standard opt-outs	All other TOU Standard opt-outs
MAP High - Retention	85% of all residential customers	100% of EV owners who opt out of TOU standard	95% of remaining TOU Standard opt-outs	All other TOU Standard opt-outs

The RAP scenario differed from the MAP scenario by:

- Lowering the peak demand baseline by the peak demand reductions generated through energy efficiency technology adoption forecasted through the energy efficiency RAP potential assessment (as opposed to the MAP scenario, which made the same adjustment using the energy efficiency MAP potential assessment).
- Restricting participation in existing programs to levels currently achieved.
- Dampening the impacts of the TOU rates for the first few years to simulate a learning curve whereby customers become more effective at responding appropriately to pricing signals over time.

Like the MAP scenario, the RAP scenario assumed low retention in the TOU Default rate. However, sensitivities around RAP focused on the effects of increasing or decreasing participation in the remaining DR and DSR program options. The table below shows that RAP Plus increased participation in non-TOU program options by 10% while RAP Minus

decreased participation by 15% (including for the TOU Default rate). AEG did not adjust marketing or incentive cost assumptions for the RAP Minus and RAP Plus scenarios.

Table 17: RAP Sensitivity Analysis

Sensitivity	Participation Adjustments	Cost Adjustments	TOU Standard Retention	TOU Impacts
RAP	**n/a**	**n/a**	**50% of all residential customers**	**4-year learning curve[1]**
RAP Plus	10% increase from RAP	No cost adjustment	50% of all residential customers	4-year learning curve[1]
RAP Minus	15% decrease from RAP	No cost adjustment	43% of all residential customers (15% decrease from RAP)	4-year learning curve[1]

[1]25% of impacts realized in Year 1, 50% of impacts realized in Year 2, 75% of impacts realized in Year 3, and 100% of impacts realized by Year 4 of being on a TOU rate.

AEG calculated the potential for each program option across the scenarios by first estimating participation in each year of the forecast period (via enabling equipment saturations, participation rates, and removing participation from programs higher in the program hierarchy) and multiplying it by the per-customer peak reductions.

The estimated potential includes impacts from existing and planned resources that Evergy already includes in its IRP model. AEG calibrated the impacts for these program options to meet Evergy's planned targets and then removed them from the total estimated potential so as not to double-count existing and planned resources. However, any associated growth in these program options was included as new, incremental potential.

AEG performed an economic screen based on each program's potential estimated in isolation (i.e., ignoring competition between resources) for the MAP scenario. These impacts represented the maximum potential achievable for each program, suggesting that if a program was not cost-effective under these near-perfect circumstances, it would not be a cost-effective option in a more restrictive case.

The table below shows the baseline projection and achievable potential for MAP and RAP scenarios in the DR/DSR potential for Evergy Metro. In 2033, achievable potential reaches an estimated 8% of baseline peak demand (147 MW in the RAP scenario and

155 MW in the MAP scenario, at generation). Potential generated through the TOU rates, maintenance of existing programs, and new DR/DSR resources all contribute to these estimates of achievable potential. The potential shown here does not include peak demand savings generated by energy efficiency adoption.

Because the MAP scenario tested the effects of the TOU rate, differences between RAP and MAP scenarios are minimal and lead to small differences in savings potential in the later years. Both scenarios exhibit similar trends over time, where potential increases in the first few years as the programs grow and then plateau as they reach maturity.

However, the RAP scenario experiences a sharper increase in potential in those first years because of the TOU rates: AEG de-rated impacts from the TOU rates for the years few years of the study to simulate a learning curve, assuming that the longer the customers are on the rates, the better that customers will respond the rates' pricing signals. AEG did not apply a learning curve to the MAP scenario.

Table 18: Cumulative DR/DSR Potential, Select Years (Summer MW @ Generator) – Evergy Metro

	2024	2025	2026	2029	2033
Baseline Projection (MW)	1,841	1,845	1,848	1,864	1,885
Achievable Potential (MW)					
RAP	89	115	135	144	147
MAP	117	135	150	152	155
Achievable Potential (% of Baseline)					
RAP	5%	6%	7%	8%	8%
MAP	6%	7%	8%	8%	8%

AEG used the MAP scenario to test sensitivities to the Default TOU rate the Missouri PSC ordered Evergy to transition residential customers to. As expected, potential increases with the level of TOU Default retention, the TOU rate customers will first be opted onto. While Evergy plans to offer TOU rates with higher rate differentials than the TOU Default rate, we assume that the majority of customers who opt out of the TOU Default rate will

move to the Peak Adjustment Rate, which has such a low-rate differential that impacts are negligible. However, in 2033, differences between the MAP scenario (based on a 50% TOU Default retention rate) and MAP High Retention (based on an 85% TOU Default retention rate) remain small, 15 MW and less than a one-percent change relative to the baseline peak demand. The table below hows MAP sensitivity results.

AEG focused the RAP scenario sensitivity analysis on the effects of increasing or decreasing participation in the DR and DSR program options. At the extremes represented by RAP Minus and RAP Plus, DR/DSR potential changes 32 MW in Evergy Metro (1.7% of baseline peak demand) in 2033.

Table 19: MAP DR/DSR Sensitivity Results, Select Years (Summer MW) – Evergy Metro

	2024	2025	2026	2029	2033
Baseline Projection (MW)	1,841	1,845	1,848	1,864	1,885
Achievable Potential (MW)					
MAP	**117**	**135**	**150**	**152**	**155**
MAP - Medium Retention	127	144	159	161	163
MAP - High Retention	135	151	165	167	170
Achievable Potential (% of Baseline)					
MAP	**6%**	**7%**	**8%**	**8%**	**8%**
MAP - Medium Retention	7%	8%	9%	9%	9%
MAP - High Retention	7%	8%	9%	9%	9%

4.4.2 Interaction of Multiple Demand-Side Rates[39]

Evergy Missouri Metro engaged AEG to conduct a DSM Market Potential Study. To avoid double counting of load reduction impacts, program-eligibility criteria were defined to ensure that customers do not participate in mutually exclusive programs at the same time.

See *Interaction Of Potential Demand-Side Rates And Programs* below for reference, which includes how the interactions between multiple potential demand-side rates if offered simultaneously.

[39] 20 CSR 4240-22.050 (4)(D)(2)

4.4.3 Interaction of Potential Demand-Side Rates And Programs[40]

AEG characterized a set of program options to reflect how Evergy might acquire DR and DSR potential. *Table 15: Overview of DR/DSR Program Options Assessed* provides a list of the DR and DSR program options considered and notes which Evergy is currently offering to customers.

AEG characterized each program option by:

- Defining the eligible pool of customers by controllable equipment,
- Gathering estimates of participation and peak demand reductions, and
- Assessing competition with other program options.

The following sections describe these steps in detail.

Controllable Equipment

Most program options rely either on grid-interactive technologies or separate equipment (e.g., a switch) that allows Evergy or a third-party to control load during an event. AEG developed forecasts of controllable equipment adoption through the energy efficiency assessment. *Table 8: DR Enabling Equipment by Program Option* provides the program options dependent on controllable equipment.

