Evergy Metro

Volume 6

Integrated Resource Plan and Risk Analysis

Integrated Resource Plan

20 CSR 4240-22.060

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evergy

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Volume 6: Integrated Resource Plan and Risk Analysis

Highlights

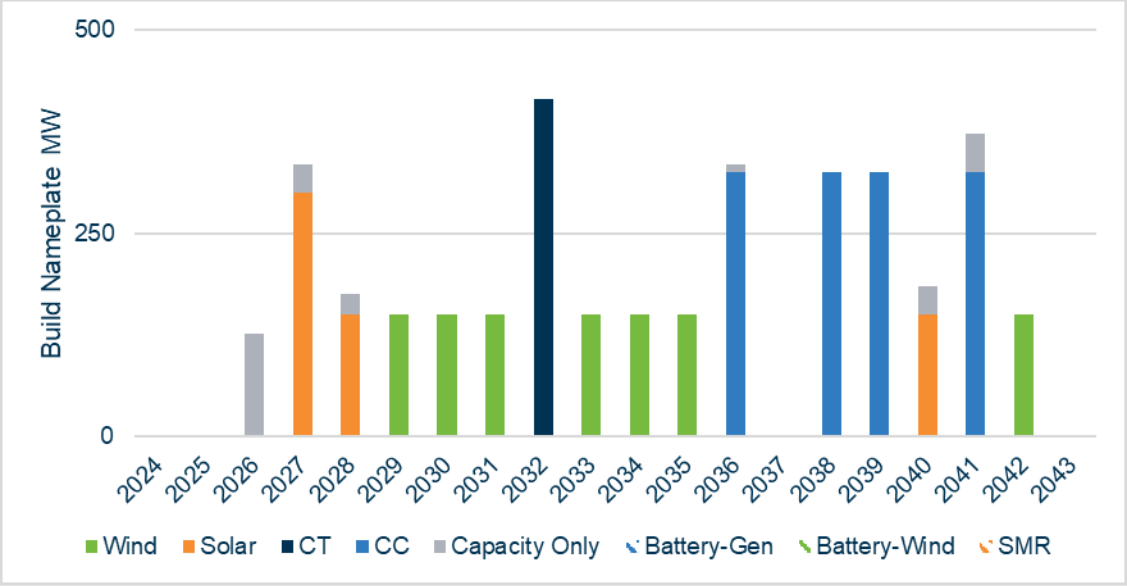
- Evergy Metro's long-term planning criteria includes meeting its customers' energy and capacity needs while balancing future risks.
- Alternative resource plans were developed to consider base planning options, varying future demand-side management portfolios, retirement dates, and resource additions.
- Resource plans were also developed to evaluate directed strategies such as minimum or maximum renewable additions and discrete scenarios of future environmental policy.
- Contingency plans address planning alternatives if conditions change, such the next best resource additions in the short term if execution challenges occur, and longer-term variation in resource decisions directly tied to higher and lower than expected load growth scenarios.
- Resource plans were evaluated economically based on their performance in future scenarios with varied levels of the identified critical uncertain factors: natural gas prices, CO_2 emissions restrictions, and construction costs.
- Plans were ranked based on expected net present value revenue requirements in different future scenarios and on a weighted-average risk basis. Performance measures also quantify costs and risks of each alternative resource plan.

Section 1: Overview of Preferred Resource Plan

The objectives for the Evergy Metro resource plan are to meet customer energy and capacity needs cost effectively, considering future risks.

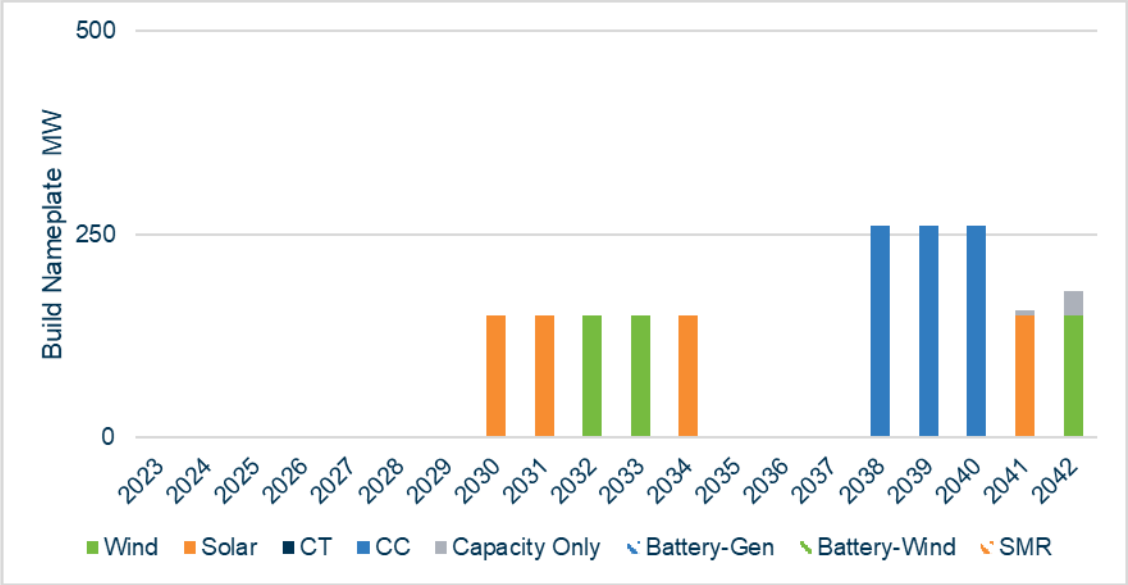
The Preferred Plan for Evergy Metro includes the RAP Plus demand-side management portfolio with additions of 300 MW of solar in 2027, 150 MW of solar in 2028 and 150 MW of wind each year 2029-2031, with the first thermal resource addition in 2032, a 415 MW combustion turbine.

Figure 1: Evergy Metro Preferred Plan 2024 CAAB



The Preferred Plan for 2024 significantly accelerates resource additions compared to the 2023 Preferred Plan. The largest driver is a higher level of forecasted load growth as a result of economic development. The increase in forecasted capacity needs, due to expected increases in reserve margin requirements and enforcement of winter capacity requirements, also prompt earlier capacity resource build.

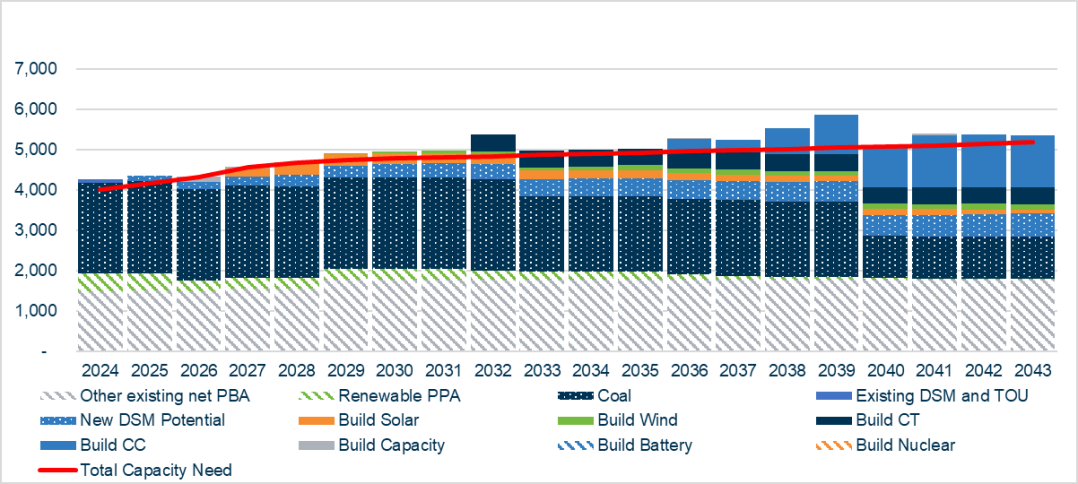
Figure 2: Evergy Metro Preferred Plan 2023



The first new resource continues to be solar. Solar resources are the first near-term builds for all Evergy utilities' preferred resource plans. There is currently very little solar in the SPP resource mix; incremental solar is expected to have high summer accreditation and provide peak-correlated energy. These attributes, and the availability of solar production tax credit incentives from the Inflation Reduction Act, make early solar builds attractive to meet customer needs at lowest cost. Evergy has shortlisted offers from its 2023 RFP, based on the expected solar additions in its other utility IRP 2023 Preferred Plans, and has viable projects to fill the 2027 solar need.

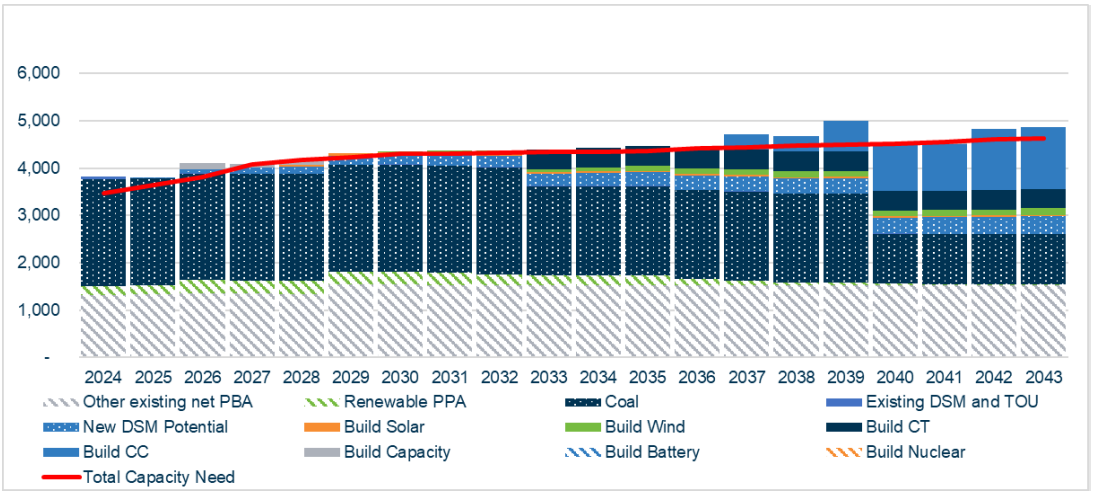
The Preferred Plan meets expected annual summer and winter capacity requirements in all years of the planning horizon. The load ramp for economic development creates a summer capacity need as early as 2026 summer. Evergy Metro plans to meet that need through coordinating the timing of new customer load ramps or bridging with market capacity for 2026, until the 300 MW of new solar additions are operational for 2027 summer capacity.

Figure 3: Preferred Plan (CAAB) Summer Capacity Position MW[1]



Evergy Metro has a relatively smaller need for winter capacity early in the planning horizon due to its lower winter peak and its resource mix. The Evergy Metro Preferred Plan adds the first thermal resource in 2032 when it has a more sizable need for both summer and winter capacity due to the projected La Cygne 1 retirement.

Figure 4: Preferred Plan (CAAB) Winter Capacity Position MW

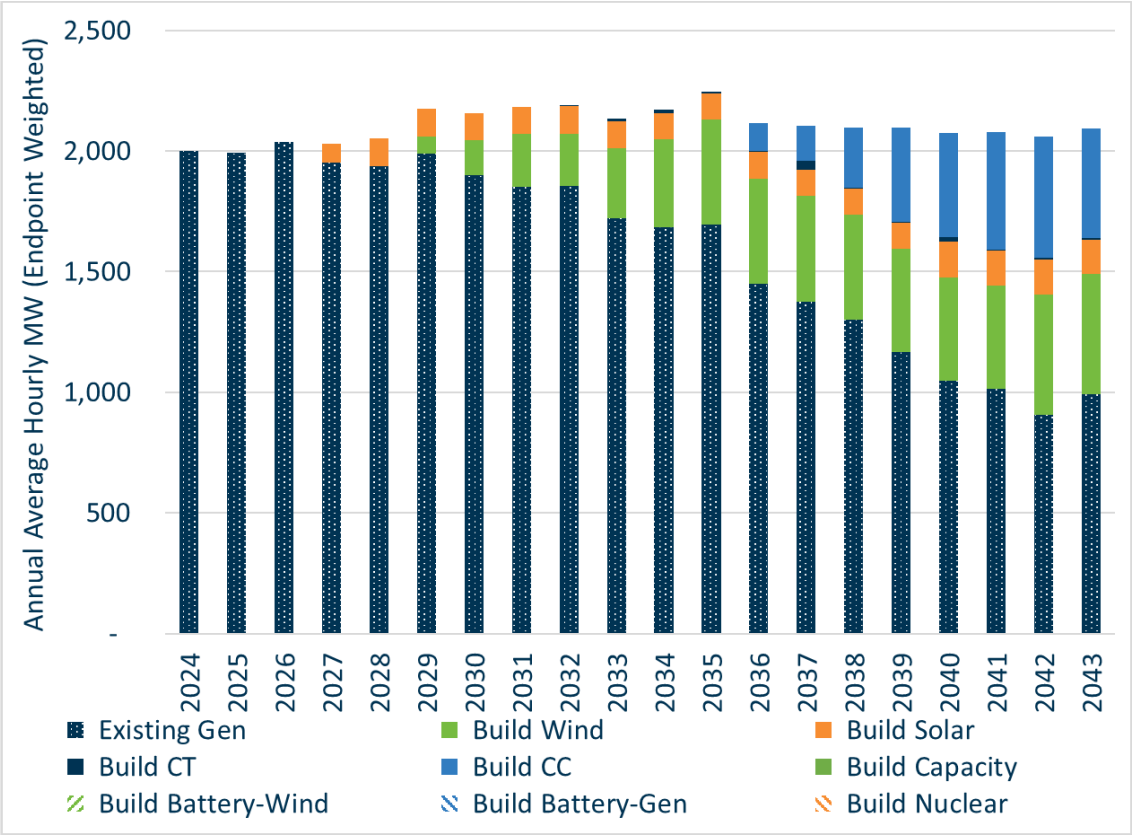


The Preferred Plan generation mix forecasts that Evergy Metro will meet its customers energy need with additional solar generation from the additions in 2027 and 2028, then increasingly with wind additions (as existing wind PPAs end) and combined cycle

[1] 20 CSR 4240-22.060(4)(B)3. Preferred Plan shown. For all other ARPs, plots of expected summer and winter capacity provided by supply-side resources are in the plan workbook workpapers.

additions beginning in 2036 and increasing towards the end of the 20-year time horizon as more planned coal retirements occur in 2039.

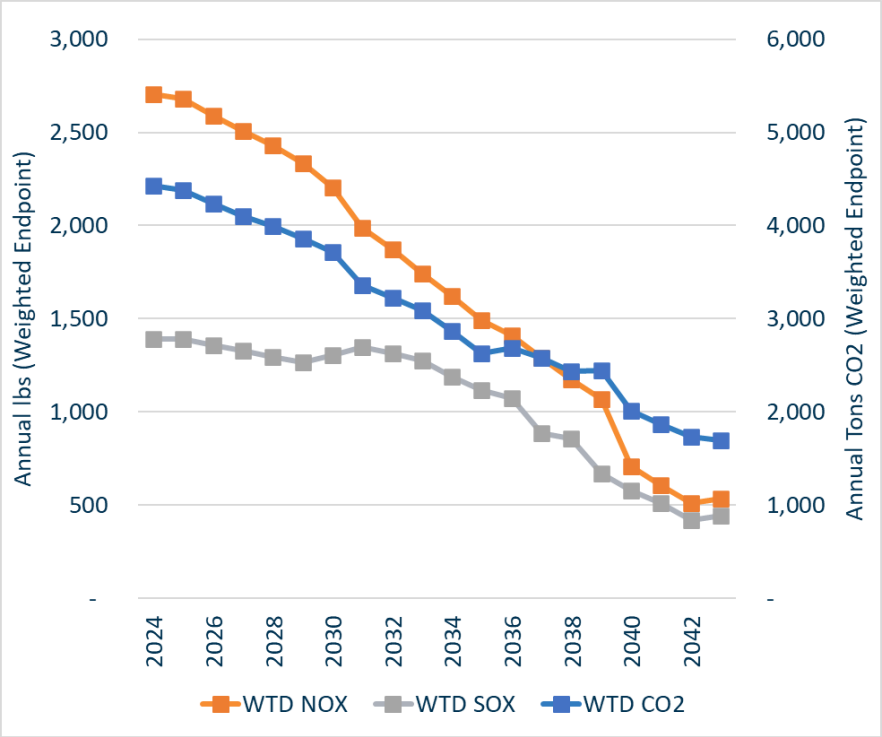
Figure 5: Preferred Plan Annual Generation[2]



The Preferred Plan expected emissions decline over the planning period due to emissions limits in some endpoints and the transition in the resource mix, with more energy supplied from renewables and more efficient, lower-emitting thermal resources.

[2] 20 CSR 4240-22.060(4)(B)6. Preferred Plan shown. For all other ARPs, plots of annual energy by supply-side resources are in Appendix 6B Annual Generation by ARP.

Figure 6: Preferred Plan Annual Emissions[3]



Section 2: Planning Criteria

2.1 Capacity Needs[4]

In the 2023 IRP forecast, Evergy Metro was projected to have sufficient capacity for the next several years and selected a Preferred Plan that did not add new resources until 2029. The Evergy Metro fleet has capacity accreditation that currently exceeds its required needs and has contracted with Evergy Missouri West to sell capacity for the next few years.

Evergy Metro is now forecasting significant load growth over the next few years due to economic development. This load growth has been driven by economic development which is not yet included in the load forecasts described in Volume 3. Due to the maturity of the economic development activity, the forecasted impact on Evergy Metro's capacity

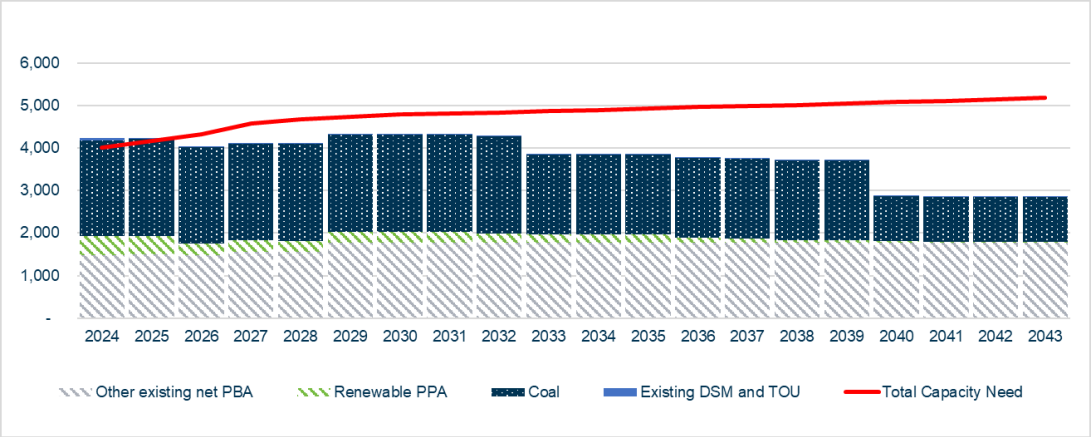
[3] 20 CSR 4240-22.060(4)(B)7. Preferred Plan shown. For all other ARPs, plots of annual energy by supply-side resources are in Appendix 6C Annual Emissions by ARP.

[4] 20 CSR 4240-22.060(4)(B)9. For all ARPs, capacity balances are provided in Appendix 6A Capacity Balance Spreadsheets.

and energy needs was factored into the requirements utilized for the development of alternative resource plans and this results in capacity being needed earlier to meet customer needs. Also, SPP is expected to significantly augment capacity requirements, including increasing reserve margins and decreasing accreditation for resources, as described in more detail in Volume 4. This will reduce the amount of "excess" capacity held by Evergy Metro, and other load-serving entities and limits the possibility of meeting additional capacity requirements by purchasing market capacity. Evergy has seen evidence that other utilities are forecasting potential shortfalls in capacity due to these policy changes and are issuing RFPs and accelerating build plans. Additionally, all three Evergy utilities are forecasting significant load growth due to economic development. Evergy affiliates will no longer have excess capacity to sell as it will be absorbed by increasing load and capacity needs.

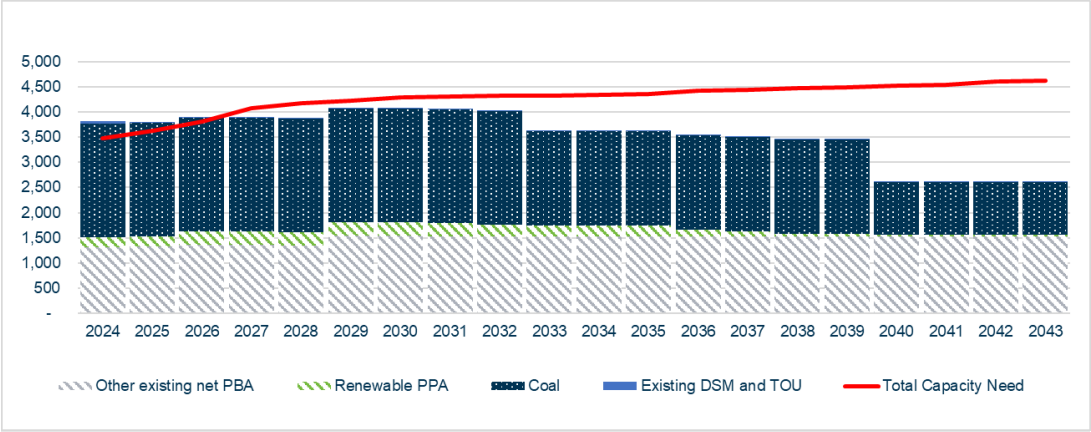
An objective of the resource plan is for Evergy Metro to meet its capacity needs with its owned/contracted resources with minimal reliance on market capacity purchases due to the changing market environment. Evergy Metro is forecasted to need summer capacity as early as 2026. Capacity needs are forecasted to grow over time due to load growth, increasing reserve margin requirements, the expiration of renewable PPAs, and retirements of coal resources (based on the 2023 Preferred Plan retirement dates). New demand-side management programs beginning in 2025 and resource builds available beginning in 2026 are needed to meet capacity needs. Evergy Metro's planning criteria was to meet the majority of the summer need with resource additions and demand-side programs, with only 50 MW of market capacity available annually beginning in 2028.

Figure 7: Evergy Metro Summer Capacity Position



Evergy Metro resource plans also include meeting the forecasted winter capacity requirement. Evergy expects SPP to impose a winter requirement beginning in the winter of 2026/2027. Evergy Metro is summer peaking, as are all of the Evergy utilities, and it has a relatively lower need in winter than summer due to its fleet characteristics and winter peak forecast. Because Evergy Kansas Central has significant winter capacity length (due to its resource mix and lower winter peak load ratio), Evergy Metro's resource planning includes the option to purchase winter market capacity through winter 2029/2030, after which it must be self-sufficient except for the annual market capacity allowance. Future demand-side management programs and renewable and storage resource builds provide less winter capacity than summer capacity, which is considered in developing the optimal resource plans to meet both winter and summer needs.

Figure 8: Evergy Metro Winter Capacity Position



2.2 Energy Needs

As discussed in Volume 4, Evergy Metro is a net seller of energy in the SPP market. The SPP market economically dispatches resources to minimize the variable costs to serve load on a short-term basis. Available resources offer energy into the SPP market based on their expected production costs. When a resource is dispatched by the SPP market it is because its marginal production costs are less than the SPP market price. If a resource is not dispatched, it is because the SPP market price is less than the resource's short-run marginal cost. The composition of Evergy Metro's resource fleet positions it to be a more frequent net seller than other Evergy utilities because it has relatively more baseload generation (coal, nuclear). These resources have lower production costs and, as a result, they are dispatched more frequently. If a utility is more frequently a net buyer from the market, it simply means that, at the times it is a net buyer, SPP market prices are cheaper than the production costs of its resources and thus buying from the market reduces overall costs for that utility.

Evergy expects all of its utility customers to continue to benefit from production cost savings through participation in the SPP market. However, planning is conducted in order to develop a future portfolio that is aligned with Evergy Metro's customers' energy needs and not overly dependent on the SPP market. The SPP market resource mix is transitioning with expected retirements of baseload (coal) generation and additions of renewables, which have low (sometimes negative) production costs but are weather dependent. Evergy utilities and others expect load growth driven by economic development. Planning for a future resource mix that matches expected energy needs (considering seasonal and time-of-day resource limitations) at the lowest cost will provide an economic and physical hedge for Evergy Metro customers. All alternative resource plans assume Evergy Metro transitions to limit net hourly purchases and sales of energy to 300 MW/h by 2031, representing approximately 10% of peak load or 15% of average load, to restrict the level of market dependence assumed in resource planning decisions.

2.3 Future Risks

2.3.1 Critical Uncertain Factors[5]

As part of the triennial IRP process, Evergy analyzed future uncertain factors to determine which uncertainties are critical to the performance of a resource plan. Evergy identified natural gas prices, CO_2 restrictions, and construction costs (including build and interconnection costs) as the three critical uncertain factors. High, mid, and low forecasts for these factors over the 20-year time horizon were used in testing alternate resource plans through different futures to calculate expected performance given these critical uncertainties.

The probability of each factor was determined based on the business judgment of Evergy subject-matter experts regarding the likelihood of the 20-year forecast levels. These probabilities were then approved by the Evergy executive team and reviewed with IRP stakeholders. The probabilities for natural gas price scenarios are consistent with the probabilities used in recent IRPs since the 2021 Triennial and reflect the expectation the lower natural gas prices are relatively more likely in the long-term than sustained high prices. The probabilities utilized for CO_2 emissions are also similar to weightings used in past years, but are adjusted slightly to reflect a higher relative weighting of low restrictions versus high. While the proposed Greenhouse Gas rules from the EPA ("GHG rules") are aligned with the high scenario and thus the high scenario is certainly possible, these rules have been evaluated as a discrete scenario in this IRP to develop resource plans which would comply with the proposed rules. In comparing plans' performance across scenarios, however, this high scenario can skew results dramatically given costs associated with carbon capture and sequestration (which are necessary to achieve required emissions reductions) are included only in that high scenario. This represents a different approach than what was done in recent IRPs (where emissions reductions in the high scenario were assumed to be possible without incremental costs) and thus the weighting was slightly reduced (from 20% to 15%) for this scenario to mitigate the impact of this single set of scenarios on expected value costs. Finally, construction costs are a new critical uncertain factor in this triennial filing and these probabilities were informed by

[5] 20 CSR 4240-22.060(7), 20 CSR 4240-22.060(7)(C)1B.

the statistical variation between the high/low and mid scenarios (e.g., the interconnection costs utilized represent the 25th and 75th percentile of the historical dataset).

Table 1: Critical Uncertain Factor Probability Weightings

	Natural Gas Price	CO_2 Emissions Restrictions	Construction Cost
Low	35%	25%	25%
Mid	50%	60%	50%
High	15%	15%	25%

A full discussion of the testing process and the results for each uncertain factor are included in Section 10.

2.3.2 Load Growth

Meeting future customer load, including energy and capacity needs is fundamental to resource planning. The load forecast is critical because it drives these needs. Higher load growth will drive the need to add more resources, while lower load growth may allow deferral of resource additions. Historically, load was added as a critical uncertain factor and used in the calculation of expected value, but the resource plans were not modified to reflect the capacity additions that would be needed or deferrals that would be enabled by the different load forecast.

In this IRP, Evergy Metro created alternative resource plans to analyze how the resource plan would change in response to load growth in the high and low forecast scenarios. These contingency plans will help assess how the resource plan may pivot in the future in response to the pace of electrification, technological improvement, and economic growth.

2.3.3 Future Environmental Policy

Risks of future environmental policy are included in the analysis of resource plans. Evergy complies with all local, state and federal environmental rules, and includes the expected costs of compliance in capital plans and operations and maintenance budgets, as described in Volume 4.

Evergy Metro also plans for probable environmental costs. The CO_2 emissions restrictions critical uncertain factor serves as a proxy for future emissions policy and impacts the expected value of the alternative resource plans.

There is also uncertainty of the outcome of the EPA's proposed GHG rules. Evergy is not able to estimate a probable effect of these rules given that significant concerns were raised in comments, a final rule has not been issued, there is a presidential election this year, and any rule may be further challenged in the administrative process and courts. Evergy estimates that a possible outcome may be CO_2 emissions reductions that resemble the high CO_2 emissions critical uncertain factor forecast. Additional alternative resource plans were developed to assess potential compliance paths based on the proposed rules.

2.3.4 Execution and Financial Risks

Evergy may experience risks in executing on its resource plan. Alternative resource plans were developed using informed judgment of the availability and timing of potential resource additions, considering construction and interconnection timelines. As described in Volume 4, cost and timing assumptions were based on offers in Evergy's 2023 RFP, research into self-build options, SPP's interconnection queue timelines and publicly available information.

The amount of resource additions was limited in each year of the planning period to respect expected capital budget spending considerations. All alternate resource plans developed using these limits are expected to maintain Evergy Metro's balance sheet stability and financial metrics. Variations in spending from year to year, within these limitations, are not expected to change Evergy Metro's financial ratios, as other components of the company capital budget can be adjusted to accommodate higher resource spends in some years (with lower spend years making room for other priorities).

Ratemaking treatment was not factored into the expected value of alternative resource plans. In practice, Evergy Metro may experience lags between spending capital and

recovering costs through rates, however, perfect ratemaking is assumed in resource plan economics.

Evergy Metro developed alternate resource plans to assess the next best planning options for execution contingencies. Additionally, alternate resource plans were created relaxing capital budget limits to illustrate more extreme planning strategies. These plans would not be expected to maintain financial ratios and would likely need alternative financing strategies. They would also have much greater execution risk due to siting and procurement challenges in adding large volumes of resources in some years.

2.3.5 Fossil Resource Risks

There are various pressures on Evergy's existing fossil resources, particularly its coal resources. Future / tightening environmental regulations, customer / community sustainability goals (e.g., Kansas City, Missouri climate goals), expiration of existing agreements (e.g., Crossroads transmission contract, Kansas Central's lease for La Cygne 2), and operational risk or large investments needed due to age all contribute to the need to plan for the retirement of the majority of Evergy's coal fleet, and portions of its gas fleet, over the coming decades. While some of these risks are directly incorporated into IRP analysis through costs, others are not quantified / quantifiable. The current Preferred Plan order of retirements is based on current expectations of economic viability, however, changes to future conditions could change the order or cause acceleration / deceleration of the pace of retirements.

Most simplistically, however, Evergy Metro does not believe it is prudent to plan for a future with no coal retirements even if the order / pace of retirements could change over time. The expected risk balance is that some level of coal retirements will occur. If Evergy Metro does not plan for enough capacity additions to replace a retirement it may be left without options and will be forced to add resources reactively at a higher cost and/or pay deficiency payments due to not meeting resource adequacy requirements. Alternative resource plans were developed to acknowledge this baseline risk and test changes in the pace/sequencing of retirements to determine economic tradeoffs.

2.3.6 Legal Mandates[6]

Evergy Metro complies with the Missouri Renewable Energy Standards. Most alternative resource plans developed exceed expected future requirements, and a plan was developed to evaluate minimum compliance with the rule. Evergy Metro does not have legal mandates for demand-side resources or other resources.

Section 3: Development of Alternative Resource Plans

Alternative resource plans (ARPs) were developed to assess base planning options, directed strategies, discrete scenarios, and contingency plans.

3.1 Base Planning Options

Base planning options include expected options available to Evergy Metro over the planning horizon. These include implementation of varying portfolios of demand-side management programs, accelerated or delayed retirements of coal resources, and addition of new renewable, storage, and thermal resources in a cadence that respects capital budget and commercial availability limitations.

Table 2: Base DSM Portfolio Options

Missouri DSM Portfolios
MAP
RAP
RAP Plus
RAP Minus
None

Table 3: Base Coal Retirement Options

Coal Resource	Base Retire Year	Early Retire Year	Late Retire Year
Iatan 1	2039	2030	n/a
Iatan 2	None	2030	n/a
La Cygne 1	2032	n/a	n/a
La Cygne 2	2039	2032	n/a
Hawthorn 5	None	2027	n/a

[6] 20 CSR 4240-22.060(3)(A)4-5

Table 4: Base Resource Addition Options

Resource Addition Type	Earliest Year Available
Battery-Wind	2026
Battery-Gen	2026
Wind	2026
Solar	2027
Combined Cycle	2028
Combustion Turbine	2028

3.2 Directed Strategies

Evergy Metro also developed several scenarios to reflect how changes to planning strategy would affect planned additions and economics, including the following ARPs:

- Plan for high natural gas – high carbon dioxide emissions limit future, with availability of combined-cycle with carbon capture beginning in 2035, and nuclear SMR beginning in 2039
- Plan for low natural gas – low (no) carbon dioxide emissions limit future
- Plan with only renewable additions necessary to comply with Renewable Energy Standards (RES) requirements
- Plan with only renewable and storage additions
- Plan with earliest retirement of coal fleet and only renewable and storage additions

3.3 Discrete Scenarios

Evergy Metro developed two scenarios intended to be extremes in planning strategy. One reflects a possible implementation of the EPA GHG rule, and optimizes the retirement and new addition decisions based on the high natural gas, high carbon dioxide emissions restriction future. The second reflects a different future with reduced expectations of environmental rules, including no emissions restrictions and no requirements for selective catalytic reduction (SCR) addition (where applicable). This plan is optimized using the low natural gas, low (no) carbon dioxide emissions future forecast.

3.4 Contingency Plans

Evergy Metro developed contingency plans to understand how optimal resource additions might vary based on risks around planning assumptions. One risk is near-term execution of the resource plan. If Evergy Metro is unable to acquire or develop a resource in the expected timeline, or does not receive regulatory approval for the resource, it may have to make changes to its plan. The two scenarios considering these near-term risks are:

- No 2027 solar build
- Kansas DSM programs end after the approved 4 years

The other risk that Evergy Metro considered through contingency plans is that the long-term load forecast may differ from the base planning assumption. Higher or lower load growth over the planning horizon may change the optimal timing, type, and amount of resource additions. The two alternate load forecasts considered were:

- High Load – including electrification
- Mid Load forecast with no new economic development load included
- Low Load

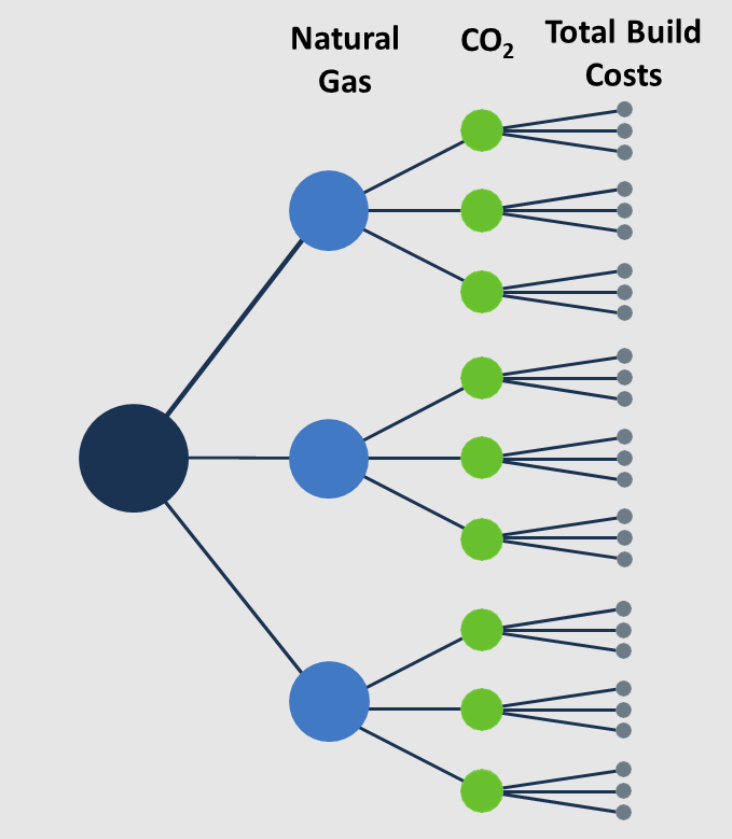
3.5 Modeling Approach

Evergy Metro used a three-step approach in modeling each ARP. First, a scenario was determined, based on the planning options discussed above. Next, the plan for resource additions was created for each scenario through capacity expansion modeling. Capacity expansion modeling determines the lowest total cost resource plan that meets capacity and energy needs (and other criteria if applicable), for the given scenario.

The lowest cost resource plan is based on the planning assumptions used (typically the base or “mid” case for each critical uncertain factor). However, to incorporate the risk of different future uncertainties, the optimized resource plan was then evaluated in each critical uncertain factor combination (endpoint) to determine the expected cost in that future. The resource plan meets capacity and energy needs in every endpoint, but will have differing economics due to changes in expected production costs, costs to serve load, and fixed costs. The natural gas price and carbon dioxide restriction critical uncertain factors both affect market prices, resource costs, and expected economic dispatch in production cost model. The construction cost critical uncertain factor affects fixed costs of resource additions.

The forecasted revenue requirements associated with each endpoint were calculated based on the modeling results. The metric net present value revenue requirement (NPVRR) can be compared to determine the economic differences between plans at different endpoints.

Figure 9: Critical Uncertain Factor Scenarios



Evergy Metro assigned probability weightings to each critical uncertain factor based on subject-matter expert and management team's expectations for the likelihood of each forecast. Weighted average NPVRR calculations were made using these probabilities, as a metric for expected value of the plan considering future uncertainties.

3.5.1 Capacity Expansion Modeling[7]

Evergy Metro developed alternative resource plans through capacity expansion planning. Capacity expansion planning involves using a long-term wholesale market simulation model (Evergy Metro utilizes PLEXOS) which is designed to generate the lowest-cost resource plan given a set of resource options, a given market scenario (e.g., natural gas prices, wholesale energy prices, emissions constraints), and a forecasted capacity requirement (i.e., forecasted load plus planning reserve margin). Evergy Metro's goal in this IRP was to use Capacity Expansion to the fullest extent practical in selecting the lowest-cost resource additions. To that end, no supply-side resource additions were "hard-coded" into pre-made resource plans for the purpose of arriving at Evergy Metro's Preferred Plan. The only portion of the Alternative Resource Plans used in this filing which were manually tested were plant retirements and demand-side management portfolio additions. This is so that it is easier to compare different options side-by-side to see what trade-offs may exist between decisions. Even in testing these decisions, however, Capacity Expansion was still used to develop the lowest-cost portfolio of supply-side resources (e.g., if a higher level of DSM was assumed, then Capacity Expansion would build less resources as part of the optimized resource plan). This approach makes comparison somewhat more complicated than the past approach where plans could be compared on a truly apples-to-apples basis (i.e., because only one item in the whole plan changed and thus the difference in cost between the two plans is driven specifically by that one item), but it also more accurately depicts the integrated nature of resource planning, where every decision has an impact on future decisions and a portfolio should be viewed holistically as opposed to looking at an individual decision in a vacuum.

[7] 20 CSR 4240-22.060(4)(H)

Unless otherwise noted in the description, capacity expansion modeling was performed using the “Mid-Mid-Mid” endpoint, based on the Mid natural gas forecast, Mid construction costs, and Mid level of carbon restrictions. This was, again, to provide easier comparisons between resource plans because a capacity expansion model will often generate different resource plans in different market scenarios. Evergy believes this approach provides a viable assessment of our current “base” expectations and that using these capacity expansion results, with revenue requirements for these Alternative Resource Plans calculated across all 27 endpoints, enables a robust analysis of these “base-case” Alternative Resource Plans across a wide variety of potential future scenarios.