If the program option is a current Evergy offering, AEG used actual participation rates and third-party evaluated savings. For program options not currently offered, AEG compiled secondary data to define the following parameters for each program option:

- Steady-State Participation Rate: the percentage of eligible customers expected to participate in the program option once it is fully up and running.
- Peak Load Reduction: the expected impact for an average participant during a system peak event.

For DR programs, AEG relied primarily on evaluation reports covering Evergy's existing program options (Residential and Business Demand Response), studies performed for

[40] 20 CSR 4240-22.050 (4)(D)(3)

other utilities in the Southwest Power Pool, and other nationally-cited research when more regional content was not available.

For DSR programs, AEG developed estimates for customer eligibility, participation, and impacts for each rate option based on an extensive review of enrollment in full-scale, time-varying rates offered in the United States published by the Brattle Group and benchmarked those results against findings from regional utilities.
Because Evergy needs to design, contract for, and market new offerings, most program options are expected to take several years to grow to their steady-state participation rate. AEG relied on the observed ramp rates from existing programs to forecast this growth. In the absence of an existing program, AEG referenced similar program options or assumed constant incremental growth through the ramp period. Most programs were assumed to fully mature in about five years.

Competition Between DR Program Options

Some of the program options target the same peak load. For example, the HVAC DLC and Connected Thermostat DLC programs target central cooling load in the summer. To avoid double-counting DR potential for these competing resources, AEG worked with Evergy to develop a program hierarchy or "loading order." In general, the hierarchy prioritized customers for existing programs over other DR resources by removing participants of programs higher in the hierarchy from the pool of customers eligible for programs lower in the hierarchy. Table 9: *Example DR/DSR Program Option Hierarchy* provides an example of this loading order for Evergy's programs.

Not all program options compete for the same peak load. AEG allowed dual enrollment in program options targeting separately metered equipment (e.g., EV Managed Charging) or distinct end uses (e.g., Connected Thermostat DLC and DHW DLC).

DR and DSR Potential Estimation

AEG estimated DR/DSR potential for two main scenarios:

- Maximum Achievable Potential (MAP) included all cost-effective programs, incorporated growth in Evergy's existing programs to benchmarked participation levels (with associated increases in costs), and tested sensitivities around the forthcoming TOU rates for residential customers (see the MAP Scenario section below for details)
- Realistic Achievable Potential (RAP) included all cost-effective programs (based on the MAP results), restricted participation in Evergy's existing programs to current achieved levels, and tested sensitivities to participation in non-TOU program options.

MAP Scenario

AEG developed the MAP analysis to focus on the effect that customer retention in the default TOU Default rate would have on other DR and DSR program options. Specifically, we expect the average residential customer's peak demand to drop as they respond to pricing signals, which will reduce the amount of demand available for other program options to impact during peak hours.

As shown in *Figure 4: TOU Rates Descriptions*, Evergy plans to offer four residential TOU rates. Residential customers will be placed on the TOU Default (Standard) rate and then have the option to move to one of three other TOU rates. AEG assumed that (1) customers who opt out of the TOU Default rate would do so within the first year, and (2) the majority would move into the Peak Adjustment Rate because of its familiarity and relatively low risk, especially since Evergy will not be offering any bill protection.

Research shows that higher rate differentials (i.e., the difference in on-peak to off-peak rates) tend to elicit stronger customer responses and lead to larger decreases in on-peak hour consumption than rates with lower pricing differentials. Therefore, the effect of Evergy's TOU rates on residential customer peak demand will be driven by the TOU Default rate's ability to retain customers and which TOU rate opt-out customers choose to move towards.

AEG assumed a conservative retention rate of 50% to estimate MAP and then tested the sensitivity of impacts and program costs to changes in the TOU retention rate as shown *in Table 16: MAP Sensitivity Analysis*. For each sensitivity, AEG estimated the weighted impacts of the TOU rates, reduced the peak demand baseline forecast by the TOU impact, and then adjusted the impact assumptions for the other DR/DSR program options. The sensitivities also included increased costs of educating customers to support the increased retention in the TOU Default rate.

RAP Scenario

The RAP scenario differed from the MAP scenario by:

- Lowering the peak demand baseline by the peak demand reductions generated through energy efficiency technology adoption forecasted through the energy efficiency RAP potential assessment (as opposed to the MAP scenario, which made the same adjustment using the energy efficiency MAP potential assessment).
- Restricting participation in existing programs to levels currently achieved.
- Dampening the impacts of the TOU rates for the first few years to simulate a learning curve whereby customers become more effective at responding appropriately to pricing signals over time.

Like the MAP scenario, the RAP scenario assumed low retention in the TOU Default rate. However, sensitivities around RAP focused on the effects of increasing or decreasing participation in the remaining DR and DSR program options. *Table 5: RAP Sensitivity Analysis* shows that RAP Plus increased participation in non-TOU program options by 10% while RAP Minus decreased participation by 15% (including for the TOU Default rate). AEG did not adjust marketing or incentive cost assumptions for the RAP Minus and RAP Plus scenarios.

AEG calculated the potential for each program option across the scenarios by first estimating participation in each year of the forecast period (via enabling equipment

saturations, participation rates, and removing participation from programs higher in the program hierarchy) and multiplying it by the per-customer peak reductions.

The estimated potential includes impacts from existing and planned resources that Evergy already includes in its IRP model. AEG calibrated the impacts for these program options to meet Evergy's planned targets and then removed them from the total estimated potential so as not to double-count existing and planned resources. However, any associated growth in these program options was included as new, incremental potential.

AEG performed an economic screen based on each program's potential estimated in isolation (i.e., ignoring competition between resources) for the MAP scenario. These impacts represented the maximum potential achievable for each program, suggesting that if a program was not cost-effective under these near-perfect circumstances, it would not be a cost-effective option in a more restrictive case.

4.5 Demand and Reduction Energy Savings[41]

The estimated incremental and cumulative demand and energy reduction savings due to the potential demand-side rates can be found in the workpaper "Exhibit E_Evergy Metro 2023 IRP Data.xlsx".

4.6 Cost of Demand-Side Rates[42]

There is no assumed incentive cost to participate the potential demand-side rate paid by the utility.[43] There is no assumed cost to the customer. The cost to the utility to implement the potential demand-side rates can be found in the workpaper "Exhibit E_Evergy Metro 2023 IRP Data.xlsx".[44] The utility's cost to administer the potential demand-side rates can be found in the workpaper "Exhibit E_Evergy Metro 2023 IRP Data.xlsx".[45] There were no other costs were identified.[46]

[41] 20 CSR 4240-22.050 (4)(D)(4)
[42] 20 CSR 4240-22.050 (4)(D)(5)
[43] 20 CSR 4240-22.050 (4)(D)(5)(A)
[44] 20 CSR 4240-22.050 (4)(D)(5)(B)
[45] 20 CSR 4240-22.050 (4)(D)(5)(C)
[46] 20 CSR 4240-22.050 (4)(D)(5)(D)

4.7 Tabulation of Number of Participants[47]

There is no assumed cost to the customer. The incremental and cumulative participants, load impacts, utility costs and program participant costs for each potential demand-side rate can be found in the workpaper "Exhibit E_Evergy Metro 2023 IRP Data.xlsx".