Section 4: Alternative Resource Plans & Rankings

4.1 Summary of Alternative Resource Plans

Table 5: Evergy Metro Alternative Resource Plan Name Key

Demand Response Potential	Retirements	Coal to NG	Other
A. RAP MO, Extend KS DSM	A. PP 2023 retirement dates	A. None	A. No Economic Development
B. MAP MO, Extend KS DSM	B. Retire Iatan1 2030		C. No 2027 Solar
C. RAP Plus MO, Extend KS DSM	C. Retire Hawthorn 5 2027		D. High/High
D. RAP Minus MO, Extend KS DSM	D. Retire La Cygne 2 2032		E. Low/Low
E. No DSM MO, Extend KS DSM	E. All early retirements		F. High load
F. No TOU, No DSM MO, Extend KS DSM	F. No retirements		G. Low load
G. RAP Plus MO, KEEIA Only DSM			I. Only renewable/storage build, no budget constraint
H. No DSM MO, KEEIA Only DSM			J. RES Only
			K. Allow SMR 2039+
			L. Allow SMR 2038+

Table 6: Alternative Resource Plan Descriptions[8]

Plan Name	DSM Level	Retirements	Renewable Additions		Storage Additions	Thermal Additions
			Wind	Solar		
Metro AAAB	RAP MO, Extend KS DSM	La Cygne 1: 2032 La Cygne 2: 2039 Iatan 1: 2039	150 MW 2026 150 MW 2029 150 MW 2030 150 MW 2031 150 MW 2033 150 MW 2034 150 MW 2035	300 MW 2027 150 MW 2028 150 MW 2041 300 MW 2042 150 MW 2043		415 MW CT 2032 325 MW CC 2036 325 MW CC 2038 415 MW CT 2039
Metro BAAB	MAP MO, Extend KS DSM	La Cygne 1: 2032 La Cygne 2: 2039 Iatan 1: 2039	150 MW 2029 150 MW 2030 150 MW 2031 150 MW 2033 150 MW 2034 150 MW 2035 150 MW 2040 150 MW 2041	300 MW 2027 150 MW 2028 150 MW 2042 300 MW 2043		415 MW CT 2032 325 MW CC 2037 325 MW CC 2038 325 MW CC 2039
Metro BEAI	MAP MO, Extend KS DSM	Hawthorn 5: 2027 Iatan 1: 2030 Iatan 2: 2030 La Cygne 1: 2032 La Cygne 2: 2032	300 MW 2030 150 MW 2031 1200 MW 2032 1500 MW 2033 600 MW 2041 1500 MW 2042	600 MW 2042	150 MW BW 2026 150 MW BW 2027 600 MW BW 2028 1500 MW BG 2030 300 MW BG 2031 1350 MW BG 2032 1500 MW BG 2033 1200 MW BG 2034 1050 MW BW 2038 1500 MW BW 2039 1500 MW BW 2040 600 MW BG 2040 1500 MW BW 2041 1500 MW BG 2041 1500 MW BW 2042 1500 MW BG 2042	
Metro CAAA	RAP+ MO, Extend KS DSM	La Cygne 1: 2032 La Cygne 2: 2039 Iatan 1: 2039	150 MW 2031 150 MW 2032	300 MW 2033 300 MW 2034 300 MW 2042 150 MW 2043		325 MW CC 2037 325 MW CC 2038 415 MW CT 2039
Metro CAAB	RAP+ MO, Extend KS DSM	La Cygne 1: 2032 La Cygne 2: 2039 Iatan 1: 2039	150 MW 2029 150 MW 2030 150 MW 2031 150 MW 2033 150 MW 2034 150 MW 2035 150 MW 2042	300 MW 2027 150 MW 2028 150 MW 2040		415 MW CT 2032 325 MW CC 2036 325 MW CC 2038 325 MW CC 2039 325 MW CC 2041
Metro CAAC	RAP+ MO, Extend KS DSM	La Cygne 1: 2032 La Cygne 2: 2039 Iatan 1: 2039	150 MW 2029 150 MW 2030 150 MW 2031 150 MW 2033 150 MW 2034 150 MW 2035 150 MW 2040 150 MW 2042	300 MW 2028	150 MW BW 2026	415 MW CT 2032 325 MW CC 2037 325 MW CC 2038 325 MW CC 2039 325 MW CC 2041
Metro CAAD	RAP+ MO, Extend KS DSM	La Cygne 1: 2032 La Cygne 2: 2039 Iatan 1: 2039	150 MW 2026 150 MW 2029 150 MW 2030 150 MW 2031 150 MW 2033 150 MW 2034 150 MW 2035 150 MW 2036 150 MW 2038	300 MW 2027 300 MW 2028 150 MW 2042	150 MW BW 2041 150 MW BG 2041 150 MW BG 2042	415 MW CT 2032 325 MW CC 2037 300 MW SMR 2039 300 MW SMR 2040

[8] 20 CSR 4240-22.060(3)(D), BW refers to battery at wind node, BG refers to battery at generation node

Metro CAAE	RAP+ MO, Extend KS DSM	La Cygne 1: 2032 La Cygne 2: 2039 Iatan 1: 2039		300 MW 2027 150 MW 2028	150 MW BW 2042	415 MW CT 2032 325 MW CC 2035 415 MW CT 2038 415 MW CT 2039
Metro CAAF	RAP+ MO, Extend KS DSM	La Cygne 1: 2032 La Cygne 2: 2039 Iatan 1: 2039	150 MW 2029	300 MW 2027 300 MW 2033 300 MW 2040 300 MW 2042 300 MW 2043	150 MW BG 2026 150 MW BW 2026	325 MW CC 2028 325 MW CC 2030 325 MW CC 2031 325 MW CC 2032 325 MW CC 2034 325 MW CC 2035 325 MW CC 2036 415 MW CT 2037 415 MW CT 2038 415 MW CT 2039 325 MW CC 2041
Metro CAAG	RAP+ MO, Extend KS DSM	La Cygne 1: 2032 La Cygne 2: 2039 Iatan 1: 2039	150 MW 2030 150 MW 2031 150 MW 2033 150 MW 2034 150 MW 2041 150 MW 2042	300 MW 2027		325 MW CC 2032 325 MW CC 2037 325 MW CC 2038 325 MW CC 2039
Metro CAAI	RAP+ MO, Extend KS DSM	La Cygne 1: 2032 La Cygne 2: 2039 Iatan 1: 2039	1050 MW 2032 1500 MW 2033 150 MW 2039 300 MW 2042	300 MW 2027 150 MW 2028	450 MW BG 2032 600 MW BG 2033 900 MW BW 2038 1500 MW BG 2039 1500 MW BW 2039 1200 MW BW 2040 1050 MW BG 2041 900 MW BW 2041 1200 MW BG 2042 1500 MW BW 2042	
Metro CAAK	RAP+ MO, Extend KS DSM	La Cygne 1: 2032 La Cygne 2: 2039 Iatan 1: 2039	150 MW 2029 150 MW 2030 150 MW 2031 150 MW 2033 150 MW 2034 150 MW 2035 150 MW 2042	300 MW 2027 150 MW 2028 150 MW 2040		415 MW CT 2032 325 MW CC 2036 325 MW CC 2038 325 MW CC 2039 325 MW CC 2041
Metro CAAL	RAP+ MO, Extend KS DSM	La Cygne 1: 2032 La Cygne 2: 2039 Iatan 1: 2039	150 MW 2029 150 MW 2030 150 MW 2031 150 MW 2033 150 MW 2034 150 MW 2035 150 MW 2042	300 MW 2027 150 MW 2028 150 MW 2040		415 MW CT 2032 325 MW CC 2036 325 MW CC 2038 325 MW CC 2039 325 MW CC 2041
Metro CBAB	RAP+ MO, Extend KS DSM	Iatan 1: 2030 La Cygne 1: 2032 La Cygne 2: 2039	150 MW 2026 150 MW 2029 150 MW 2031 150 MW 2033 150 MW 2034 150 MW 2040 150 MW 2041 150 MW 2042	300 MW 2027 150 MW 2028 150 MW 2038		415 MW CT 2030 415 MW CT 2032 325 MW CC 2035 325 MW CC 2039
Metro CCAB	RAP+ MO, Extend KS DSM	La Cygne 1: 2032 La Cygne 2: 2032 Iatan 1: 2039	150 MW 2029 150 MW 2030 150 MW 2033 150 MW 2034 150 MW 2035 150 MW 2040 150 MW 2042	300 MW 2027 150 MW 2028 150 MW 2038		325 MW CC 2031 415 MW CT 2032 325 MW CC 2036 325 MW CC 2039 325 MW CC 2041
Metro CDAB	RAP+ MO, Extend KS DSM	Hawthorn 5 2027 La Cygne 1: 2032 La Cygne 2: 2039 Iatan 1: 2039	150 MW 2029 150 MW 2030 150 MW 2031 150 MW 2033 150 MW 2034 150 MW 2035 150 MW 2040	300 MW 2027 300 MW 2042	150 MW BW 2026 150 MW BG 2026	415 MW CT 2028 415 MW CT 2032 325 MW CC 2036 325 MW CC 2038 415 MW CT 2039 325 MW CC 2041

Metro CEAB	RAP+ MO, Extend KS DSM	Hawthorn 5 2027 Iatan 1: 2030 Iatan 2: 2030 La Cygne 1: 2032 La Cygne 2: 2032	150 MW 2033 150 MW 2035 150 MW 2036 150 MW 2037 150 MW 2038 150 MW 2040 150 MW 2041	300 MW 2042 150 MW 2043	150 MW BG 2026 150 MW BW 2026 300 MW BW 2027	415 MW CT 2028 415 MW CT 2029 415 MW CT 2030 325 MW CC 2031 415 MW CT 2032 325 MW CC 2034 325 MW CC 2039
Metro CFAB	RAP+ MO, Extend KS DSM		150 MW 2029 150 MW 2030 150 MW 2031 150 MW 2032 150 MW 2033 150 MW 2034 150 MW 2035 150 MW 2041 150 MW 2042	300 MW 2027 150 MW 2028 150 MW 2040		325 MW CC 2036
Metro CFAE	RAP+ MO, Extend KS DSM			300 MW 2027 150 MW 2028 150 MW 2043		415 MW CT 2035
Metro DAAB	RAP- MO, Extend KS DSM	La Cygne 1: 2032 La Cygne 2: 2039 Iatan 1: 2039	150 MW 2029 150 MW 2030 150 MW 2031 150 MW 2033 150 MW 2034 150 MW 2035 150 MW 2040	150 MW 2027 150 MW 2028 300 MW 2041 300 MW 2042	150 MW BW 2026	415 MW CT 2032 325 MW CC 2036 325 MW CC 2038 415 MW CT 2039
Metro EAAB	No DSM MO, Extend KS DSM	La Cygne 1: 2032 La Cygne 2: 2039 Iatan 1: 2039	150 MW 2029 150 MW 2030 150 MW 2031 150 MW 2033 150 MW 2034 150 MW 2040 150 MW 2041	300 MW 2027 300 MW 2028 300 MW 2042	150 MW BW 2026	415 MW CT 2032 325 MW CC 2035 325 MW CC 2037 325 MW CC 2038 325 MW CC 2039
Metro EAAJ	No DSM MO, Extend KS DSM	La Cygne 1: 2032 La Cygne 2: 2039 Iatan 1: 2039		8 MW 2034	150 MW BG 2026 150 MW BW 2026 150 MW BW 2027	325 MW CC 2028 325 MW CC 2032 325 MW CC 2036 325 MW CC 2037 325 MW CC 2038 325 MW CC 2040
Metro FAAB	No TOU, No DSM MO, Extend KS DSM	La Cygne 1: 2032 La Cygne 2: 2039 Iatan 1: 2039	150 MW 2029 150 MW 2030 150 MW 2031 150 MW 2033 150 MW 2034 150 MW 2040	150 MW 2027 300 MW 2028 300 MW 2041 300 MW 2042	150 MW BG 2026 150 MW BW 2026	325 MW CC 2032 325 MW CC 2035 325 MW CC 2037 325 MW CC 2038 325 MW CC 2039
Metro GAAB	RAP+ MO, KEEIA Only DSM	La Cygne 1: 2032 La Cygne 2: 2039 Iatan 1: 2039	150 MW 2029 150 MW 2030 150 MW 2031 150 MW 2033 150 MW 2034 150 MW 2041 150 MW 2042	300 MW 2027 300 MW 2028 150 MW 2040		415 MW CT 2032 325 MW CC 2035 325 MW CC 2037 325 MW CC 2038 325 MW CC 2039
Metro HAAB	No DSM MO, KEEIA Only DSM	La Cygne 1: 2032 La Cygne 2: 2039 Iatan 1: 2039	150 MW 2029 150 MW 2030 150 MW 2031 150 MW 2033 150 MW 2035 150 MW 2040 150 MW 2041	300 MW 2027 300 MW 2028 300 MW 2042 150 MW 2043	150 MW BG 2026 150 MW BW 2026	415 MW CT 2032 325 MW CC 2034 325 MW CC 2037 325 MW CC 2038 415 MW CT 2039

4.2 Overall Plan Rankings

Table 7: Metro Overall Plan Rankings

Rank	Plan	NPVRR	Difference	Description
1	CAAB	23,144		RAP Plus
2	AAAB	23,190	47	RAP
3	CCAB	23,217	73	Retire La Cygne 2 2032
4	GAAB	23,271	128	RAP Plus MO, KEEIA Only DSM
5	CAAC	23,274	130	No 2027 Solar
6	CBAB	23,307	163	Retire Iatan 1 2030
7	DAAB	23,337	193	RAP Minus
8	BAAB	23,370	226	MAP
9	EAAB	23,394	250	No DSM MO
10	FAAB	23,516	372	No TOU, No DSM MO
11	CAAD	23,574	430	High/High
12	HAAB	23,685	542	No DSM MO, KEEIA Only DSM
13	CDAB	23,881	738	Retire Hawthorn 5 2027
14	CAAE	24,936	1,792	Low/Low
15	CEAB	25,029	1,885	All early retirements
16	EAAJ	25,079	1,935	RES only
17	CFAE	25,130	1,986	Low/Low, no retirements
18	CAAI	26,316	3,172	Only renewable/storage build, no budget
19	BEAI	30,424	7,280	MAP; Ret all early; Only renewable/storage build, no budget

4.3 Rankings by CO_2 Emissions Restriction

Table 8: High CO_2 Emissions Restrictions Rankings

Rank	Plan	NPVRR	Difference	Description
1	CAAB	23,864		RAP Plus
2	CCAB	23,918	54	Retire La Cygne 2 2032
3	CAAD	23,948	84	High/High
4	GAAB	24,025	161	RAP Plus MO, KEEIA Only DSM
5	AAAB	24,097	233	RAP
6	CAAC	24,117	253	No 2027 Solar
7	BAAB	24,135	271	MAP
8	EAAB	24,144	280	No DSM MO
9	FAAB	24,283	420	No TOU, No DSM MO
10	CBAB	24,422	558	Retire Iatan 1 2030
11	DAAB	24,453	589	RAP Minus
12	HAAB	24,585	721	No DSM MO, KEEIA Only DSM
13	CDAB	24,721	857	Retire Hawthorn 5 2027
14	EAAJ	25,598	1,734	RES only
15	CEAB	25,850	1,986	All early retirements
16	CAAI	26,717	2,854	Only renewable/storage build, no budget
17	CAAE	27,769	3,905	Low/Low
18	CFAE	28,867	5,003	Low/Low, no retirements
19	BEAI	30,935	7,071	MAP; Ret all early; Only renewable/storage build, no budget

Table 9: Mid CO_2 Emissions Restrictions Rankings

Rank	Plan	NPVRR	Difference	Description
1	CAAB	23,111		RAP Plus
2	AAAB	23,122	11	RAP
3	CCAB	23,186	75	Retire La Cygne 2 2032
4	CBAB	23,210	99	Retire Iatan 1 2030
5	CAAC	23,230	119	No 2027 Solar
6	GAAB	23,243	132	RAP Plus MO, KEEIA Only DSM
7	DAAB	23,259	148	RAP Minus
8	BAAB	23,318	207	MAP
9	EAAB	23,363	252	No DSM MO
10	FAAB	23,488	377	No TOU, No DSM MO
11	CAAD	23,532	421	High/High
12	HAAB	23,665	554	No DSM MO, KEEIA Only DSM
13	CDAB	23,797	686	Retire Hawthorn 5 2027
14	CEAB	24,916	1,805	All early retirements
15	CAAE	25,249	2,138	Low/Low
16	CFAE	25,508	2,397	Low/Low, no retirements
17	EAAJ	25,761	2,650	RES only
18	CAAI	26,259	3,148	Only renewable/storage build, no budget
19	BEAI	30,336	7,225	MAP; Ret all early; Only renewable/storage build, no budget

Table 10: Low CO_2 Emissions Restrictions Rankings

Rank	Plan	NPVRR	Difference	Description
1	CFAE	21,980		Low/Low, no retirements
2	CAAE	22,485	505	Low/Low
3	CAAB	22,790	810	RAP Plus
4	AAAB	22,811	831	RAP
5	DAAB	22,854	874	RAP Minus
6	CBAB	22,869	889	Retire Iatan 1 2030
7	CCAB	22,870	889	Retire La Cygne 2 2032
8	CAAC	22,874	894	No 2027 Solar
9	GAAB	22,887	907	RAP Plus MO, KEEIA Only DSM
10	EAAB	23,018	1,038	No DSM MO
11	BAAB	23,036	1,055	MAP
12	FAAB	23,122	1,142	No TOU, No DSM MO
13	EAAJ	23,129	1,148	RES only
14	HAAB	23,195	1,215	No DSM MO, KEEIA Only DSM
15	CAAD	23,450	1,470	High/High
16	CDAB	23,580	1,600	Retire Hawthorn 5 2027
17	CEAB	24,807	2,827	All early retirements
18	CAAI	26,211	4,230	Only renewable/storage build, no budget
19	BEAI	30,328	8,348	MAP; Ret all early; Only renewable/storage build, no budget

Table 11: High Natural Gas Rankings

Rank	Plan	NPVRR	Difference	Description
1	AAAB	23,552		RAP
2	CAAB	23,562	10	RAP Plus
3	CCAB	23,670	118	Retire La Cygne 2 2032
4	GAAB	23,713	160	RAP Plus MO, KEEIA Only DSM
5	CAAC	23,716	164	No 2027 Solar
6	CAAD	23,726	174	High/High
7	CBAB	23,755	203	Retire Iatan 1 2030
8	BAAB	23,763	211	MAP
9	DAAB	23,792	240	RAP Minus
10	EAAB	23,833	281	No DSM MO
11	FAAB	23,969	417	No TOU, No DSM MO
12	HAAB	24,149	597	No DSM MO, KEEIA Only DSM
13	CDAB	24,400	848	Retire Hawthorn 5 2027
14	CAAE	25,575	2,023	Low/Low
15	CFAE	25,724	2,172	Low/Low, no retirements
16	EAAJ	25,797	2,244	RES only
17	CEAB	26,122	2,569	All early retirements
18	CAAI	26,290	2,738	Only renewable/storage build, no budget
19	BEAI	30,363	6,811	MAP; Ret all early; Only renewable/storage build, no budget

Table 12: Mid Natural Gas Rankings

Rank	Plan	NPVRR	Difference	Description
1	CAAB	23,140		RAP Plus
2	AAAB	23,191	51	RAP
3	CCAB	23,212	72	Retire La Cygne 2 2032
4	GAAB	23,267	127	RAP Plus MO, KEEIA Only DSM
5	CAAC	23,270	129	No 2027 Solar
6	CBAB	23,304	164	Retire Iatan 1 2030
7	DAAB	23,331	191	RAP Minus
8	BAAB	23,371	230	MAP
9	EAAB	23,392	251	No DSM MO
10	FAAB	23,512	371	No TOU, No DSM MO
11	CAAD	23,573	433	High/High
12	HAAB	23,674	534	No DSM MO, KEEIA Only DSM
13	CDAB	23,873	732	Retire Hawthorn 5 2027
14	CAAE	24,896	1,755	Low/Low
15	CEAB	24,978	1,838	All early retirements
16	EAAJ	25,022	1,881	RES only
17	CFAE	25,081	1,940	Low/Low, no retirements
18	CAAI	26,307	3,167	Only renewable/storage build, no budget
19	BEAI	30,408	7,268	MAP; Ret all early; Only renewable/storage build, no budget

Table 13: Low Natural Gas Rankings

Rank	Plan	NPVRR	Difference	Description
1	CAAB	22,969		RAP Plus
2	CCAB	23,028	59	Retire La Cygne 2 2032
3	AAAB	23,034	64	RAP
4	GAAB	23,088	119	RAP Plus MO, KEEIA Only DSM
5	CAAC	23,091	121	No 2027 Solar
6	CBAB	23,118	148	Retire Iatan 1 2030
7	DAAB	23,149	179	RAP Minus
8	BAAB	23,200	231	MAP
9	EAAB	23,209	240	No DSM MO
10	FAAB	23,327	358	No TOU, No DSM MO
11	HAAB	23,503	533	No DSM MO, KEEIA Only DSM
12	CAAD	23,509	540	High/High
13	CDAB	23,671	702	Retire Hawthorn 5 2027
14	CEAB	24,633	1,664	All early retirements
15	CAAE	24,720	1,751	Low/Low
16	EAAJ	24,852	1,883	RES only
17	CFAE	24,945	1,976	Low/Low, no retirements
18	CAAI	26,339	3,370	Only renewable/storage build, no budget
19	BEAI	30,472	7,503	MAP; Ret all early; Only renewable/storage build, no budget

Table 14: High Construction Costs Rankings

Rank	Plan	NPVRR	Difference	Description
1	CAAB	23,722		RAP Plus
2	CCAB	23,784	62	Retire La Cygne 2 2032
3	CAAC	23,831	109	No 2027 Solar
4	AAAB	23,857	135	RAP
5	GAAB	23,883	161	RAP Plus MO, KEEIA Only DSM
6	DAAB	23,927	205	RAP Minus
7	CBAB	23,949	227	Retire Iatan 1 2030
8	BAAB	23,963	241	MAP
9	EAAB	24,049	327	No DSM MO
10	FAAB	24,131	409	No TOU, No DSM MO
11	HAAB	24,390	668	No DSM MO, KEEIA Only DSM
12	CAAD	24,520	798	High/High
13	CDAB	24,574	852	Retire Hawthorn 5 2027
14	CAAE	25,214	1,491	Low/Low
15	EAAJ	25,305	1,583	RES only
16	CFAE	25,330	1,608	Low/Low, no retirements
17	CEAB	25,703	1,981	All early retirements
18	CAAI	28,058	4,336	Only renewable/storage build, no budget
19	BEAI	33,106	9,384	MAP; Ret all early; Only renewable/storage build, no budget

Table 15: Mid Construction Costs Rankings

Rank	Plan	NPVRR	Difference	Description
1	CAAB	23,150		RAP Plus
2	AAAB	23,193	43	RAP
3	CCAB	23,216	67	Retire La Cygne 2 2032
4	CAAC	23,270	121	No 2027 Solar
5	GAAB	23,280	130	RAP Plus MO, KEEIA Only DSM
6	CBAB	23,309	160	Retire Iatan 1 2030
7	DAAB	23,330	180	RAP Minus
8	BAAB	23,374	224	MAP
9	EAAB	23,392	242	No DSM MO
10	FAAB	23,503	353	No TOU, No DSM MO
11	CAAD	23,553	404	High/High
12	HAAB	23,669	519	No DSM MO, KEEIA Only DSM
13	CDAB	23,866	716	Retire Hawthorn 5 2027
14	CAAE	24,937	1,787	Low/Low
15	CEAB	24,988	1,838	All early retirements
16	EAAJ	25,047	1,898	RES only
17	CFAE	25,128	1,978	Low/Low, no retirements
18	CAAI	26,109	2,959	Only renewable/storage build, no budget
19	BEAI	30,003	6,854	MAP; Ret all early; Only renewable/storage build, no budget

Table 16: Low Constructions Costs Rankings

Rank	Plan	NPVRR	Difference	Description
1	AAAB	22,519		RAP
2	CAAB	22,553	35	RAP Plus
3	GAAB	22,644	125	RAP Plus MO, KEEIA Only DSM
4	CCAB	22,649	130	Retire La Cygne 2 2032
5	CBAB	22,658	139	Retire Iatan 1 2030
6	CAAD	22,667	148	High/High
7	CAAC	22,724	206	No 2027 Solar
8	EAAB	22,743	224	No DSM MO
9	DAAB	22,760	241	RAP Minus
10	BAAB	22,769	250	MAP
11	FAAB	22,927	408	No TOU, No DSM MO
12	HAAB	23,012	494	No DSM MO, KEEIA Only DSM
13	CDAB	23,220	701	Retire Hawthorn 5 2027
14	CEAB	24,437	1,918	All early retirements
15	CAAE	24,657	2,138	Low/Low
16	EAAJ	24,915	2,396	RES only
17	CFAE	24,933	2,415	Low/Low, no retirements
18	CAAI	24,987	2,469	Only renewable/storage build, no budget
19	BEAI	28,583	6,064	MAP; Ret all early; Only renewable/storage build, no budget

Section 5: Analysis of Base Planning Decisions

5.1 Comparison of Demand-Side Management Potential Portfolio Options

5.1.1 Overview of Demand-Side Management Portfolios[9]

Future demand-side programs were assumed to begin providing capacity and energy value beginning in 2025 and continue over the planning horizon, consistent with the assumptions in Volume 5. The load and NSI values shown here are consistent with the assumptions in Volume 3, but also include the expected impact of economic development load which was not included in those forecasts.

[9] 20 CSR 4240-22.060(4)(B)1, 20 CSR 4240-22.060(4)(B)2, 20 CSR 4240-22.060(4)(B)4, 20 CSR 4240-22.060(4)(B)5

Figure 10: Metro Peak Load (MAP)

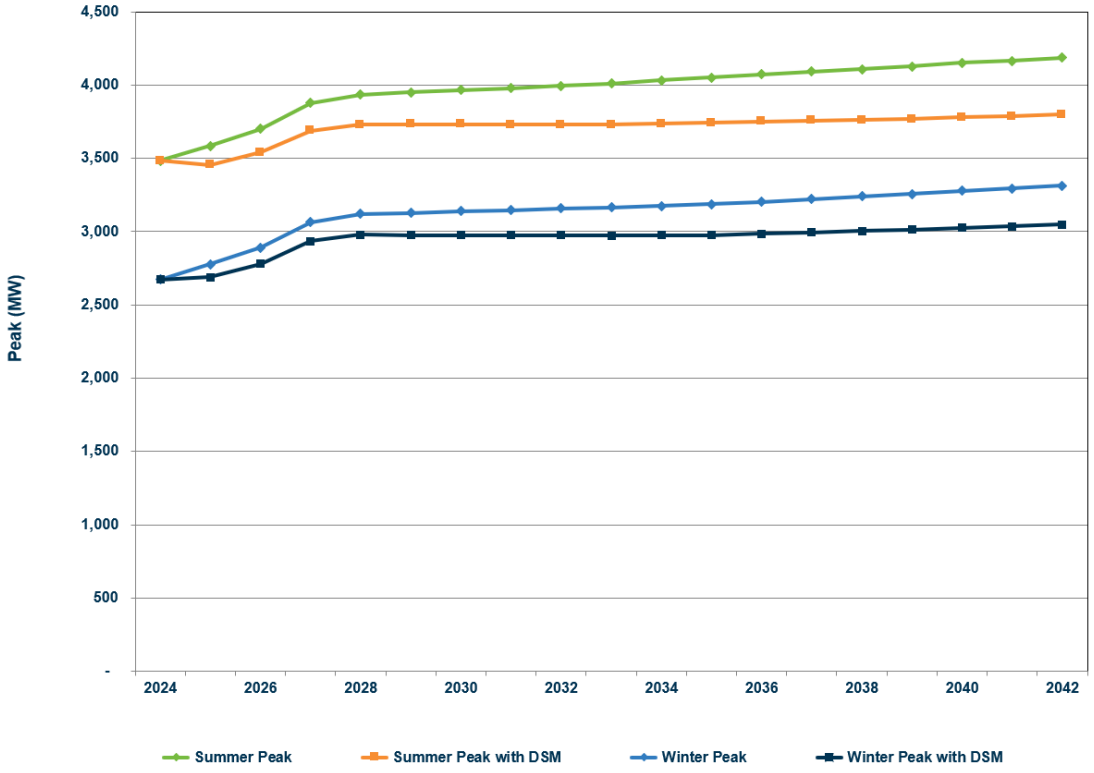


Figure 11: Metro DSM Capacity (MAP)

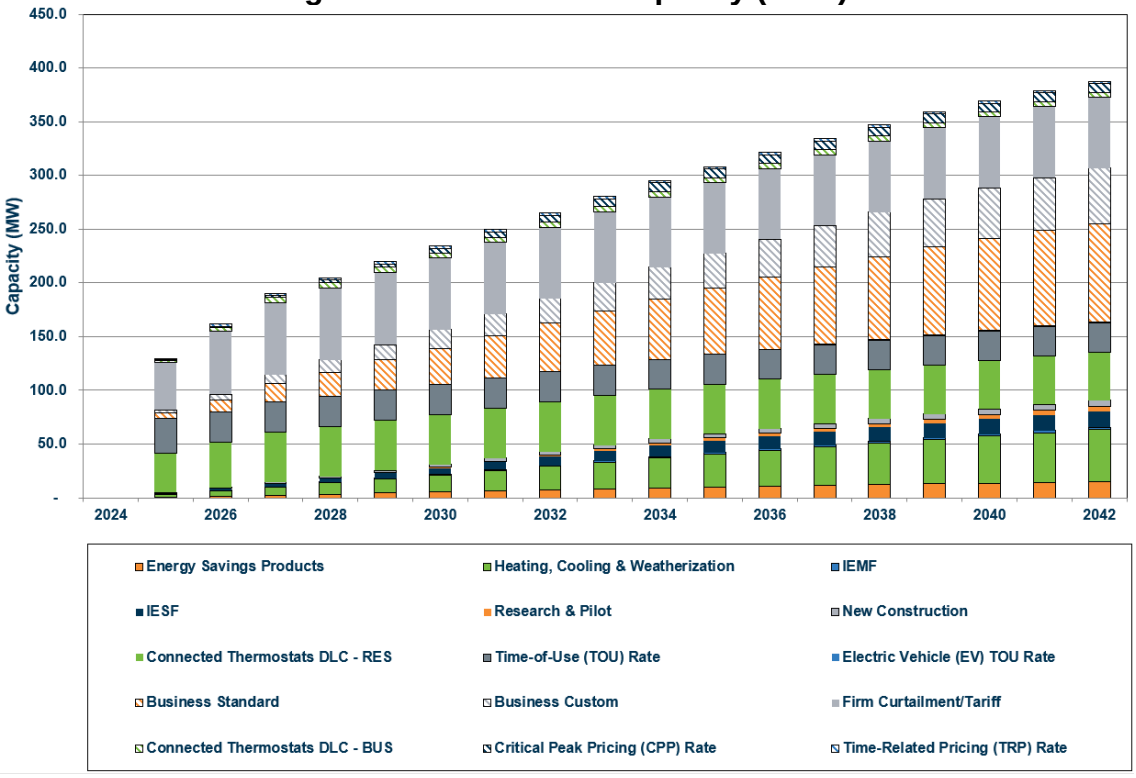


Figure 12: Metro Gross NSI (MAP)

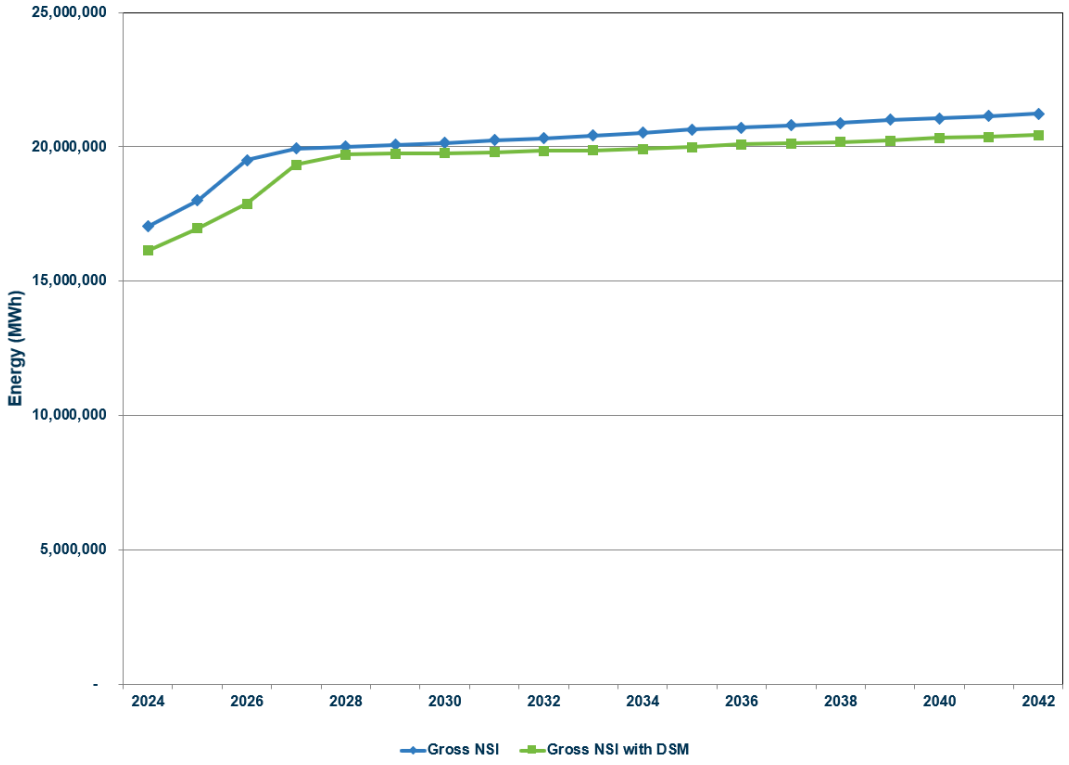


Figure 13: Metro DSM Energy (MAP)

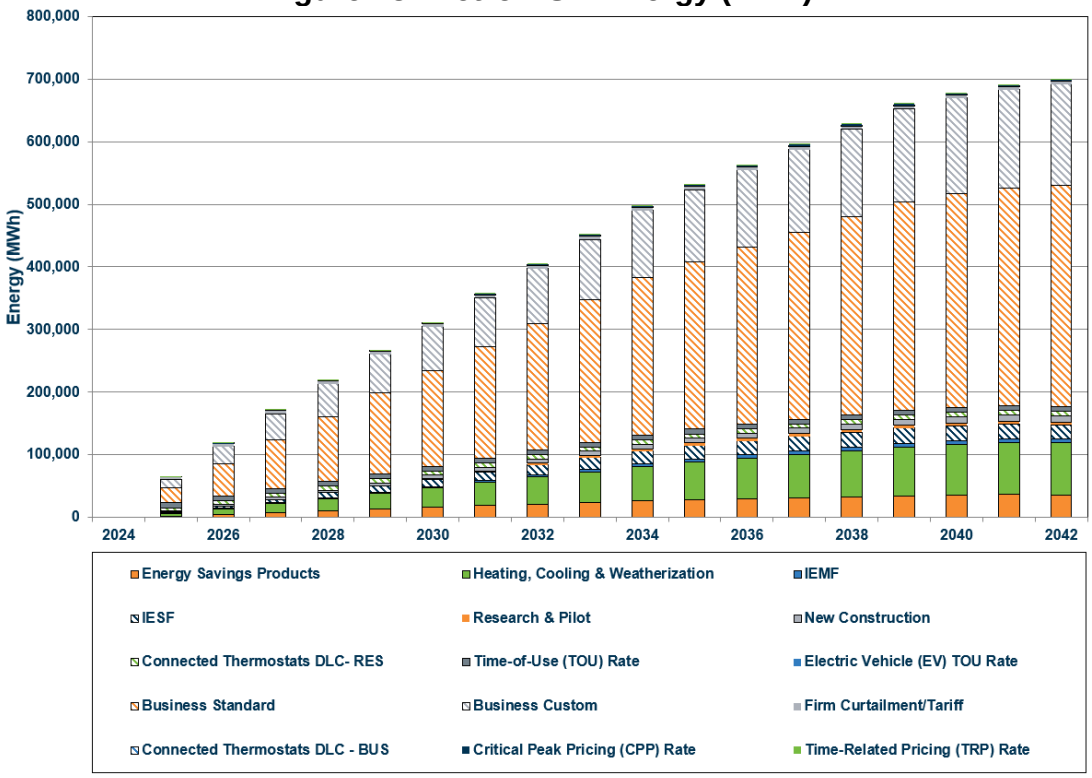


Figure 14: Metro Peak Load (RAP)

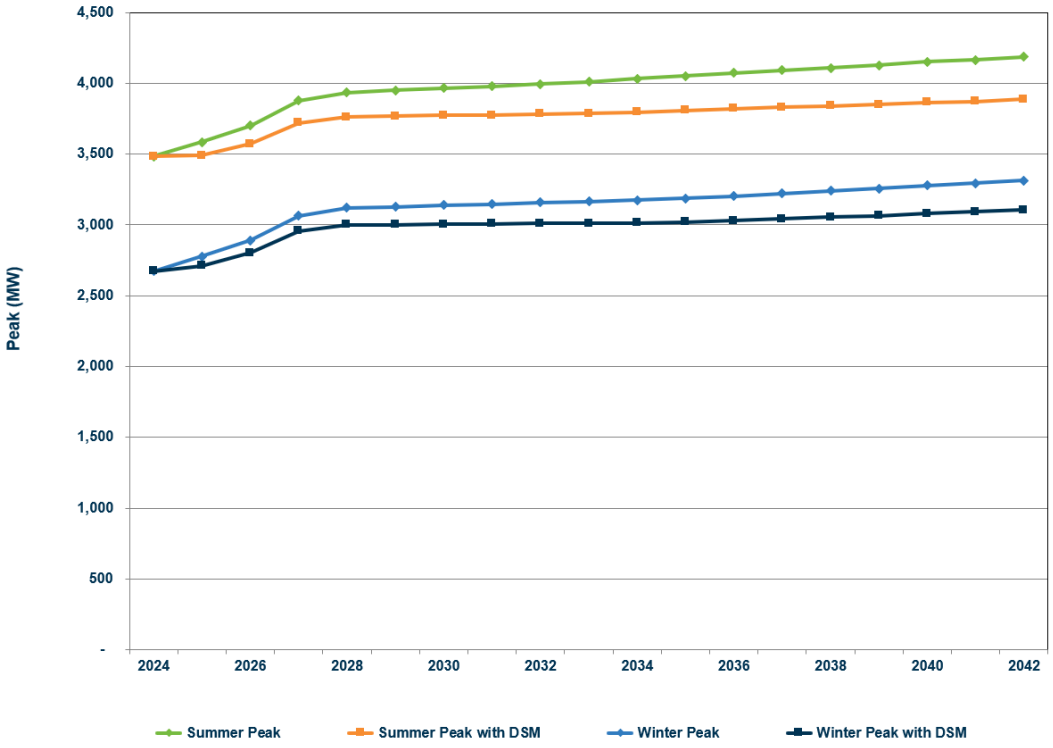


Figure 15: Metro DSM Capacity (RAP)

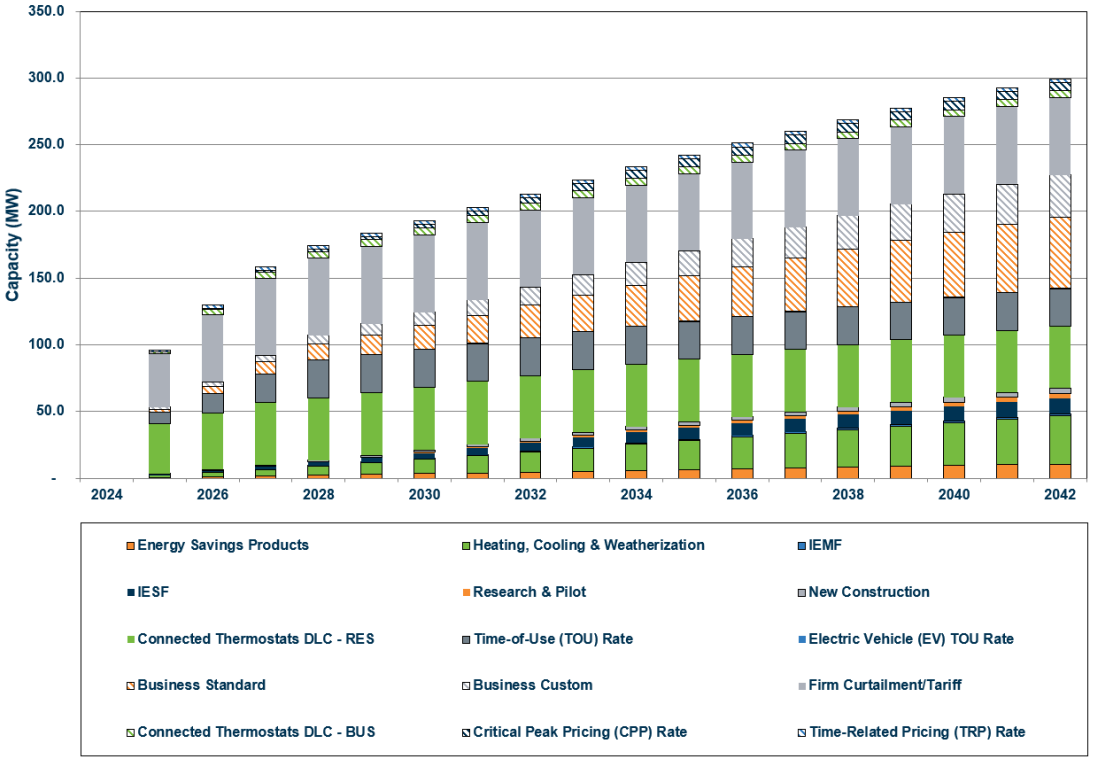


Figure 16: Metro Gross NSI (RAP)