4.8 SPP Demand Response Eligibility[48]

Most demand-side rates are not eligible to be considered as a resource in the Southwest Power Pool (SPP) as they are not loads that are controllable and dispatchable by the market. Retail tariffs that have a curtailment requirement and demand response programs could potentially participate in the SPP market if they met all market requirements.

To offer a Demand Response Resource (DRR) into the Southwest Power Pool (SPP) market, market participants must register the resource as either a Dispatchable Demand Response (DDR) Resource or a Block Demand Response (BDR) Resource.
A DDR resource is a controllable load and/or a behind-the-meter generator that is dispatchable on a 5-minute basis and has telemetering installed that can provide real-time load values to SPP via SCADA on a 10-second basis and meet all other market requirements.

A BDR is a resource that is not dispatchable on a 5-minute basis but can be dispatched and committed in hourly blocks. A BDR resource must also have telemetering installed and have the real-time load consumption sent to SPP SCADA via ICCP on a 10-second basis. A BDR resource is also required to submit an hourly load profile prior to the hour for which the BDR resource has been committed which represents the forecast assuming no load reduction.

A major limiting factor for the use of DRRs in the SPP market are the telemetering requirements. SPPs requirements stipulate that the DRRs must be metered at the individual meter level. Therefore, the company cannot register a DR program as a whole,

[47] 20 CSR 4240-22.050 (4)(E)
[48] 20 CSR 4240-22.050 (4)(F)

but would have to register and telemeter each individual participating customer as a separate resource. This would greatly increase the amount of work required to manage the program and would also increase the cost, with unclear benefits.

Further, SPP does not have a capacity market and thus the DRRs do not receive a capacity payment and only receive compensation for the energy and ancillary services provided. DRRs are included in the must offer requirements of the SPP market, meaning that the company is required to offer all available resources into the market. The utility does retain some capability to self-commit the resource, but if there are a limited number of times we can call on a particular DR program and SPP has already utilized all those times, then we will have nothing left to use.

Finally, SPP does not recognize demand response as a resource equal to a generator in the capacity margin requirements. If the DRR does not get dispatched, the utility does not realize a reduction in its peak demand and therefore does not avoid the capacity need. For the time being, it would appear that the company may have greater ability to control and manage its peak demand by self-dispatching its DRRs rather than submitting demand response offers into the SPP market. This will help to maximize the value of DRR by capturing the value of avoided capacity by reducing its overall system load from SPP's perspective.

The recent FERC Order 2222 requires SPP and other RTO to provide greater market access to aggregators of Distributed Energy Resources (DER). SPP has a process underway to develop the market protocols to comply with the FERC order. The company will continue to evaluate and monitor SPPs DR and DER market options for the best way to maximize the value of DRR and DERs.

4.9 Document How Assessments Were Performed[49]

Evergy Missouri Metro engaged AEG conduct a DSM Market Potential Study. The study considered a comprehensive list of demand response programs available in the DSM marketplace today and projected into the 20-year study time horizon. These are controllable or dispatchable programmatic options where customers agree to reduce, shift, or modify their load during a limited number of event hours throughout the year.

The demand response (DR) and demand-side rate (DSR) component of this potential study assessed technical, economic, and achievable potential in the residential, commercial, and industrial sectors within Evergy Missouri service areas. While technical and economic potential are theoretical concepts for DR and DSR, the achievable potential scenarios provide a comprehensive view of the potential that can be achieved under various assumptions.

The study framework follows the same basic outline as energy efficiency, but the details of the methodology adopted vary significantly for DR and DSR. Survey data was the primary source to estimate the market size for the DR programs, while AMI saturation (at 100%) determined the market size for the rates. The baseline kW usage was guided by the energy usage and simulations for various building types, and the peaks were approximated at various breakdowns— building type and end use. The technical potential and economic potential used an unconventional approach of determining the (cost-effective) mix of programs that resulted in the maximum savings.

Four achievable potential scenarios were developed for energy efficiency: realistic achievable potential (RAP), RAP-, RAP+, Maximum Achievable Potential (MAP). Three Maximum Achievable Potential (MAP) with High/Medium/Low retention rate of the TOU. Figure 1 shows the Bundle Design Scenarios. As in the case of energy efficiency, RAP is the reference case, and RAP- and RAP+ are variants of RAP assuming lower/higher participation levels. MAP includes all cost-effective programs, incorporated growth in

[49] 20 CSR 4240-22.050 (4)(G)

Evergy's existing programs to benchmarked participation levels (with associated increases in costs), and tested sensitivities around the forthcoming TOU rate for residential customers.

AEG began with a larger database of programs and rates and selected only those programs and rates applicable to the Evergy territory. While the database was built over time by AEG and contains all the DR and DSR programs implemented as programs or pilots across the country, the filtered programs were chosen based on Evergy's feedback. AEG prioritized Evergy-specific data, supplemented by regional and national data sources. Where possible, data were adapted to local conditions (e.g., using local weather and local sources for measure data). The data sources are organized into the following categories:

- Evergy data
- Residential Appliance Saturation Survey (discussed in Section 2)
- Regional and national data sources
- AEG's databases and analysis tools
- Other secondary data and reports

The entire list of data sources AEG utilized for this study can be found in Appendix 5 Section 2.2 Data Development.

AEG used a bottom-up approach to perform the DR and DSR analysis, following these major steps:

1. Market Characterization. The segmentation included jurisdiction, sector, and customer size. Key assumptions around equipment saturations and customer counts align with the Energy Efficiency Market Characterization.
2. Program Characterization. AEG developed a comprehensive set of program options for the analysis, including direct load control, grid-interactive, manual, and rate-based options.

3. Baseline Peak and Customer Forecasts. AEG developed a reference baseline peak projection and customer growth forecast using the class-level MW and customer growth forecasts provided by Evergy.
4. Potential Estimates. Technical and economic potential is not meaningful because DR/DSR does not exist in the absence of utility programs. Instead, AEG estimated DR/DSR potential for six achievable potential scenarios based upon several assumptions, including:
    a. Retention rates on the opt-out Time-of-Use (TOU) rate,
    b. Programmatic parameters, including participation and costs, and
    c. Adjustments to DR impacts to account for interactions with DSR. Their applicability based on the saturation of enabling equipment.

Further details on the assumptions, approach, and results of the study are provided in the Appendix 5. Program and portfolio savings, costs, and cost-effectiveness results can be found in workpaper “Exhibit E_Evergy Metro 2023 IRP Data.xlsx”.

Section 5: Demand-Side Program Cost Effectiveness[50]

The framework for assessing savings, costs, and other attributes of energy efficiency measures involves the following:

- Identifying the list of energy efficiency measures to include in the analysis.
- Determining their applicability to each market sector and segment.
- Fully characterizing each measure.
- Preparing for integration with the greater potential modeling process.

Figure 3: Approach for Energy Efficiency Measure Assessment outlines the framework for measure analysis.

AEG compiled robust lists of energy efficiency measures for each customer sector. The measure lists covered all major types of end-use equipment as well as devices and actions that reduce energy consumption when installed or implemented. Particular focus was given to including the latest available data on emerging technologies from AEG's in-depth research and participation in technical working groups nationwide.