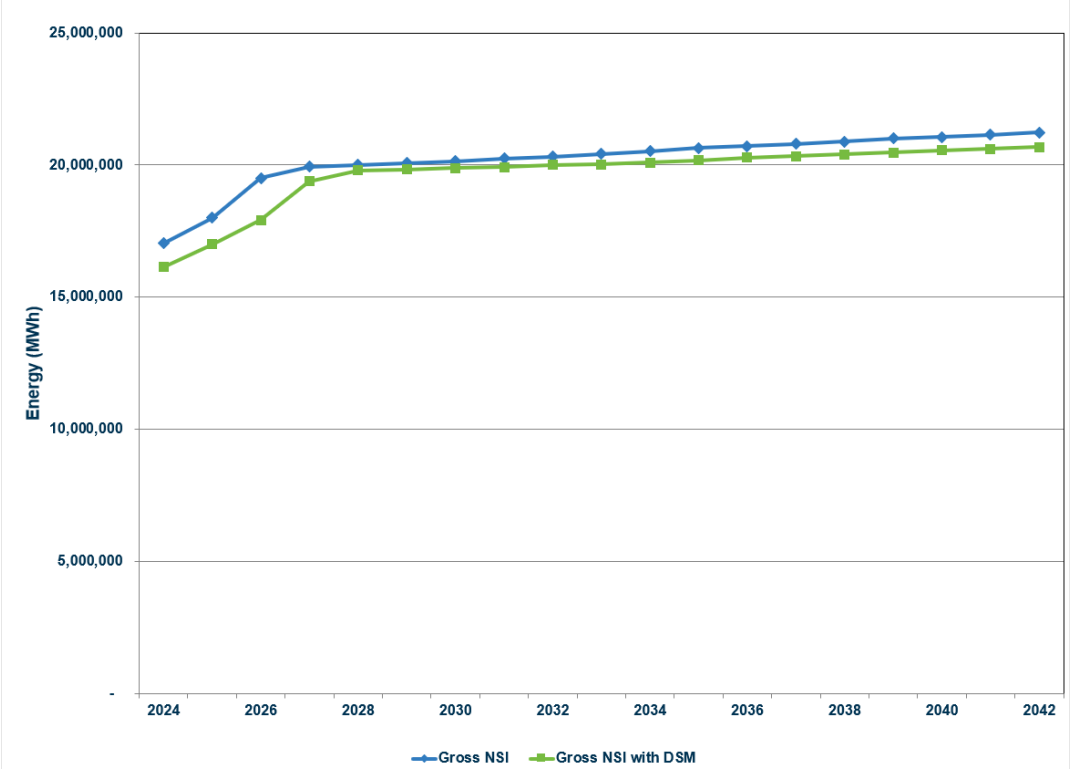


Figure 17: Metro DSM Energy (RAP)

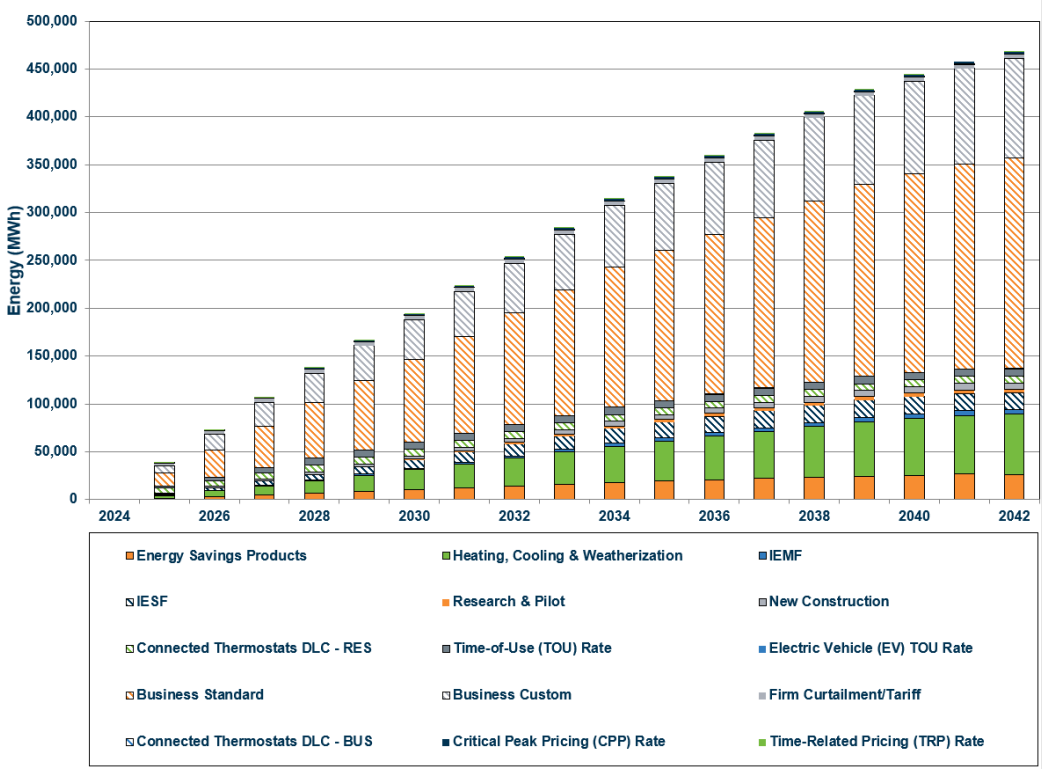


Figure 18: Metro Peak Load (RAP Plus)

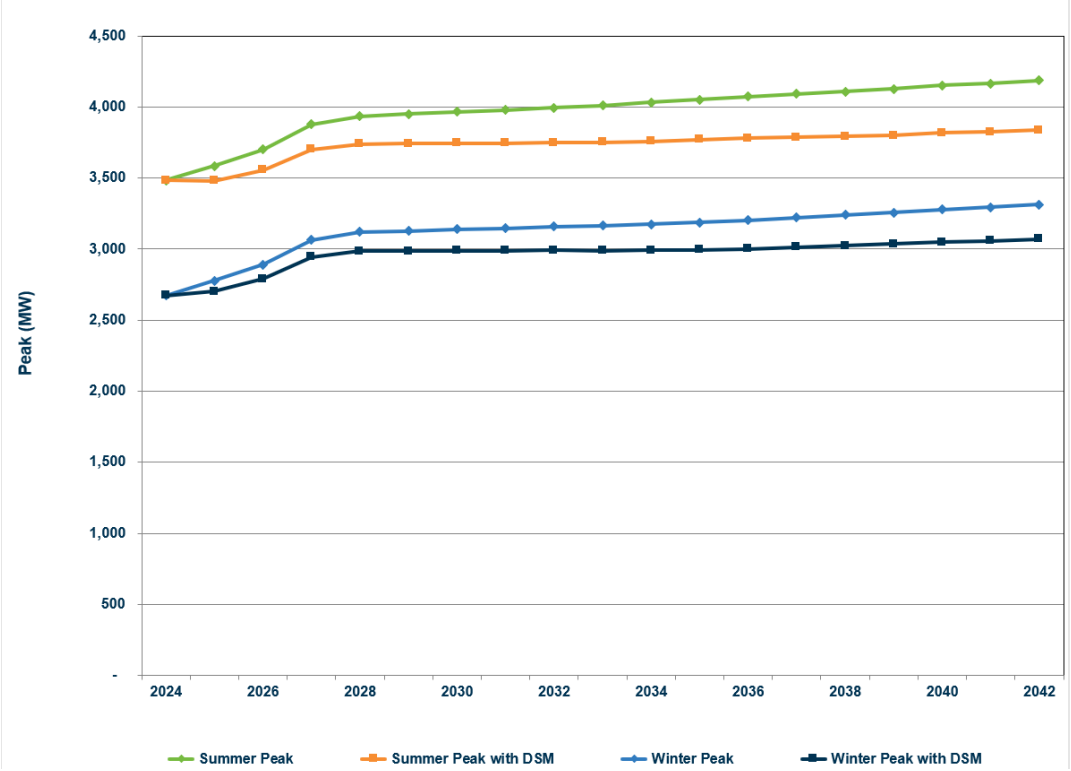


Figure 19: Metro DSM Capacity (RAP Plus)

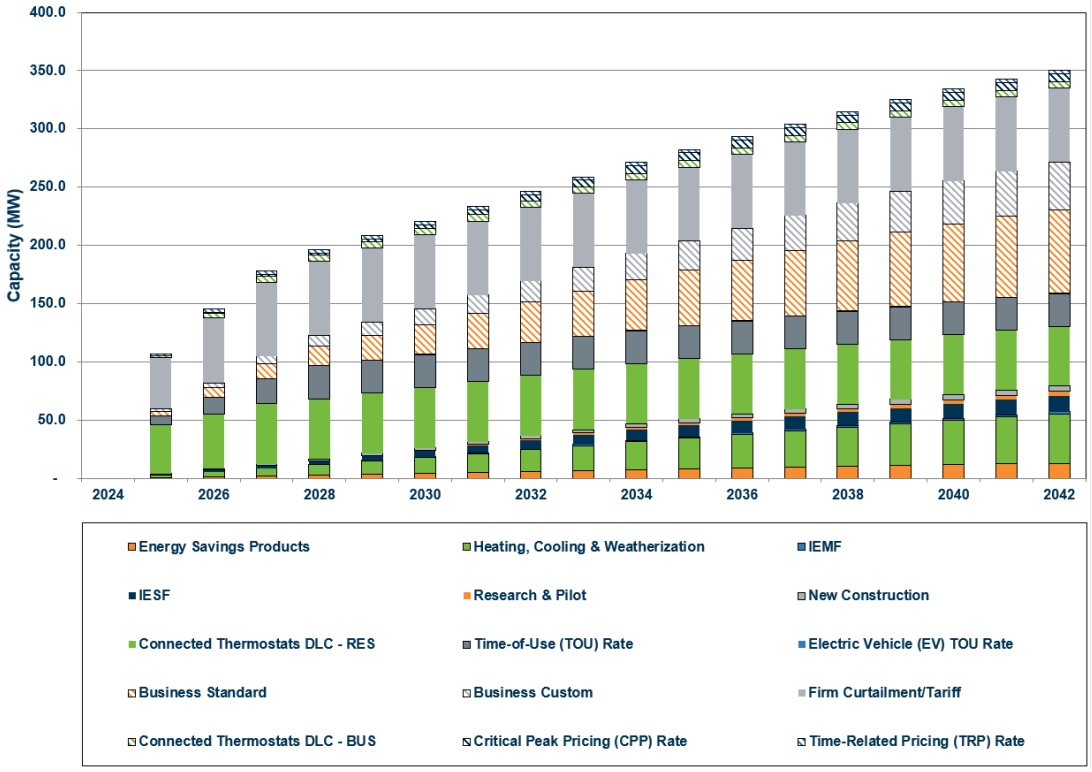


Figure 20: Metro Gross NSI (RAP Plus)

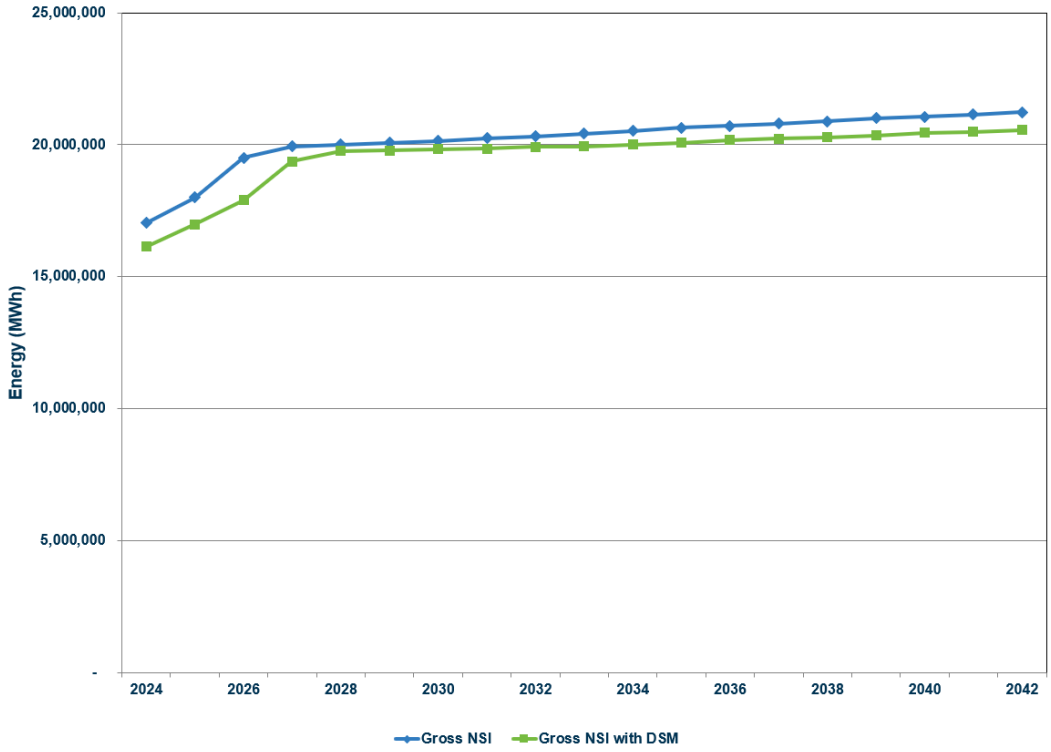


Figure 21: Metro DSM Energy (RAP Plus)

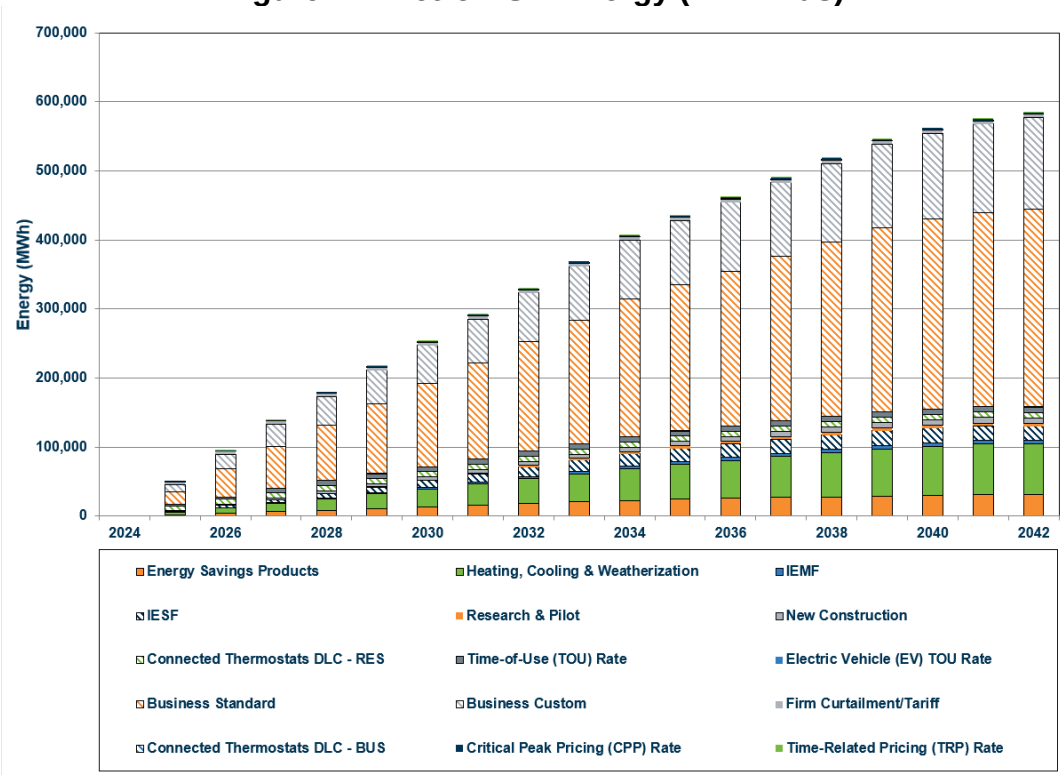


Figure 22: Metro Peak Load (RAP Minus)

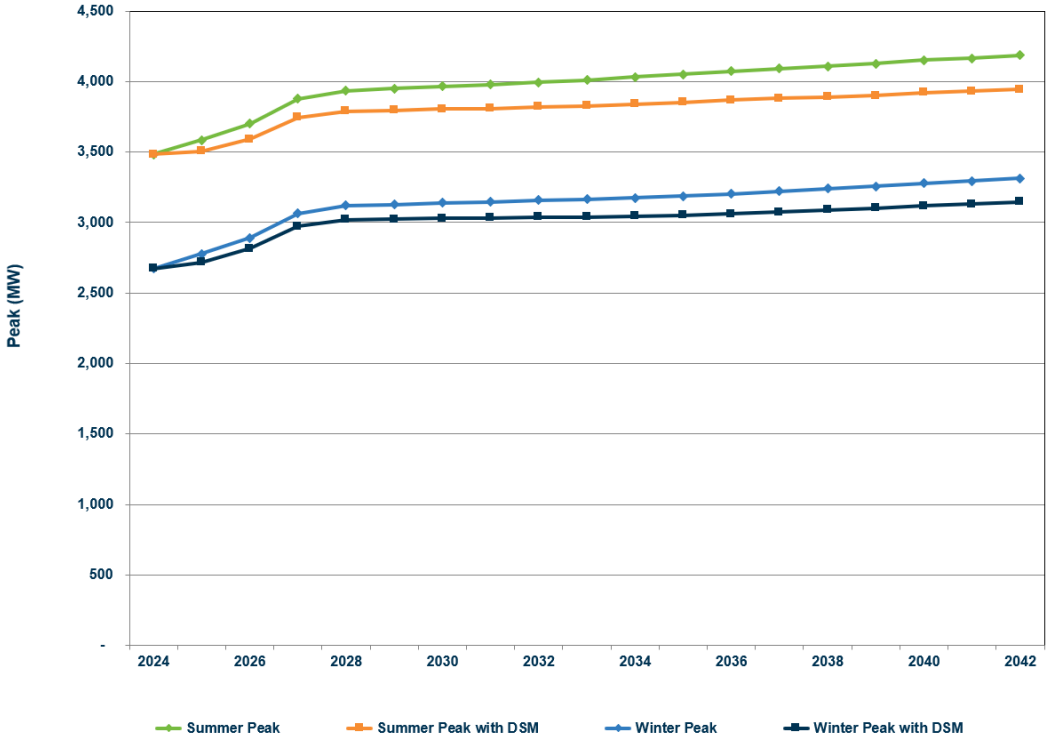


Figure 23: Metro DSM Capacity (RAP Minus)

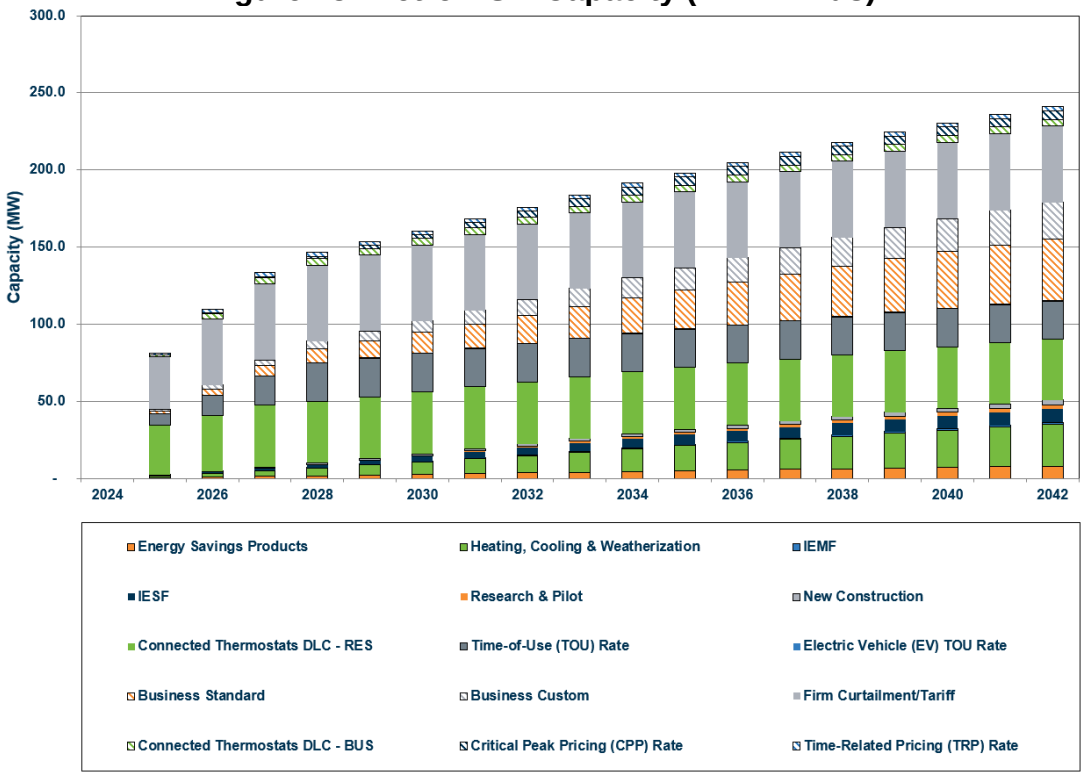


Figure 24: Metro Gross NSI (RAP Minus)

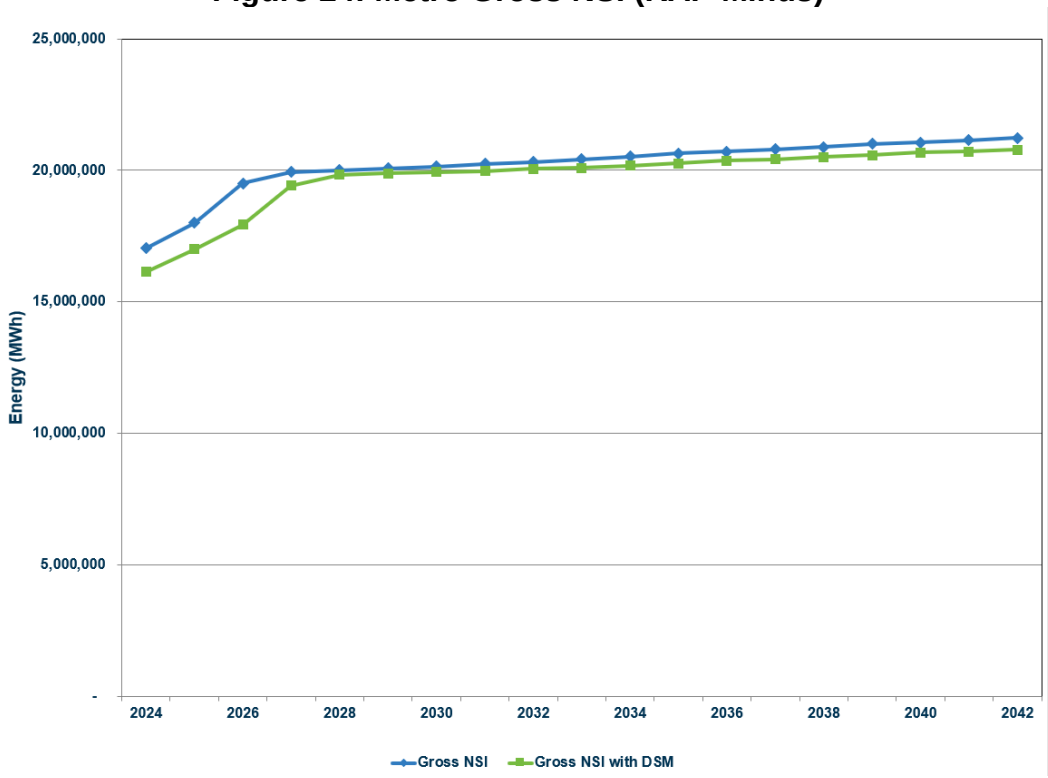
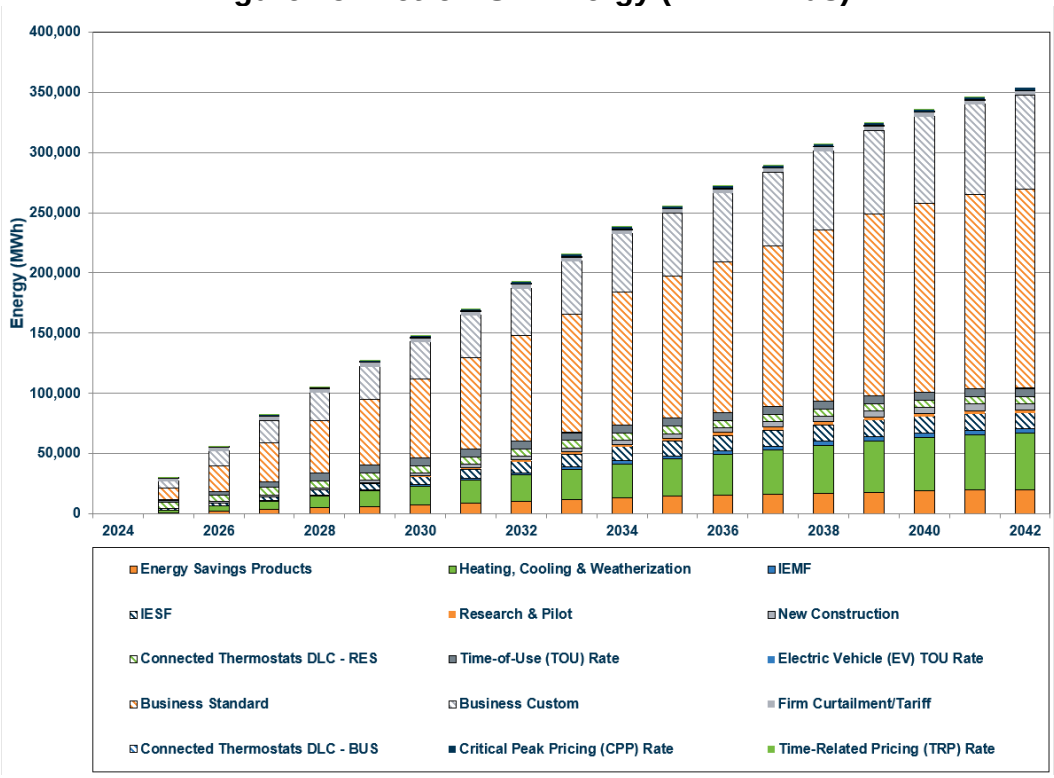


Figure 25: Metro DSM Energy (RAP Minus)



5.1.2 Demand-Side Management Alternative Resource Plans

An ARP for each demand-side management portfolio was created by using the same base scenario assumptions and varying only the portfolio option. Generally, the greater the amount of peak load reduction associated with a portfolio, the more it would be expected to reduce the need for other resource additions or defer additions to later in the time horizon. Maximum Achievable Potential (MAP) has the highest peak load reduction over the 20-year horizon, and the highest costs per unit of reduction. Other programs considered, in order of declining capacity value and cost, were RAP Plus, RAP, and RAP Minus. A plan without future DSM programs, after the MEEIA extension ends in 2024, was also considered.

Table 17: Rankings of Demand-Side Management Portfolio Options

Rank	Plan	NPVRR	Difference	Description
1	CAAB	23,144		RAP Plus
2	AAAB	23,190	47	RAP
3	DAAB	23,337	193	RAP Minus
4	BAAB	23,370	226	MAP
5	EAAB	23,394	250	No DSM MO

The top ranked plans were CAAB (RAP Plus) followed by AAAA (RAP). Both have very similar optimal resource plans, with the same additions 2027-2036, including 300 MW solar in 2027 and 150 MW solar in 2028, 450 MW of wind 2029-2031. The primary near-term difference is that the RAP plan includes a wind build in 2026 that is deferred until 2042 in the RAP Plus plan. The greater capacity need earlier in the plan makes the RAP Plan more costly.

Figure 26: RAP Plan AAAB

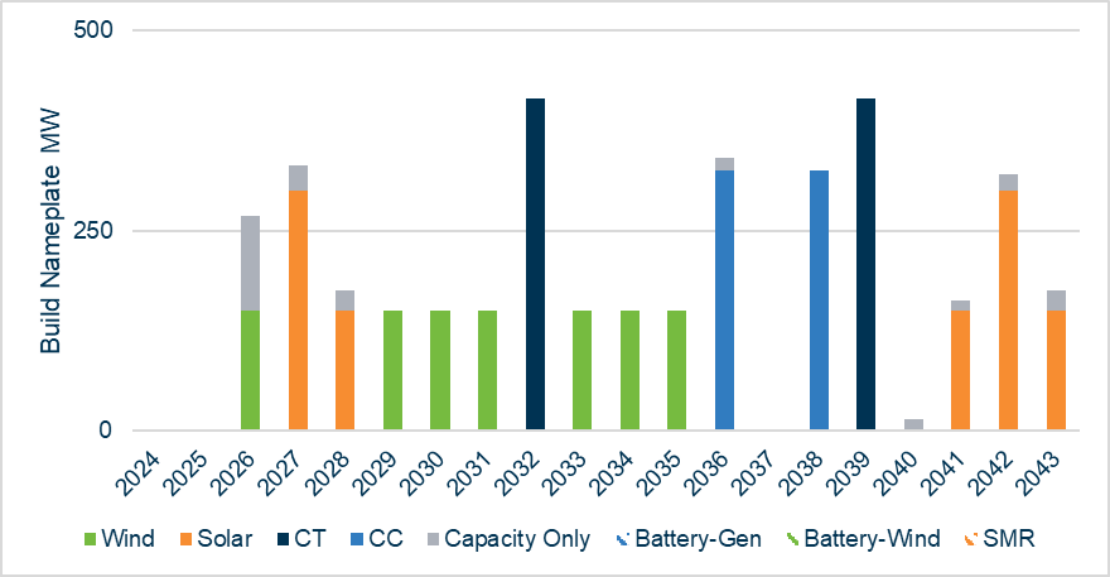
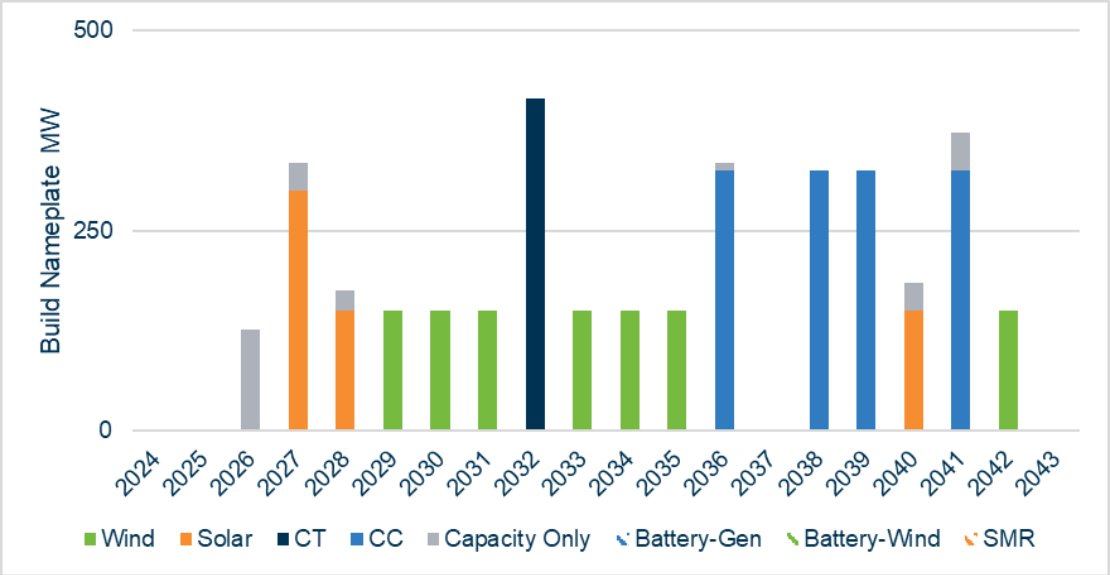
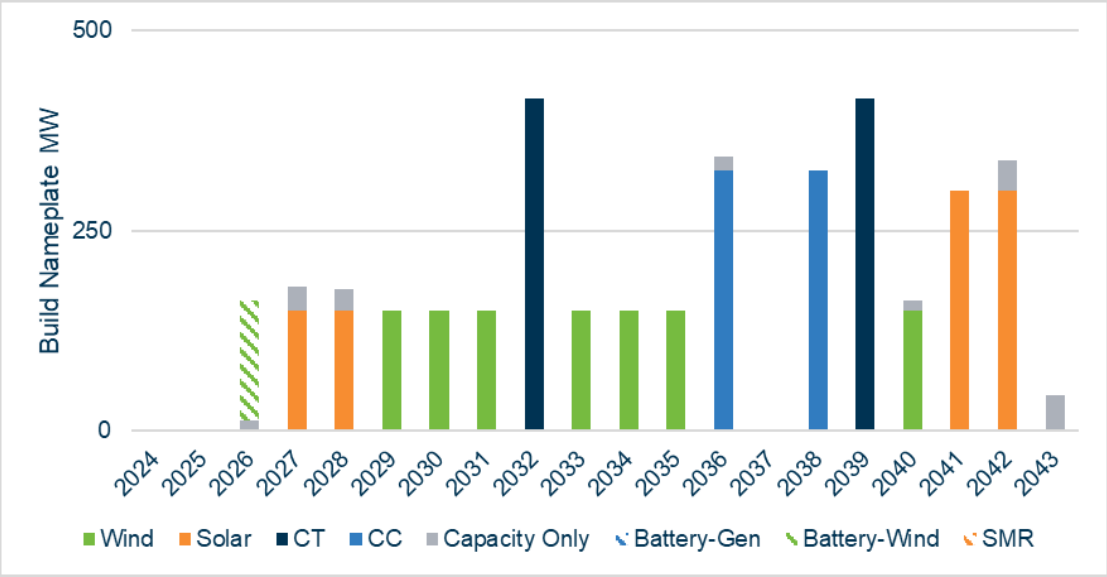


Figure 27: RAP Plus Plan CAAB



The RAP Minus Plan (DAAB) substitutes a 150 MW storage build in 2026 for 150 MW of solar in 2027, compared to the RAP Plus Plan, and is higher cost by over $200 million.

Figure 28: RAP Minus Plan DAAB



The MAP (BAAB)[10] and No DSM (EAAB)[11] plans are significantly more expensive. The MAP plan additions are the same as RAP Plus through 2035. The plan with No DSM is the most expensive and includes an additional 150 MW battery build in 2026 and an additional 150 MW of solar in 2028, likely to meet the greater capacity need.

[10] 20 CSR 4240-22.060(3)(A)3
[11] 20 CSR 4240-22.060(3)(C)3

Figure 29: MAP Plan BAAB

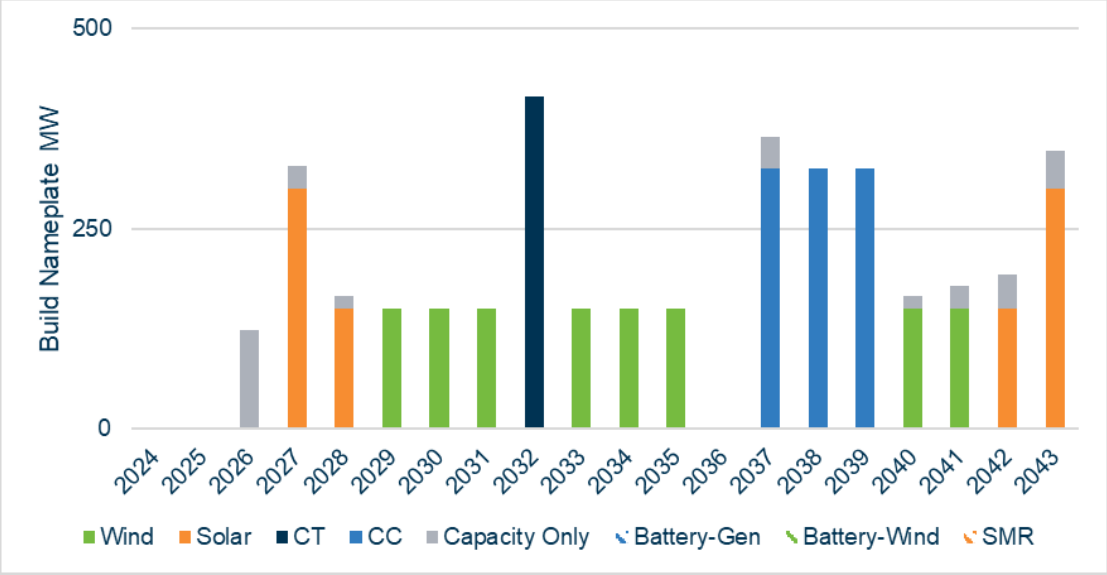
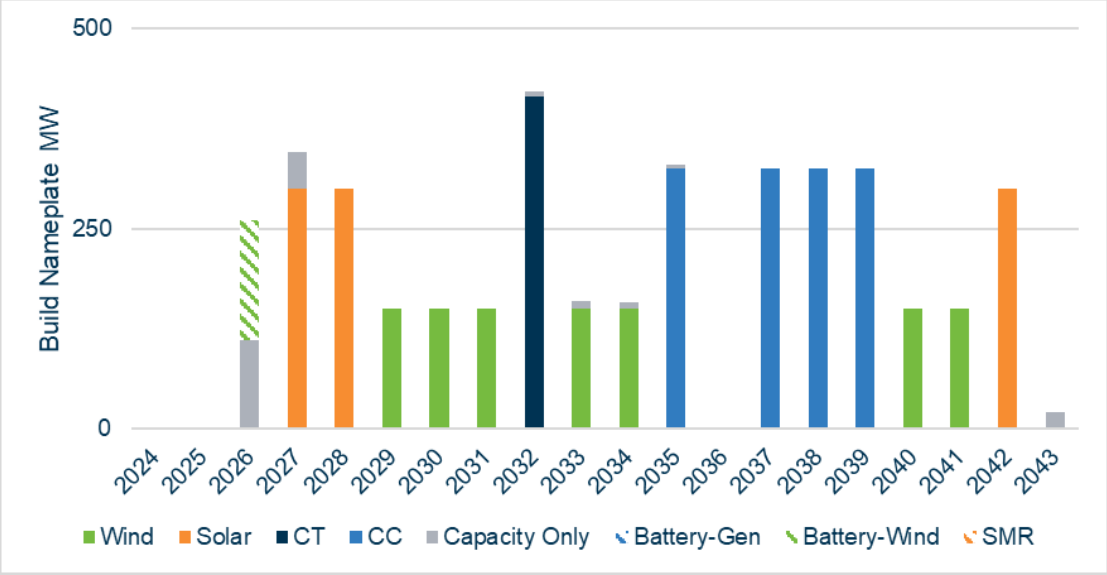


Figure 30: No DSM Plan EAAB



5.2 Comparison of Retirement Options[12]

Evergy Metro owns Hawthorn 5 and has large shares of its jointly-owned coal resources, 50% of La Cygne Units 1 & 2, 70% of Iatan 1 and 54.71% of Iatan 2. Each coal retirement brings a loss of capacity of approximately 300 MW – 550 MW, as well as a loss of

[12] 20 CSR 4240-22.060(3)(C)1

baseload energy (with recent capacity factors ranging from 38% to 62%). Evergy Metro assumes that if it continues to operate coal resources, it will comply with all environmental and other regulations and keep the plants maintained. These costs are included in the expected value of the resource plan.[13]

The 2023 preferred resource plan included retirement of La Cygne 1 in 2032, and La Cygne 2 and Iatan 1 in 2039. Retirement dates of Iatan 2 and Hawthorn 5 were expected to be outside of the 20-year planning horizon. These retirements are in the 2024 Preferred Plan (CAAB) which also includes the RAP Plus demand-side portfolio. Alternative resource plans with the same demand-side portfolio were developed to compare the expected value of accelerating retirements. Plans accelerating retirements include CBAB (Iatan 1 2030), CCAB (La Cygne 2 2032), CDAB (Hawthorn 5 2027), and CEAB (all early retirement dates including Iatan 2 2030).

All accelerated retirement plans include earlier thermal additions to replace the retiring capacity, in addition to the 2032 combustion turbine that is added in all plans. For the 2030 retirement of Iatan 1, a combustion turbine is added in 2030, for the 2032 La Cygne 2 retirement, a combined cycle is added in 2031, and for the 2027 Hawthorn 5 retirement, a combustion turbine is added in 2028. The Hawthorn 5 retirement plan also includes 300 MW of storage in 2026. The plan with all earliest retirements requires 600 MW of battery storage in 2026-2027, followed by three combustion turbines and a half combined cycle through 2031 (1570 MW).