After the lists were finalized, AEG identified the most appropriate source for each parameter and assembled information for all measures to reflect equipment performance, incremental costs, and lifetimes. AEG created a comprehensive measure characterization database to summarize the data. These characteristics form the basis for determining measure-level savings and cost-effectiveness as well as the subsequent build-up to the sector-level potential by scenario. *Table 3: Energy Efficiency Measure Source Hierarchy* presents the measure source hierarchy.

[50] 20 CSR 4240-22.050 (5)

5.1 Economic Potential

To estimate economic potential, AEG performed measure-level cost-effectiveness screening each year of the analysis using the TRC test. Costs included the full or incremental cost of the measure (depending on the application) and an assumed program administration cost. Benefits included (1) the avoided cost of electric generation, transmission, and generation; and (2) quantifiable water and operations and maintenance savings.

AEG's LoadMAP model performs the cost-effectiveness screening dynamically and on an annual basis, considering changing savings, costs, and benefits over time. Thus, measures can pass the economic screen for some, but not all, of the years in the forecast.

It is important to note the following about the economic screen:

- Cost-effectiveness was assessed at the measure level based on gross savings (i.e., not adjusted for potential free-ridership), reflecting that the potential study is attempting to assess cost-effectiveness without assuming or prescribing specific acquisition strategies or delivery mechanisms. Net-to-gross adjustments are applied during the development of program offerings.
- The economic evaluation of each measure was conducted relative to a baseline condition, such as minimum federal standard equipment or average existing building shell conditions.
- The economic evaluation was conducted only for measures applicable to each building type and vintage. Thus, measures deemed not applicable to a building type and vintage were excluded for that application.

5.2 Achievable Potential

To develop achievable potential estimates, AEG applied market adoption rates for each measure to estimate the percentage of customers that may elect to adopt each measure. The market adoption rates consider barriers such as imperfect information, supplier constraints, technology availability, and individual consumer preferences. Market

adoption rates intend to establish a path to full market maturity for each measure or technology group and ensure resource planning stays within acquisition capabilities.

AEG performed the industry standard cost-effectiveness tests to gauge the economic merits of the measures, programs and portfolio. Each test compares the benefits of a DSM program to its costs using its own unique perspectives and definitions. All measures were screened for cost effectiveness using the Total Resource Cost (TRC) test. All programs were screened for cost effectiveness using the Societal Test, the TRC test, the Utility Cost Test (UCT), the Participant Cost Test (PCT), and the Ratepayer Impact Measure (RIM) test. Benefits and costs used in these tests are consistent with Missouri Public Service Commission rules. The primary benefit-cost test is the TRC. The definitions for the four standard tests most commonly used are described below.

- *Total Resource Cost Test (TRC)* measures the net costs and benefits of an energy efficiency program as a resource option based on the total costs of the measure, including both the participant's and the utility's costs. This test represents the combination of the effects of a program on both participating and non-participating customers.
- *Utility Cost Test (UCT)* measures the net costs of a measure as a resource option based on the costs incurred by the program administrator, excluding any net costs incurred by the participant.
- *Participant Cost Test (PCT)* quantifies the benefits and costs to the customer due to program participation.
- *Rate Impact Measure Test (RIM)* measures what happens to a customer's rates due to changes in utility revenues and operating costs.

Only measures that are cost-effective were included in economic and achievable measure-level potential. An initial economic screening process based on the Total Resource Cost (TRC) test was used to assess cost-effectiveness and filter out any measures with a benefit-cost ration below one.

Each economic potential estimate was based on the most efficient, cost-effective measure available for a given baseline opportunity. Exceptions to this rule were made for two measure types: low-income measures and measures within general education programs. This is because neither of these programs are subject to cost-effectiveness screening per Missouri Electric Utility Resource Planning regulations.[51]

Details of all DSM resources evaluated in the potential study including program descriptions, energy and demand saving estimates, program characteristics as well as implementation strategy can be found in Appendix 5 Exhibit G_Evergy_Program Descriptions.

Specifically, when translating from the measure-level potential to program-level potential, AEG applied the following:

- Developed a comprehensive list of EE measures
- Characterized each measure with energy and demand savings, incremental cost, service life, and other performance factors.
- Screened the measures for cost-effectiveness dynamically, taking into account changing savings and cost data over time. Thus, some measures pass the economic screen (i.e., a TRC benefit-cost ratio greater than or equal to 1.0) for some — but not all — of the years in the projection.

The DSM Potential Study measure-level MAP and RAP results served as the foundation for the development of the bundles. In order to maintain alignment, results from the potential study were exported into the DSM Bundles Design. The measures were vetted for inclusion in a DSM program bundle and re-screened for cost-effectiveness. Measures were added to bundles as they became cost-effective throughout the timeframe.
There are several differences between measure-level and bundled savings and general considerations to note that occur when translating the measure-level potential to bundles. These differences and considerations are as follows:

[51] Missouri Energy Efficiency Investment Act (MEEIA) (4 CSR 240-20.094 subsections (3)(A)4., (4)(J), and (6)(B)) https://s1.sos.mo.gov/cmsimages/adrules/csr/current/4csr/4c240-20.pdf

- May include multiple efficiency levels for a specific technology over the projection.
- May exclude some measures with very small potential or implementation challenges, such as stoves, microwaves, monitors, laptops, and TVs.
- Addition of administrative & delivery costs may render certain measures or bundles not cost-effective.
- Participation rates adjusted to reflect different IRP scenarios.
- Net to gross and realization rates impact savings.

5.3 Cumulative Benefits: Avoided Demand Cost, Energy Cost, and Probable Environmental Costs[52]

5.3.1 Avoided Demand Cost[53]

Evergy has developed a probability weighted approach to calculate the avoided capacity cost when the IRP projects that a capacity shortfall will occur. The approach models six scenarios taking account for the possibility of unit retirements as well as potential large upcoming new customer loads. The modeling demonstrates the value of the demand response program in avoiding building capacity. The model tested all of the programs as well as no program. NPVRR were compared among all scenarios.

Evergy provided hourly load profiles (MW load in each hour of the typical year) for thirteen different sector and end use combinations (e.g. Large Commercial Cooling), and hourly avoided costs for the study period. AEG first converted the hourly load profiles to an index shape so that each hour is represented as a % of total load for the year, then multiplied these percent shapes by the hourly avoided costs to produce a stream of annual avoided cost values for each sector/end use combination. Finally, AEG deflated the annual values so that all values would be in real base-year dollars, which is necessary for the LoadMAP model. The capacity value ($ per kW-yr), which is a separate value stream for peak demand savings, was brought in as provided by Evergy except for setting the inflation rate to zero so that again, the model would have values in real dollar terms.

[52] 20 CSR 4240-22.050 (5)(A)
[53] 20 CSR 4240-22.050 (5)(A)(1)

The avoided capacity cost ($/kW-year) can be found in Appendix 5-1 (CONFIDENTIAL). The calculation of avoided demand cost for the DSM Potential Study can be found in Appendix 5-3 (CONFIDENTIAL).

5.3.2 Avoided Energy Cost[54]

The energy price forecast used for the DSM Potential Study was based on the expected value of all market price scenarios from the 2022 IRP Annual Updates. The corresponding energy costs by year are provided in Appendix 5-1 (CONFIDENTIAL).

5.3.3 Avoided Environmental Cost[55]

The probable environmental costs were developed as described in the response to 20 CSR 4240-22.040(2)(B) and are included in the calculation of avoided energy costs.

5.4 Total Resource Cost Test (TRC)[56]

5.4.1 Demand-Side Program Costs[57]

The TRC costs include the incremental participant cost and utility administrative costs associated with the program.

5.4.2 Demand-Side Rate Costs[58]

The TRC costs include the incremental participant cost and the utility administrative costs associated with the program.

5.4.3 Costs Not To Include[59]

The TRC costs do not include lost revenues or incentive payments to customers.

[54] 20 CSR 4240-22.050 (5)(A)(2)
[55] 20 CSR 4240-22.050 (5)(A)(3)
[56] 20 CSR 4240-22.050 (5)(B)
[57] 20 CSR 4240-22.050 (5)(B)(1)
[58] 20 CSR 4240-22.050 (5)(B)(2)
[59] 20 CSR 4240-22.050 (5)(B)(3)

5.3 Utility Cost Test (UCT)[60]

5.3.1 Test Costs[61]

The UCT costs include the utility's incentive and administrative costs.

5.3.2 Costs Not to Include[62]

The UCT costs do not include lost revenues.

5.3.3 Rate of Return or Incentive Costs[63]

The analysis did not assume a rate of return or utility incentive.

5.4 TRC Must be Greater than One[64]

Except for the low-income programs, the DSM programs were designed to be cost-effective. The ratio of annualized benefit to annualized costs were greater than one. AEG designed a wide range of energy efficiency, demand response programs and demand-side rates. Only cost effective programs were included in the achievable potential scenarios. However, in the maximum achievable potential scenario, the cost-effective screening was changed from program level to sector level.

5.5 TRC and UCT Test Results[65]

The TRC and UCT results for each potential DSM program and demand-side rate are presented in the workpaper "Exhibit E_Evergy Metro 2023 IRP Data". Avoided capacity cost and avoided energy cost can be found in Appendix 5-1.

5.6 Other Cost Benefit Test Results[66]

ICF also analyzed cost-effectiveness for the following standard tests:

[60] 20 CSR 4240-22.050 (5)(C)
[61] 20 CSR 4240-22.050 (5)(C)(1)
[62] 20 CSR 4240-22.050 (5)(C)(2)
[63] 20 CSR 4240-22.050 (5)(C)(3)
[64] 20 CSR 4240-22.050 (5)(D)
[65] 20 CSR 4240-22.050 (5)(E)
[66] 20 CSR 4240-22.050 (5)(F)

- ***Participant Cost Test (PCT).*** The benefits include lost utility revenues (i.e. the lifetime value of retail rate savings). The costs include the participant incremental measure costs minus the value of incentives.
- ***Rate Impact Measure Test (RIM).*** The test measures what happens to customer's rates due to changes in utility revenues and operating costs. Therefore, if the benefits are greater than the costs, rates will decrease on average and subsidies will be minimized or avoided. The benefits are the same as the TRC benefits and the costs include all utility costs associated with the program, including lost utility revenue as well as incentive and administrative costs.
- ***Societal Cost Test (SCT).*** It is the Total Resource Cost test (TRC) with the addition of non-energy benefits.

The PCT, RIM and SCT results for each potential DSM program and demand-side rate are presented in the workpaper "Exhibit E_Evergy Metro 2023 IRP Data".

5.7 Describe and Document Cost Effectiveness Tests[67]

AEG used a bottom-up approach to develop the IRP bundles, incorporating the findings from the measure-level EE potential. The analysis conducted for the energy efficiency potential study reflects a measure-level approach to cost-effectiveness and potential estimation. In order to meet the rules set forth under 4 CSR 240-22.050, an additional set of steps were required to combine measures into program bundles based on target market and delivery method, as well as to assign program costs.

AEG developed the program bundles using the maximum and realistic achievable measure-level potential results, working closely with Evergy to develop cost-effective bundles. Multiple program bundle scenarios were developed to support Evergy's Demand-Side Resource Analysis under 4 CSR 240-22.050 for the 2024 IRP Triennial filing.

[67] 20 CSR 4240-22.050 (5)(G)

5.7.1 IRP Bundle Design Approach

Evergy must achieve all cost-effective demand-side savings. AEG utilized measure and participation data from the comprehensive DSM Potential Study to inform and develop the proposed DSM IRP Bundles Design.

As part of the potential study, AEG:

- Developed a comprehensive list of EE measures
- Characterized each measure with energy and demand savings, incremental cost, service life, and other performance factors.
- Screened the measures for cost-effectiveness dynamically, taking into account changing savings and cost data over time. Thus, some measures pass the economic screen (i.e., a TRC benefit-cost ratio greater than or equal to 1.0) for some — but not all — of the years in the projection.

The DSM Potential Study measure-level MAP and RAP results served as the foundation for the development of the bundles. In order to maintain alignment, results from the potential study were exported into the DSM Bundles Design. The measures were vetted for inclusion in a DSM program bundle and re-screened for cost-effectiveness. Measures were added to bundles as they became cost-effective throughout the timeframe.

There are several differences between measure-level and bundled savings and general considerations to note that occur when translating the measure-level potential to bundles. These differences and considerations are as follows:

- May include multiple efficiency levels for a specific technology over the projection.
- May exclude some measures with very small potential or implementation challenges, such as stoves, microwaves, monitors, laptops, and TVs.
- Addition of administrative & delivery costs may render certain measures or bundles not cost-effective.
- Participation rates adjusted to reflect different IRP scenarios.
- Net to gross and realization rates impact savings.

All bundles were designed with cost-effective measures. Measures were bundled based on the end-use, sector, and implementation strategy. Incentive costs and non-incentive costs were assigned to bundles. Options were rescreened after measure bundling and cost assignment. Cost effectiveness at the option level was balanced with implementation considerations.

The Total Resource Cost Test (TRC) is the primary method of assessing the cost-effectiveness of energy efficient measures and bundles, considering the effects on both participating and non-participating customers. The TRC test is a widely accepted methodology that has been used across the United States for over twenty-five years. TRC measures the net costs and benefits of an energy efficiency bundle as a resource option based on the total costs of the bundle, including both the participant's and the utility's costs.

In total, five benefit-cost tests were utilized to analyze bundle design cost-effectiveness from different perspectives:

- Participant Cost Test quantifies the benefits and costs to the customer due to bundle participation.
- Ratepayer Impact Measure measures what happens to a customer's rates due to changes in utility revenues and operating costs.
- Utility Cost Test measures the net costs of a bundle as a resource option based on the costs incurred by the program administrator, excluding any net costs incurred by the participant.
- Societal Cost Test measures the effects of a bundle on society as a whole.

The cost-effectiveness analysis was performed using Evergy-specific data. The input data gathered for the model included as shown in the table below.