[13] 20 CSR 4240-22.060(3)(C)2

Figure 31: Earlier Retirement Iatan 1 2030 CBAB

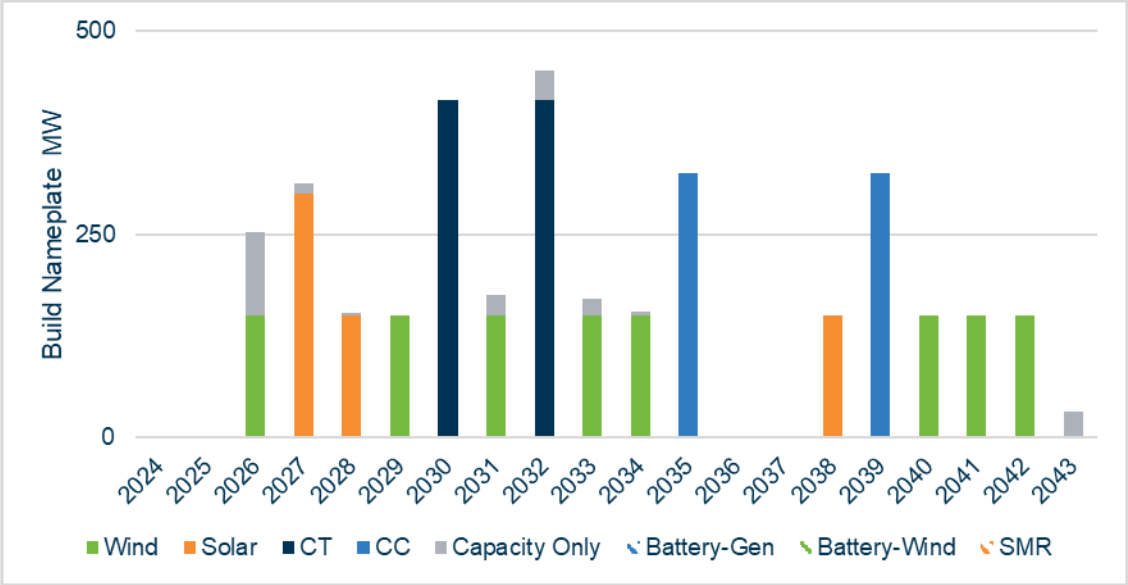


Figure 32: Earlier Retirement La Cygne 2 2032 CCAB

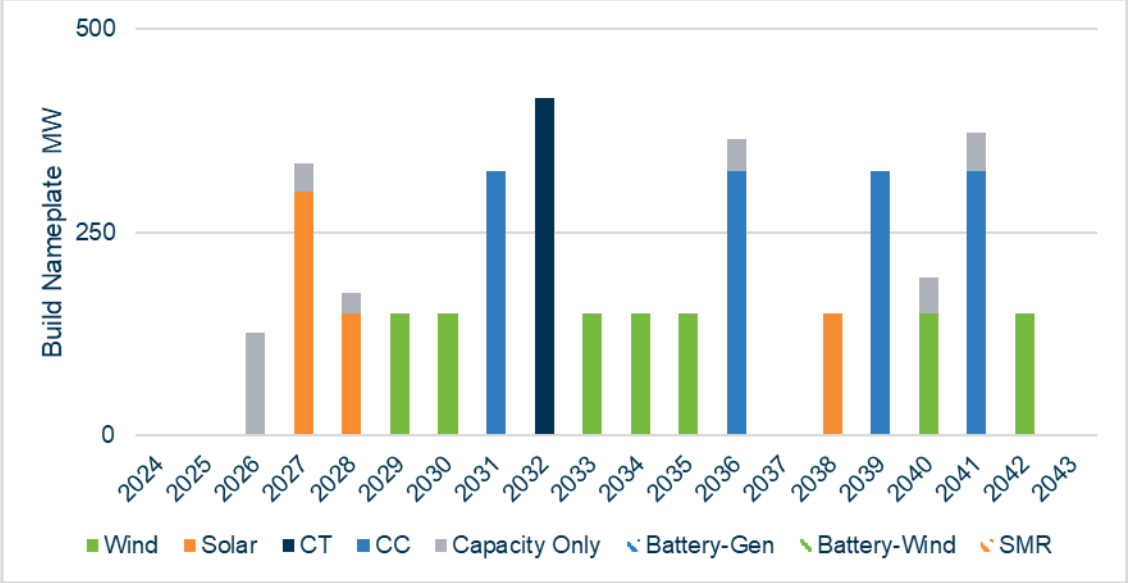


Figure 33: Earlier Retirement Hawthorn 5 2027 CDAB

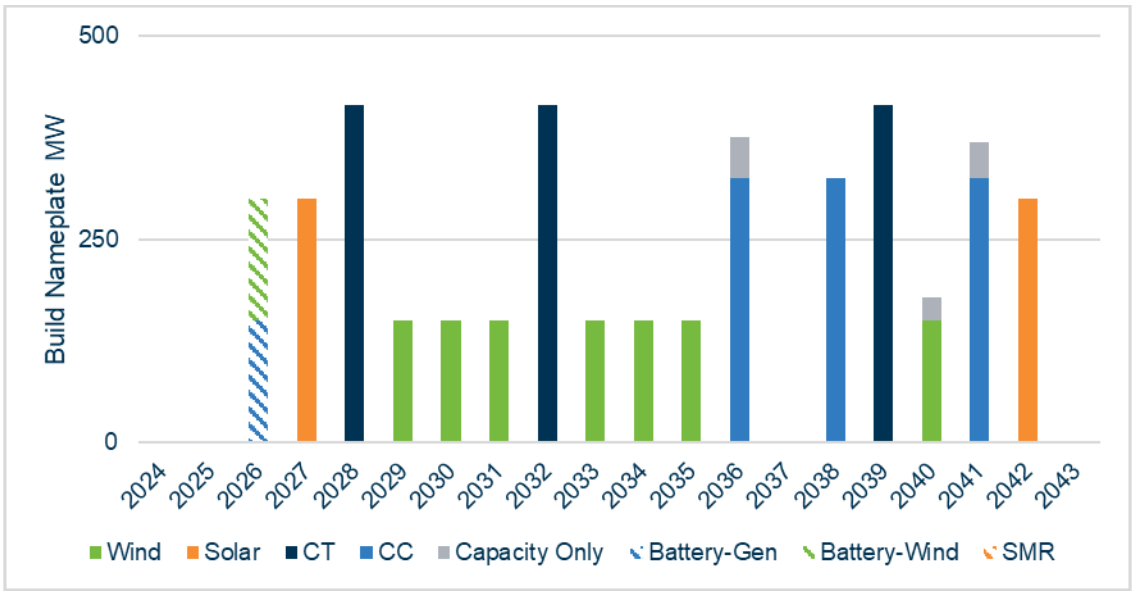
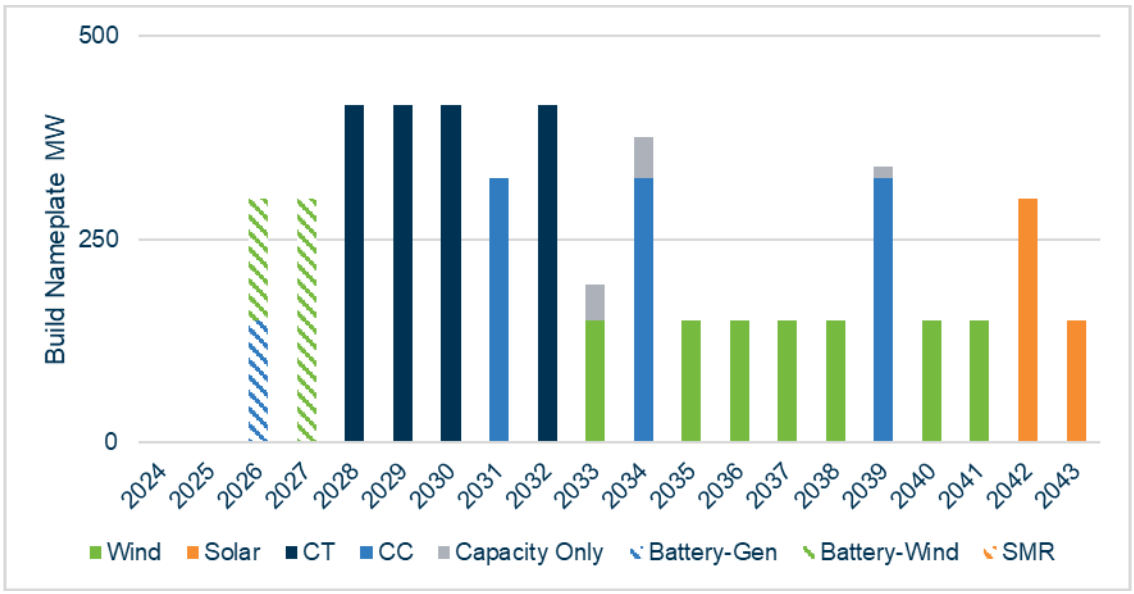


Figure 34: Earliest Retirement All Coal CEAB



All accelerated retirement plans are higher cost than the Preferred Plan.

Table 18: Evergy Metro Retirement Plan Rankings

Rank	Plan	NPVRR	Difference	Description
1	CAAB	23,144		PP 2023 retirements
2	CCAB	23,217	73	Retire La Cygne 2 2032
3	CBAB	23,307	163	Retire Iatan 1 2030
4	CDAB	23,881	738	Retire Hawthorn 5 2027
5	CEAB	25,029	1,885	All early retirements

Section 6: Analysis of Directed Strategies

6.1 Plans at Endpoints

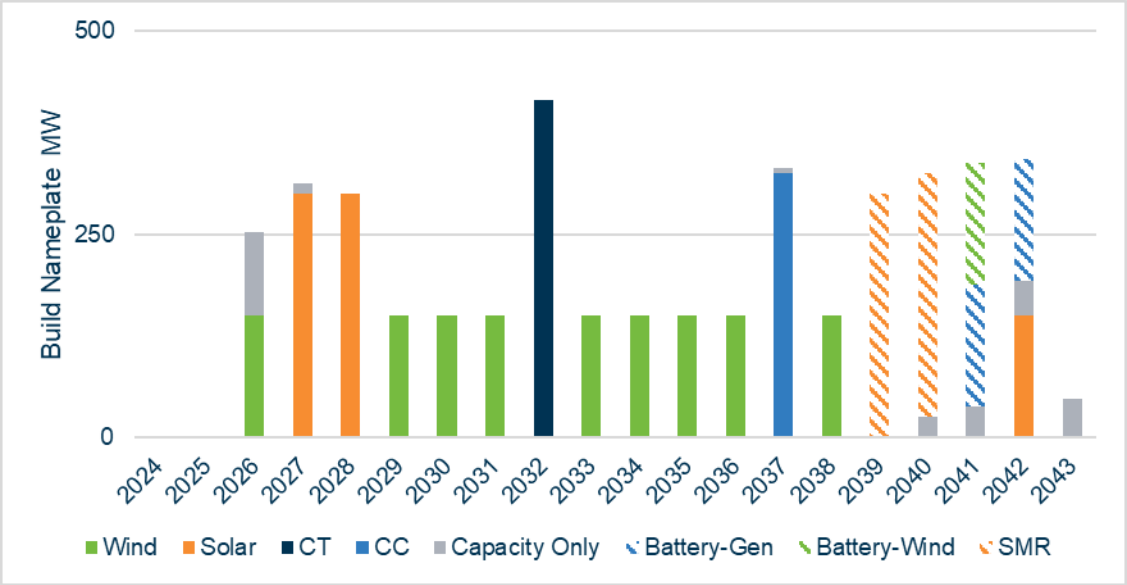
Plans created to determine the optimal resource additions in the High Carbon Restriction – High Natural Gas Price ("High/High") future and the Low Carbon Restriction – Low Natural Gas Price ("Low/Low") future are costly on a weighted-average basis.

Table 19: Rankings of Plans Created for Specific Futures

Rank	Plan	NPVRR	Difference	Description
1	CAAB	23,144		RAP Plus
2	CAAD	23,574	430	High/High
3	CAAE	24,936	1,792	Low/Low

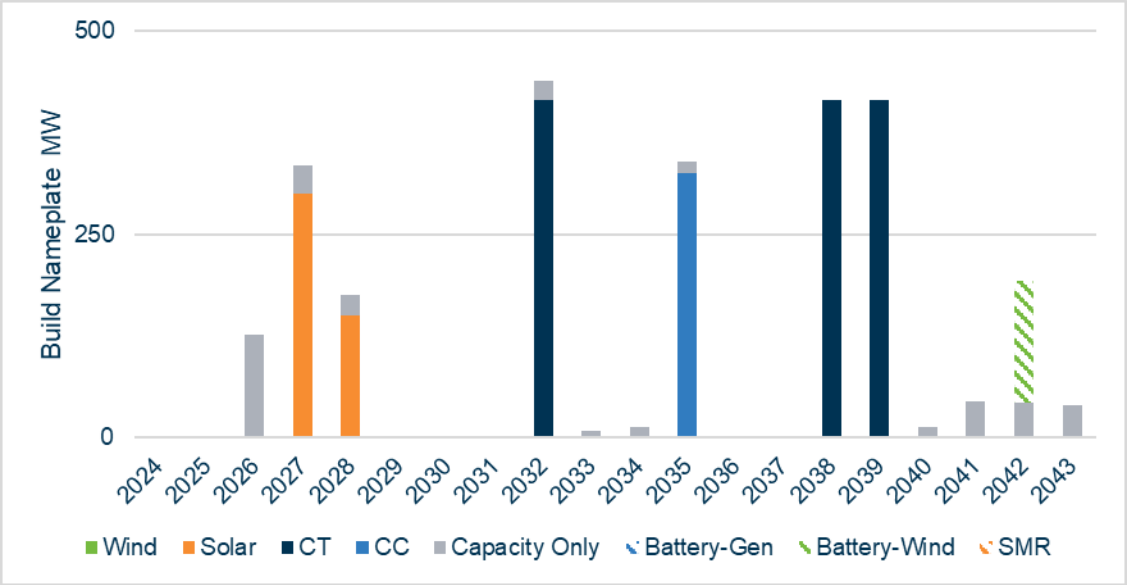
Capacity expansion modeling performed specifically in the High Carbon Restriction – High Natural Gas Price ("High/High") scenario shows an additional early solar build and an increased level of wind builds compared to the Preferred Plan given the increased value of zero-carbon energy in a heavily carbon-restricted market. In the last five years of the planning horizon, two 300 MW Nuclear SMRs are added as well as 450 MW of storage. Given Metro's large coal fleet, this plan demonstrates the elevated need for new sources of carbon-free energy if stringent carbon restrictions are in place.

Figure 35: Optimal Build Plan for High CO2/ High NG Future CAAD



In contrast, there are no wind additions in the optimal resource plan for the Low/Low future, given the reduced value of zero-carbon energy without the imposition of carbon restrictions. The Low/Low early solar builds are consistent with the Preferred Plan. Thermal resources are added with similar timing, although the Low/Low Plan is more heavily weighted toward combustion turbines as opposed to combined cycles. This is, again, driven by the reduced value of low- or zero-carbon energy which makes higher capacity factor Combined Cycles less valuable compared to Combustion Turbines (which are largely a capacity resource – as opposed to an energy resource).

Figure 36: Optimal Build Plan for Low CO_2/ Low NG Future CAAE



6.2 RES Minimally Compliant Plan[14]

All Alternative Resource Plans comply with the Missouri renewable energy mandates (Missouri Renewable Energy Standard).

The RES requirements include 15% of retail sales to be served by non-solar renewables and 0.3% by solar renewables. Evergy Metro's expected compliance need is 8 MW of solar in 2034.

[14] 20 CSR 4240-22.060(3)(A)1

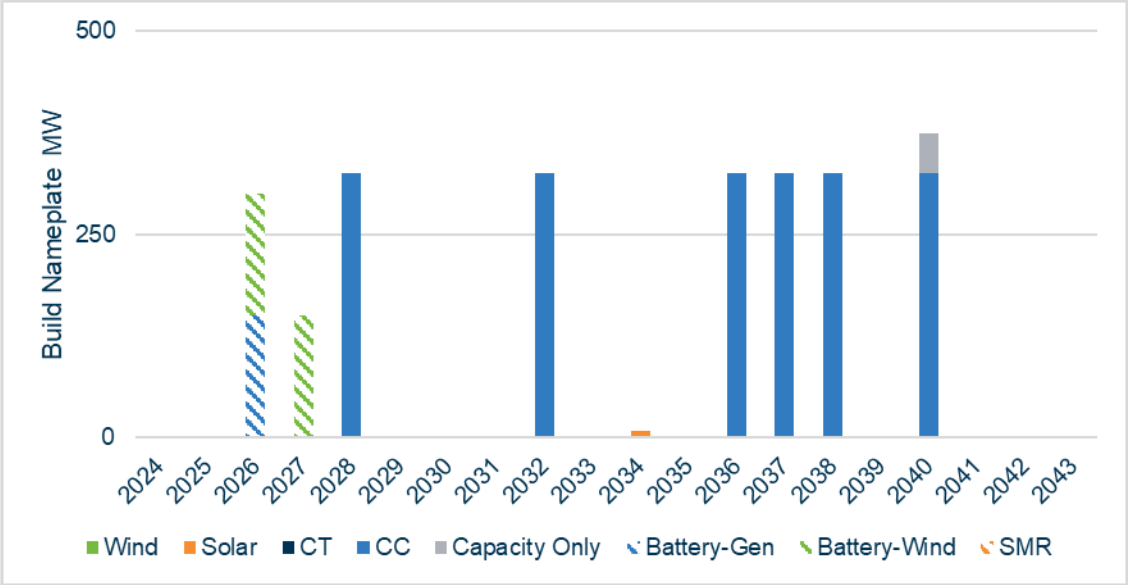
Table 20: Evergy Metro RES Requirements

Year	Evergy Metro Missouri Retail Electric Sales (MWh)	Missouri RES Non-Solar Requirement	Evergy Metro Missouri Non-Solar RES Requirement (MWh)	Missouri RES Solar Requirement	Evergy Metro Missouri Solar RES Requirement (MWh)
2024	8,572,022	15%	1,260,087	0.3%	25,716
2025	8,624,554	15%	1,267,809	0.3%	25,874
2026	8,704,114	15%	1,279,505	0.3%	26,112
2027	8,785,044	15%	1,291,401	0.3%	26,355
2028	8,876,372	15%	1,304,827	0.3%	26,629
2029	8,939,353	15%	1,314,085	0.3%	26,818
2030	8,996,254	15%	1,322,449	0.3%	26,989
2031	9,047,881	15%	1,330,039	0.3%	27,144
2032	9,114,041	15%	1,339,764	0.3%	27,342
2033	9,169,787	15%	1,347,959	0.3%	27,509
2034	9,242,389	15%	1,358,631	0.3%	27,727
2035	9,318,252	15%	1,369,783	0.3%	27,955
2036	9,405,333	15%	1,382,584	0.3%	28,216
2037	9,467,814	15%	1,391,769	0.3%	28,403
2038	9,542,178	15%	1,402,700	0.3%	28,627
2039	9,614,361	15%	1,413,311	0.3%	28,843
2040	9,701,548	15%	1,426,128	0.3%	29,105
2041	9,764,393	15%	1,435,366	0.3%	29,293
2042	9,832,631	15%	1,445,397	0.3%	29,498
2043	9,904,959	15%	1,456,029	0.3%	29,715

One Alternative Resource Plan, EAAJ, limits solar additions to the 8 MW of solar capacity in 2034 that is expected to be needed to meet solar RES requirements. Evergy Metro is currently expected to be compliant with non-solar RES requirements through 2043, therefore no Alternative Resource Plan included non-solar resources specifically to meet RES compliance.

Since there is no mandated DSM requirement, the minimally compliant plan assumes no additional DSM beyond what is currently in progress as part of Evergy MEEIA approved programs.

Figure 37: RES Compliant Plan EAAJ



The minimally compliant RES plan meets capacity and energy needs at the lowest cost by building 450 MW of battery storage in 2026 and 2027, and 1,950 MW of combined cycles throughout the planning horizon. The NPVRR of this plan is almost $2 billion higher than the preferred plan which meets capacity and energy needs through a mix of resources, including wind and more solar.

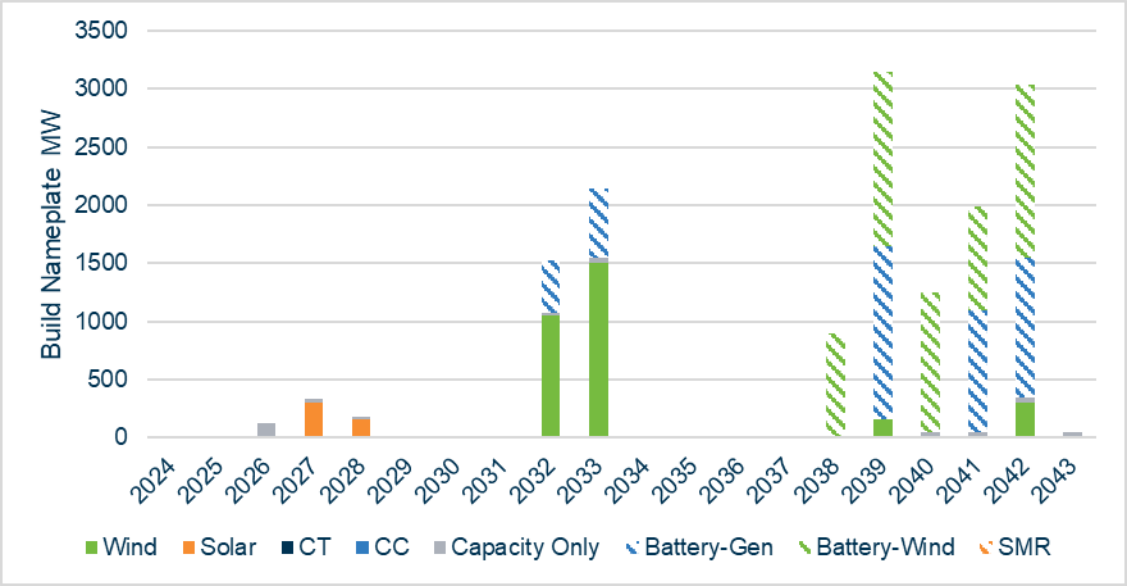
Table 21: RES Plan NPVRR Comparison

Rank	Plan	NPVRR	Difference	Description
1	CAAB	23,144		RAP Plus, Renewables allowed
2	EAAJ	25,079	1,935	RES only

6.3 High Renewables Plans[15]

Two alternative resource plans were developed to maximize renewable resources. The first, CAAI used the preferred plan demand-side management portfolio level – RAP Plus, and preferred plan retirement dates, and optimized future builds using only renewables and storage.