Table 20: Cost-Effectiveness Model Inputs

General Inputs	Specific-Project Inputs
Retail Rate ($/kWh)	Utility Project Costs (Administrative & Incentives)
Commodity Cost ($/kWh)	Direct Participant Project Costs ($/Participant)
Demand Cost ($/kW-Year)	Measure Life (Years)
Discount Rate (%)	kW/Participant Saved (Net and Gross)
Inflation Rate (%)	Number of Participants
Line Losses (%)	

Cost-effective Test ratios for all programs modeled in the DSM Market Potential Study can be accessed in workpaper “Exhibit E_Evergy Metro 2023 IRP Data”.

Section 6: Total Resource Cost Test[68]

Potential demand-side programs and demand-side rates that passed the total resource cost test (a benefit-cost ratio of at least 1.0) were considered as a demand-side candidate resource option.

6.1 Bundling of Portfolios[69]

AEG used a bottom-up approach to develop the IRP bundles, incorporating the findings from the measure-level EE potential. The analysis conducted for the energy efficiency potential study reflects a measure-level approach to cost-effectiveness and potential estimation. In order to meet the rules set forth under 4 CSR 240-22.050, an additional set of steps were required to combine measures into program bundles based on target market and delivery method, as well as to assign program costs.

As required by 4 CSR 240-22.050, Evergy must achieve all cost-effective demand-side savings. AEG utilized measure and participation data from the comprehensive DSM Potential Study to inform and develop the proposed DSM IRP Bundles Design.

As part of the potential study, AEG:

- Developed a comprehensive list of EE measures
- Characterized each measure with energy and demand savings, incremental cost, service life, and other performance factors.
- Screened the measures for cost-effectiveness dynamically, taking into account changing savings and cost data over time. Thus, some measures pass the economic screen (i.e., a TRC benefit-cost ratio greater than or equal to 1.0) for some — but not all — of the years in the projection.

The DSM Potential Study measure-level MAP and RAP results served as the foundation for the development of the bundles. In order to maintain alignment, results from the

[68] 20 CSR 4240-22.050 (6)
[69] 20 CSR 4240-22.050 (6)(A)

potential study were exported into the DSM Bundles Design. The measures were vetted for inclusion in a DSM program bundle and re-screened for cost-effectiveness. Measures were added to bundles as they became cost-effective throughout the timeframe.

There are several differences between measure-level and bundled savings and general considerations to note that occur when translating the measure-level potential to bundles. These differences and considerations are as follows:

- May include multiple efficiency levels for a specific technology over the projection.
- May exclude some measures with very small potential or implementation challenges, such as stoves, microwaves, monitors, laptops, and TVs.
- Addition of administrative & delivery costs may render certain measures or bundles not cost-effective.
- Participation rates adjusted to reflect different IRP scenarios.
- Net to gross and realization rates impact savings.

Figure 5: Analysis Framework outlines the framework for developing the IRP Bundles.

All bundles were designed with cost-effective measures. Measures were bundled based on the end-use, sector, and implementation strategy. Incentive costs and non-incentive costs were assigned to bundles. Options were rescreened after measure bundling and cost assignment. Cost effectiveness at the option level was balanced with implementation considerations.

AEG reviewed ed current programs and recently filed plans for utilities across the country. The review informed the design of the bundles and identified new opportunities.
AEG took the following steps in the review:

1. Compared potential study results to other utility offerings to assess new opportunities that filled gaps in the current MEEIA portfolio.
2. Searched for utilities with comparable programs targeting a new measure or customer segment.

3. Assessed the applicability of each option for the IRP bundle development and potential future MEEIA application.
4. Added measures to existing bundles (i.e., LED Grow Lights for Indoor Agriculture) or created new programs (i.e., Residential New Construction) that integrated learnings from the review.

Results of the utility program review can be accessed in Appendix 5 Exhibit D_Evergy Utility Program Review.

The Total Resource Cost Test (TRC) is the primary method of assessing the cost-effectiveness of energy efficient measures and bundles, considering the effects on both participating and non-participating customers. In total, five benefit-cost tests were utilized to analyze bundle design cost-effectiveness from different perspectives.

Based on the RAP and MAP potential scenario results from the DSM Potential Study, AEG developed four portfolios comprised of cost-effective measures. Each of these portfolios was considered to determine which DSM portfolio was optimal based on Evergy's supply options.

Figure 1: Bundle Design Scenarios represent the program bundle design.

- Program RAP: The measure-level RAP candidates from the DSM Potential Study. This portfolio reflects expected program participation given barriers to customer acceptance and non-ideal implementation conditions.
- Program RAP-: is set to be 75% of RAP level and a scenario where customer incentives are set to be 50% of incremental cost.
- Program RAP+: Alternative portfolio designed to represent approximately the average of RAP and MAP participation levels and a scenario where customer incentives are set to be 50% of incremental cost.
- Program MAP: The measure-level MAP candidates from the DSM Potential Study. This portfolio reflects expected program participation given ideal market

implementation and few barriers to customer adoption, is a theoretical scenario where all customer incentives are set to 100% of measure incremental costs. Non-incentives are based on benchmarked factors.

AEG estimated DR/DSR potential for two main scenarios:

1. Maximum Achievable Potential (MAP) included all cost effective programs, incorporated growth in Evergy's existing programs to benchmarked participation levels (with associated increases in costs) and tested sensitivities around the forthcoming TOU rate for residential. During the DSM Market Potential Study, Evergy received an order from the Missouri PSC to transition all residential customers to TOU rates by October 1, 2023 with the Two-Period TOU rate as the default rate. The DSM Market Potential Study proceeded with this assumption. In response to the order, AEG and Evergy modified the MAP analysis to focus on the effect that customer retention in the default TOU rate would have on other DR and DSR program options. Specifically, we expect the average residential customer's peak demand to drop as they respond to pricing signals, which will reduce the amount of demand available for other program options to impact during peak hours. AEG assumed a conservative retention rate of 50% to estimate MAP and then tested the sensitivity of impacts and program costs to changes in the TOU retention rate as shown in *Table 16: MAP Sensitivity Analysis*. For each sensitivity, AEG estimated the weighted impacts of the TOU rates, reduced the peak demand baseline forecast by the TOU impact, and then adjusted the impact assumptions for the other DR/DSR program options. The sensitivities also included increased costs of educating customers to support the increased retention in the TOU Default rate.
2. Realistic Achievable Potential (RAP) included all cost effective programs (based on the MAP results) restricted participation in Evergy's existing programs to current achieved levels, and tested sensitivities to participation in non TOU program option. The RAP scenario assumed low retention in the TOU Default rate.

6.1.1 Bundle Offerings

Bundle eligibility has been defined broadly to make bundles as inclusive as possible. In general, participation guidelines are designed to include all customer sectors and end uses. Bundle offerings were intending to be broad program designs in order to allow for maximum flexibility for future MEEIA program offerings.

Table 21: Proposed DSM Bundle Descriptions, 2024-2043 represents the proposed DSM program bundle description.

Detailed descriptions of all bundled programs can be found in Appendix 5 Exhibit E_Program Descriptions.

6.1.2 Proposed DSM IRP Bundles

Evergy's proposed DSM bundle portfolio for 2024 through 2043 are comprised of six residential bundles and two non-residential bundles. Each bundle targets multiple end uses and offers residential, commercial and industrial customers an opportunity to achieve significant energy savings through participation. The 2024-2043 bundles are listed with a brief description in Table 19: Proposed DSM Bundle Descriptions.

Evergy's portfolio:

- Is cost-effective at portfolio level.
- Expands and/or coordinates with existing Evergy energy efficiency programs.
- Provides a broad range of energy efficiency opportunities to all Evergy customers.
- Represents broad program categories that Evergy can draw upon for upcoming MEEIA program planning.

The proposed bundle design delivers an effective and balanced portfolio of energy and peak demand savings opportunities across all customer segments. Each bundle was designed to leverage the mix of best-practice measures and technologies, delivery strategies, and target markets in order to most effectively deliver bundles and measures

to Evergy customers. The bundles were designed to be broad enough to allow for flexibility in nuanced implementation strategies for specific measures or target markets.

The proposed DSM portfolio includes a suite of bundles that offer customers a variety of opportunities to participate in energy efficiency. Evergy's programs have been aligned to offer customers consistent programs and incentives across both service territories. This will allow Evergy to streamline implementation and marketing activities and provide equitable programs to all of their customers, regardless of whether they are located within Evergy West and Evergy Metro territories. The bundles described in the table below are inclusive of existing Evergy programs and go beyond the current programs.

Table 21: Proposed DSM Bundle Descriptions, 2024-2043

Bundle	Description
Energy Savings Products	Rebates to purchase and install qualifying energy efficient HVAC equipment, appliances, electronics, and water heating measures.
Heating, Cooling, and Weatherization.[70]	Incentives for purchase and installation of qualifying energy efficient HVAC equipment, appliances, weatherization, and water heating measures.
Income Eligible Multifamily	The program aims to provide direct install measures in housing units and common area measures to multi-family buildings, targeting income eligible customers.
Income Eligible Single Family	The program leverages the existing Missouri Weatherization Assistance Program to provide qualifying customers with approved energy efficiency measures and equipment. Targets income eligible customers and provides fully subsidized measures.
Research and Pilot	Customers are provided an incentive to turn in inefficient refrigerators, freezers and room air conditioners to be recycled.
Residential New Construction	Incentives for installation of new, qualifying energy efficient measures for the purposes of new construction projects.
Commercial Prescriptive	C&I customers may receive prescriptive rebates for purchasing energy efficient equipment for commercial and industrial facilities.
Commercial Custom	C&I customers may receive custom rebates for purchasing energy efficient equipment for commercial and industrial facilities.

[70] Whole Home Efficiency option is designed to encompass a range of general whole home designs including PAYS.

Outreach, Marketing and Communications

Outreach, marketing and communications are critical mechanisms for ensuring customers and trade allies are aware of, and participate in, the portfolio of bundles. The DSM bundle portfolio relies on a combination of education and customer incentives to advance energy efficiency. The bundles have been designed to maximize participation given industry best practices. Educating customers and trade allies on the benefits of energy efficiency can help speed the adoption of energy efficient measures and promote market transformation.

Customer incentives are the primary mechanism for bundle delivery. Through this mechanism, customers receive rebates to purchase energy efficient equipment and services through existing market actors including contractors, equipment dealers and retailers.

Net-to-Gross Impacts

Net-to-Gross (NTG) ratios adjust the gross energy and demand savings associated with a bundle to reflect the overall effectiveness of the bundle, taking into account free riders and spillover. Free riders and spillover, as determined from an impact evaluation, are defined as:

- **Free Riders:** Customers who participate in energy efficiency bundles that would have engaged in the efficient behavior in the absence of the bundle. The inclusion of free riders overestimates the energy and demand savings associated with a bundle.
- **Spillover:** Customers who engage in energy efficient behavior due to some influence of a bundle but who do not participate in a bundle. For example, if a customer purchases an air purifier through the Energy Savings Products Bundle and then chooses to purchase an ENERGY STAR® clothes dryer after learning about the benefits of energy efficiency.

Spillover and free ridership act in opposing directions, with spillover increasing a bundle's energy and demand savings while free ridership diminishes a program's savings.

Evergy should make an effort to minimize free ridership and maximize spillover by:

- Modifying incentives to respond to market conditions, as needed and practical.
- Verifying customer eligibility to ensure the customer is an Evergy customer, as practical.
- Increasing marketing of Evergy's DSM portfolio.

Evergy bundle adjustments to address free ridership and spillover should not negatively impact bundle implementation or continuity (e.g., Evergy should not modify incentive levels with a frequency that would compromise bundle stability and the customer experience).

6.2 Load Impact Estimates[71]

The time-differentiated load impacts for each demand-side candidate resource option are detailed in the workpaper "Exhibit E_Evergy Metro 2023 IRP Data".

6.3 Uncertainty of Load Impact Estimates[72]

6.3.1 Uncertainty of Customer Participation Levels[73]

Based on the RAP and MAP potential scenario results from the DSM Potential Study, AEG developed four portfolios comprised of cost effective measures. Each of these portfolios was considered during the integration phase of Evergy's IRP process to determine which DSM portfolio was optimal based on Evergy's supply options.

Figure 1: Bundle Design Scenarios shows the program buddle design scenarios.

- Program RAP: The measure-level RAP candidates from the DSM Potential Study. This portfolio reflects expected program participation given barriers to customer acceptance and non-ideal implementation conditions.

[71] 20 CSR 4240-22.050 (6)(B)
[72] 20 CSR 4240-22.050 (6)(C)
[73] 20 CSR 4240-22.050 (6)(C)(1)

- Program RAP-: is set to be 75% of RAP level and a scenario where customer incentives are set to be 50% of incremental cost.
- Program RAP+: Alternative portfolio designed to represent approximately the average of RAP and MAP participation levels and a scenario where customer incentives are set to be 50% of incremental cost.
- Program MAP: The measure-level MAP candidates from the DSM Potential Study. This portfolio reflects expected program participation given ideal market implementation and few barriers to customer adoption, is a theoretical scenario where all customer incentives are set to 100% of measure incremental costs. Non-incentives are based on benchmarked factors.

AEG estimated DR/DSR potential for two main scenarios:

- Maximum Achievable Potential (MAP) included all cost effective programs, incorporated growth in Evergy's existing programs to benchmarked participation levels (with associated increases in costs) and tested sensitivities around the forthcoming TOU rates for residential. During the DSM Market Potential Study, Evergy received an order from the Missouri PSC to transition all residential customers to TOU rates by October 1, 2023 with the Two-Period TOU rate as the default rate. The DSM Market Potential Study proceeded with this assumption. In response to the order, AEG and Evergy modified the MAP analysis to focus on the effect that customer retention in the default TOU rate would have on other DR and DSR program options. Specifically, we expect the average residential customer's peak demand to drop as they respond to pricing signals, which will reduce the amount of demand available for other program options to impact during peak hours. AEG assumed a conservative retention rate of 50% to estimate MAP and then tested the sensitivity of impacts and program costs to changes in the TOU retention rate as shown in Table 16: MAP Sensitivity Analysis. For each sensitivity, AEG estimated the weighted impacts of the TOU rates, reduced the peak demand baseline forecast by the TOU impact, and then adjusted the impact assumptions for the other DR/DSR program options. The sensitivities also included increased

costs of educating customers to support the increased retention in the TOU Default rate.

- Realistic Achievable Potential (RAP) included all cost effective programs (based on the MAP results) restricted participation in Evergy's existing programs to current achieved levels, and tested sensitivities to participation in non TOU program option. The RAP scenario assumed low retention in the TOU Default rate.

The annual incremental and cumulative energy and demand impacts and budgets for each scenario are presented in the workpaper "Exhibit E_Evergy Metro 2023 IRP Data".

6.3.2 Uncertainty of Cost Effectiveness[74]

Based on the RAP and MAP potential scenario results from the DSM Potential Study, AEG developed four portfolios comprised of cost effective measures. Each of these portfolios was considered during the integration phase of Evergy's IRP process to determine which DSM portfolio was optimal based on Evergy's supply options.

Figure 1:Bundle Design Scenarios shows the program buddle design scenarios.

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- Program MAP: The measure-level MAP candidates from the DSM Potential Study. This portfolio reflects expected program participation given ideal market implementation and few barriers to customer adoption, is a theoretical scenario

[74] 20 CSR 4240-22.050 (6)(C)(2)

where all customer incentives are set to 100% of measure incremental costs. Non-incentives are based on benchmarked factors.

The annual incremental and cumulative energy and demand impacts and budgets for each scenario are presented in the workpaper “Exhibit E_Evergy Metro 2023 IRP Data”.

Section 7: Development Of Evaluation Plans[75]

Program evaluation supports the need for public accountability, oversight, validation of program performance and cost-effective program improvements. The performance of DSM portfolios in regulated jurisdictions is almost universally evaluated by third-party independent contractors. Evergy Missouri Metro has designated approximately 3% of its portfolio budget for Evaluation, Measurement and Verification (EM&V) activities.

Evergy Missouri Metro will engage an EM&V contractor(s) to conduct process and impact evaluations of the DSM programs. The EM&V Contractor will meet with Evergy program staff to discuss evaluation objectives, establish a schedule of deliverables and set up a communications protocol. The EM&V Contractor will develop a high level timeline of evaluation activities and reporting.

7.1 Process Evaluations

Process evaluations ensure that a program is operating as intended and provides information necessary to evaluate the cost-effectiveness and that can enable improvements in both the program design and implementation. Each demand-side program that is part of the utility's preferred resource plan shall be subjected to an ongoing evaluation process which addresses at least the following questions about program design.

1. What are the primary market imperfections that are common to the target market segment?
2. Is the target market segment appropriately defined, or should it be further subdivided or merged with other market segments?
3. Does the mix of end-use measures included in the program appropriately reflect the diversity of end-use energy service needs and existing end-use technologies within the target market segment?
4. Are the communication channels and delivery mechanisms appropriate for the target market segment?

[75] 20 CSR 4240-22.050 (7)

5. What can be done to more effectively overcome the identified market imperfections and to increase the rate of customer acceptance and implementation of each end-use measure included in the program?

Process evaluations assess customer understanding, attitudes about, and satisfaction with the program and other educational activities. The EM&V contractor will assess the effectiveness of the marketing and outreach, trade ally involvement, and whether implementation milestones are met adequately and on schedule. These evaluations will use sales and promotion data maintained by the tracking system as well as customer survey data.

7.2 Evaluation Plans

The EM&V Contractor will develop evaluation plans for each program, identifying the program objectives, key researchable issues, data collection requirements, sampling plan, budget and timeline. The sampling plan will describe the sample design, interview methodology and stratification. The interview methodology will range depending on the market actor being interviewed, from on-site interviews, in-depth interviews, virtual or telephone interviews. The EM&V Contractor will identify key market actors, such as Evergy staff, third-party implementation contractors, participation trade allies, and participation customers. The sample size of each group will be calculated at a 90% confidence interval with ± 10% precision. The EM&V Contractor will provide a draft of the EM&V Plan for Evergy review, conduct a virtual meeting of that EM&V plan with Evergy, Evergy implementers, EM&V Auditor, and Missouri stakeholders' and incorporate their comments and suggestions in the final EM&V Plan.

7.3 Document Review

The EM&V Contractor will collect program materials, including, but not limited to, process flowcharts, third-party implementation contractor agreements (redacted as necessary), trade ally agreements, rebate applications, and marketing and outreach materials.

The EM&V Contractor will also evaluate the program tracking system(s), including initial data validation (application processing, measure and savings capture and validation,

audit trail, and system location), security, and data granularity (types of data being captured, QA/QC processes, data thresholds and back-up data capture, refresh rate and automated validations).

7.4 Market Actor Interviews

Interviews with key market actors will focus on understanding the program history and objectives as well as program implementation, including, but not limited to:

- Marketing and outreach activities
- Third-party implementation contractor responsibilities and management, if applicable
- Customer acquisition and participation process
- Trade Ally participation
- Rebate application processing
- Program tracking and reporting

Interview questions will be based on portfolio- and program-level activities and achievements to identify process improvements to improve program efficiency.

7.5 Customer Surveys

Participating customer surveys will seek to understand the customer experience with the program and awareness of the Evergy portfolio. The surveys will identify barriers to participation, spillover, and areas of improvement.

7.5.1 Trade Ally Surveys/Interviews

Trade allies will be asked about clarity of program rules, support from KPC&L staff and/or third-party implementation contractor, marketing efforts, and rebate applications. The surveys/interviews will identify barriers to participation, free-ridership, spillover, and opportunities to improve program processes.

Non-Participating Customer and Trade Ally Interviews/Surveys

Where appropriate, interviews with non-participating customers and trade allies will be conducted to better understand the free ridership, spillover, barriers to participation and marketing messages.

7.6 Impact Evaluations

The EM&V Contractor will conduct impact evaluations annually according to Missouri requirements, and follow the rules in Section 20 CSR 4240-22.070 (8) (B). Impact evaluations estimate gross and net demand, energy savings and the cost-effectiveness of installed systems. These evaluations used to verify measure installations, identify key energy assumptions and provide the research necessary to calculate defensible and accurate savings attributable to the program.

The EM&V Contractor will develop evaluation plans that ensure the appropriate measurement of savings in compliance with the appropriate International Performance Measurement and Verification Protocol (IPMVP) Framework and Uniform Methods Project (UMP) as well as the State of Missouri EM&V protocols. The evaluation will verify measure installations and identify key assumptions for equipment life, incremental equipment cost, free ridership and spillover. The evaluation will also provide the necessary research to calculate defensible and accurate savings attributable to the program.

The EM&V Contractor will evaluate program cost-effectiveness using the standard tests including Total Resource Cost, Societal Cost Test, Participant Test, Utility Test and Rate Impact Measure Test.

Section 8: Demand-Side Resources and Load-Building Programs[76]

Evergy Metro has provided its cost-benefit analysis for transportation electrification (TE) in its 2021 TE program portfolio filing Case No ET-2021-0151. There are no new load building programs.

[76] 20 CSR 4240-22.050 (8)