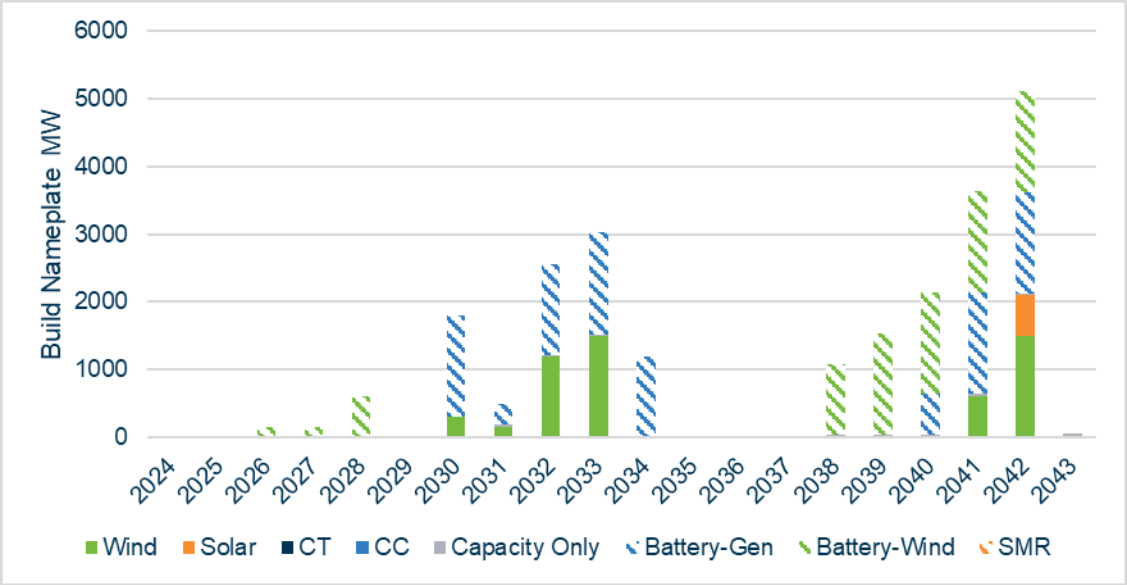
Figure 38: Only Renewable and Storage Additions CAAI



The second, BEAI, included MAP DSM and early retirements of all coal units (Hawthorn 5 in 2027, Iatan Units 1 &2 in 2030, La Cygne Units 1 & 2 in 2032) with only renewable and storage builds.

[15] 20 CSR 4240-22.060(3)(A)2

Figure 39: Earliest Retirements, Only Renewable and Storage Additions BEAI



Renewable build alone, and renewable and storage build together cannot meet the summer and winter capacity requirements of Evergy Metro in every year if capital spend limits are respected. Therefore, CAAI and BEAI resource plans were optimized for lowest cost with relaxed build limits. They would be difficult to implement due to the high volume of additions and would not meet financial metrics. Both plans have significantly higher NPVRR than the preferred plan.

Table 22: NPVRR Comparison of High Renewable Plans

Rank	Plan	NPVRR	Difference	Description
1	CAAB	23,144		RAP Plus, All build options, budget
2	CAAI	26,316	3,172	RAP Plus, Only renewable/storage build, no budget
3	BEAI	30,424	7,280	MAP; Ret all early; Only renewable/storage build, no budget

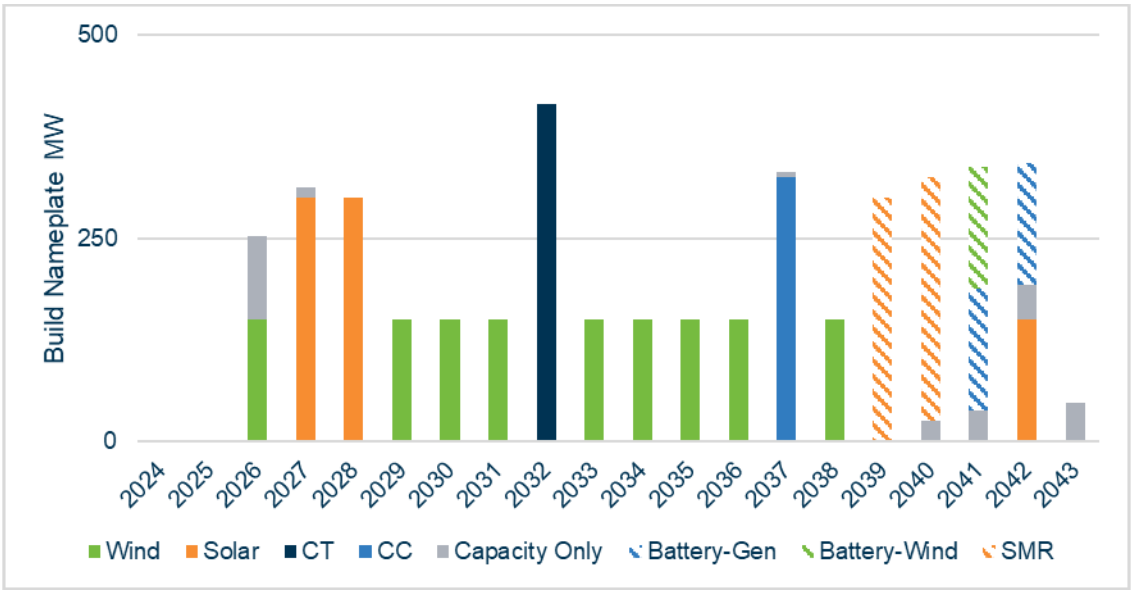
Section 7: Analysis of Discrete Scenarios

Evergy Metro developed two ARPs to determine the optimal resource plans that would be lowest cost under either environmental policy extreme – high carbon restrictions due to new GHG rules and no carbon restrictions and no retirement pressures for coal resources.

7.1 GHG Rules

Evergy tested the optimal coal fleet retirement strategy assuming high carbon restrictions and high natural gas prices, at the joint-planning level.[16] A prescriptive compliance plan applying the proposed GHG rule best system of emission reduction (BSER) was also developed and included for comparison with the retirement strategies. The lowest cost ARP had the same retirements as the Preferred Plan. For Evergy Metro, this includes La Cygne 1 retiring in 2032, Iatan 1 and La Cygne 2 retiring in 2039, and operation of Hawthorn 5 and Iatan 2 throughout the planning period. The plan is the same as the High/High plan discussed in section 6.1.

Figure 40: GHG Rule Optimal Plan CAAD

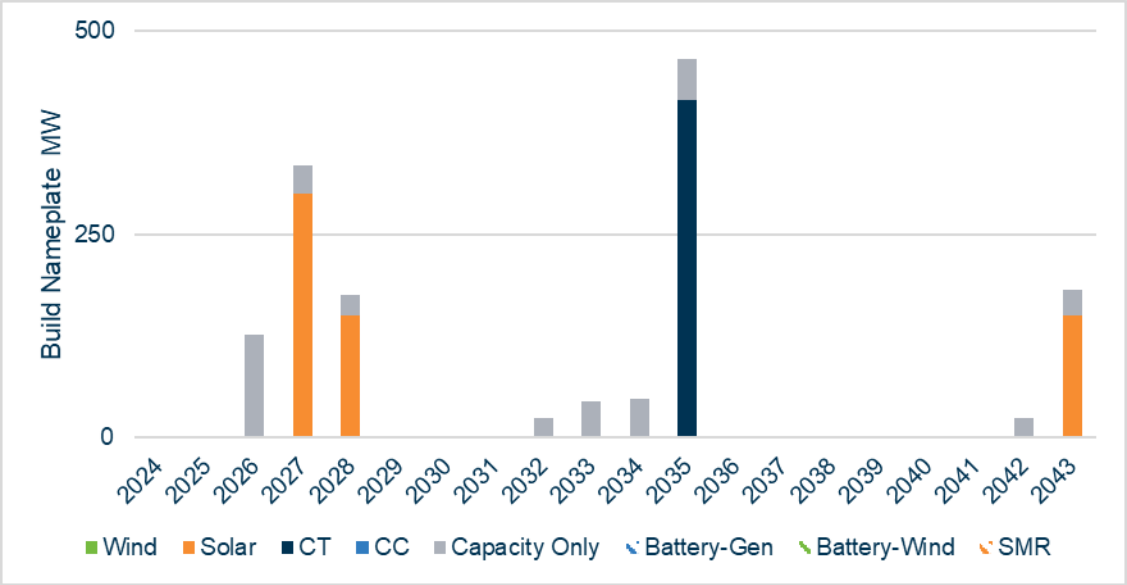


[16] See the Special Contemporary Issue response in Volume 8 for the full analysis. 20 CSR 4240-22.060(3)(A)6

7.2 Low/Low No Retirements

The Low/Low No Retirements ARP was developed by extending the operation of all Evergy Metro coal units through the planning horizon and optimizing resource additions for the expectation of a non-CO_2 restricted, low natural gas price future. The plan added solar in 2027 and 2028, consistent with the Preferred Plan, but then only added a CT in 2035 and solar in 2043. It did not add any wind resources and filled gaps in capacity in some years through market capacity.

Figure 41: Low/Low No Retirements Plan CFAE



7.3 Expected Costs of Planning for Discrete Scenarios

Both discrete plans are significantly higher cost than the Preferred Plan on a weighted-average-risk basis. CFAE is the most costly due to the lack of carbon-free energy available in carbon-restricted futures.

Table 23: NPVRR Comparison of Discrete Scenarios

Rank	Plan	NPVRR	Difference	Description
1	CAAB	23,144		Base planning assumptions
2	CAAD	23,574	430	High/High GHG rules
3	CFAE	25,130	1,986	Low/Low, no retirements

Section 8: Analysis of Contingency Plans

8.1 Execution Risk of 2027 Solar

If Evergy Metro is unable to execute on the 300 MW of solar planned for 2027 in the Preferred Plan, the next best option is for Evergy Metro to add 150 MW of storage in 2026.

Figure 42: Alternative Plan Without 2027 Solar CAAC

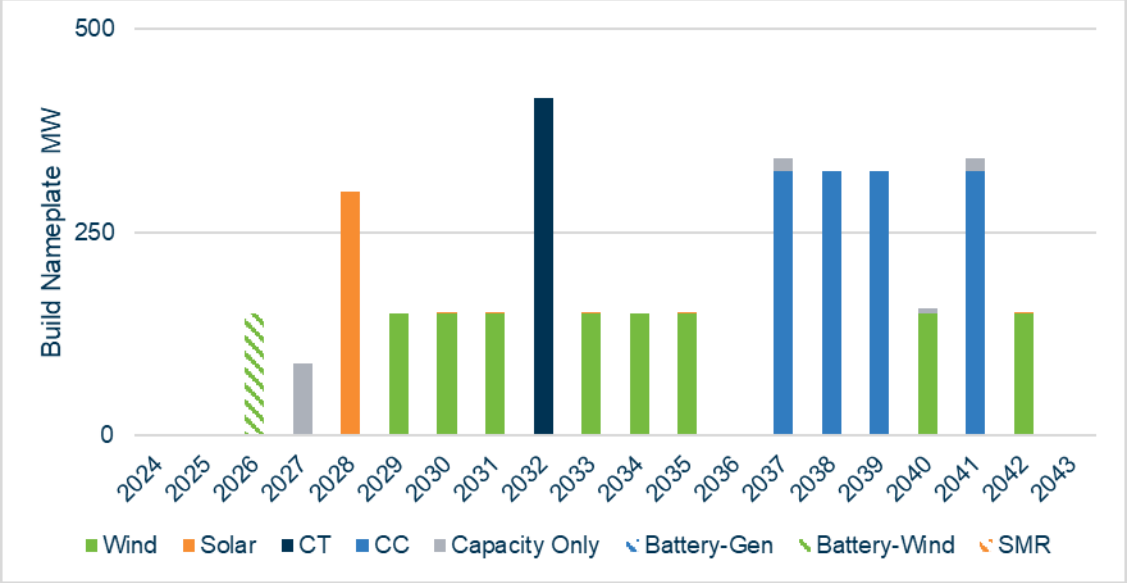


Table 24: NPVRR Comparison Without 2027 Solar

Rank	Plan	NPVRR	Difference	Description
1	CAAB	23,144		RAP Plus
2	CAAC	23,274	130	No 2027 Solar

8.2 Kansas DSM Programs End after KEEIA

The Kansas KEEIA program was approved for 4 years. Evergy Metro's base planning assumption is that KEEIA programs continue to be approved through the 20-year planning horizon and grow over time. Evergy Metro developed plan GAAB to assess how the need for resource additions would change if Kansas does not approve DSM programs after the 4-year KEEIA programs end. This plan assumes continuation of RAP Plus level programs in Missouri.

Figure 43: Contingency Plan for KEEIA Programs End GAAA

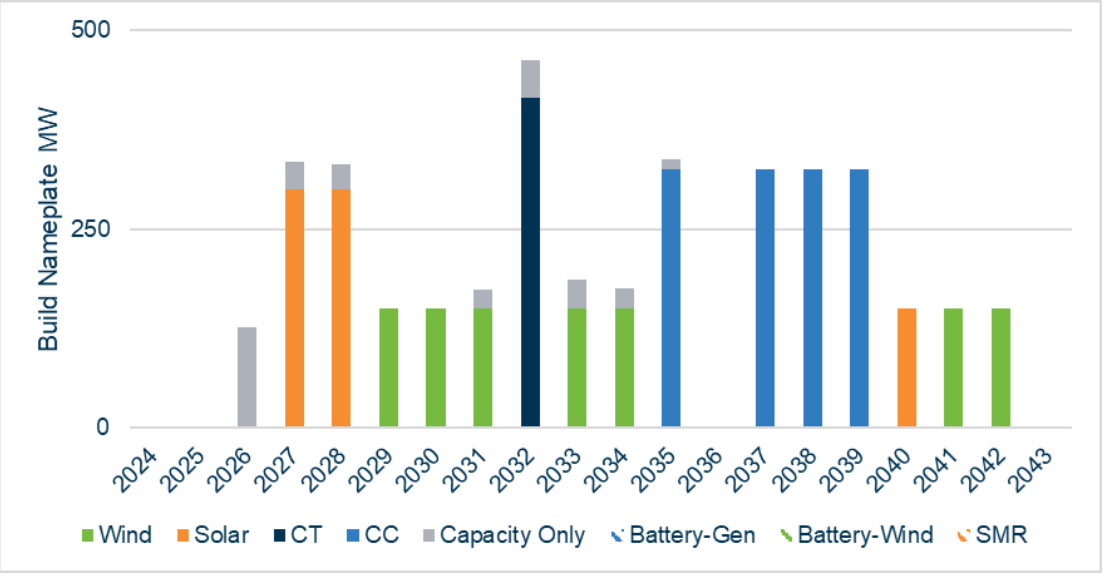


Table 25: NPVRR Comparison KEEIA DSM Ends

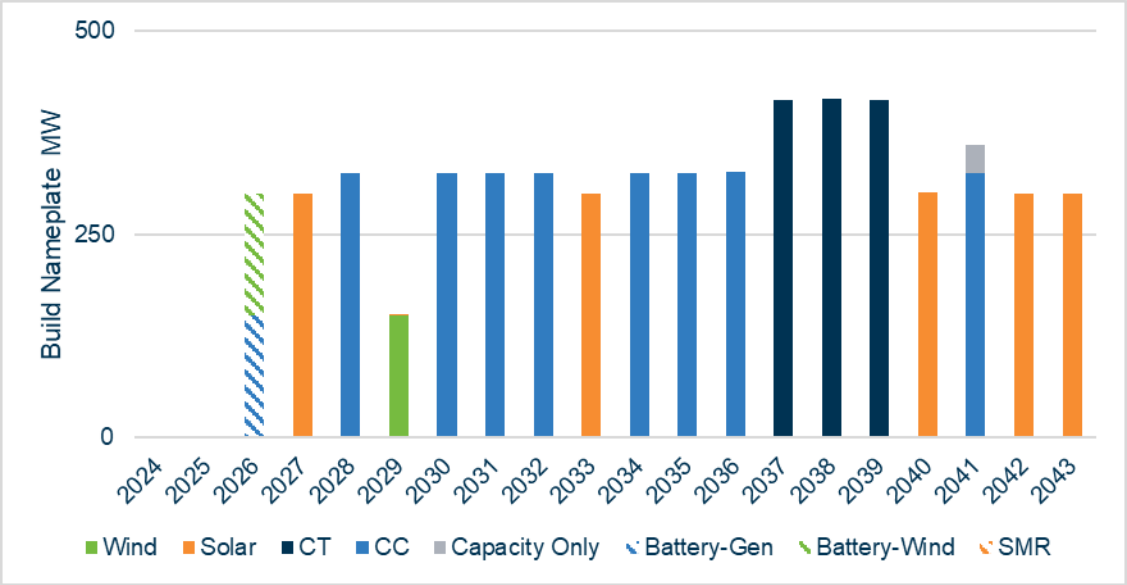
Rank	Plan	NPVRR	Difference	Description
1	CAAB	23,144		RAP Plus
2	GAAB	23,271	128	RAP Plus MO, KEEIA Only DSM

8.3 High Load Growth

Evergy Metro developed an ARP using the high load forecast, which includes high economic growth as well as economy-wide electrification. This forecast requires significant energy and capacity additions as compared to the base load forecast. The ARP fully utilizes the capital budget each year in the planning horizon and shifts the resource plan to more firm dispatchable resources. If the pace of electrification and

economic growth align with this forecast, Evergy Metro will need to adjust its resource plan to develop more firm dispatchable resources.

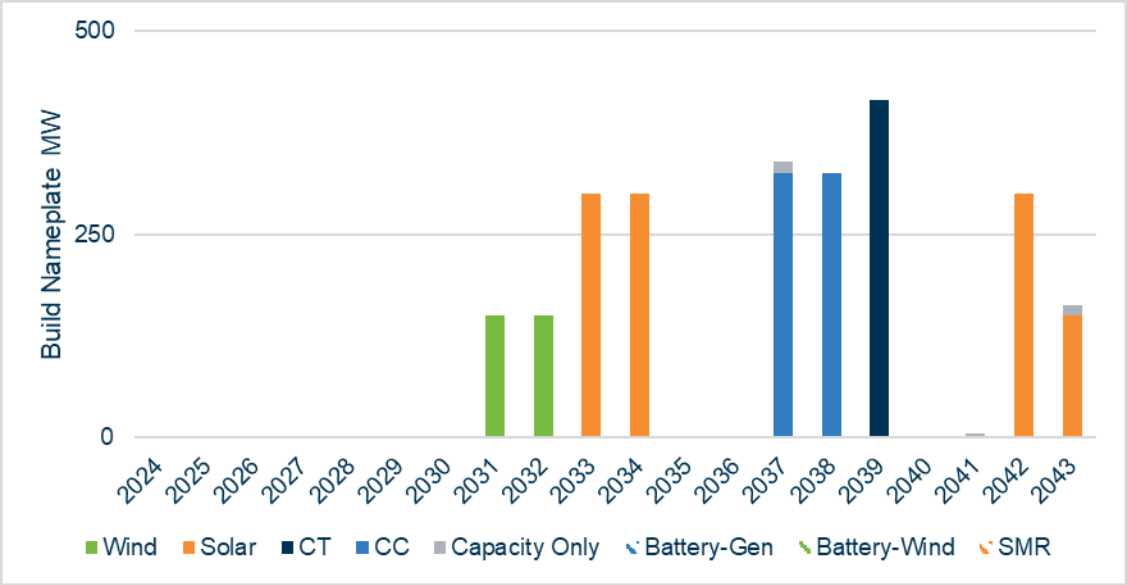
Figure 44: High Load Growth Plan CAAF



8.4 Mid Load – No Economic Development

The high load growth due to economic development has accelerated the need for Evergy Metro to add resources. A plan was created to assess the optimal resource additions if the load growth driven by economic development load does not occur. This scenario is highly unlikely given the mature status of the economic development project included in Metro‘s load forecast, but if this rapid load growth does not occur, Evergy Metro’s need for new resources is delayed.

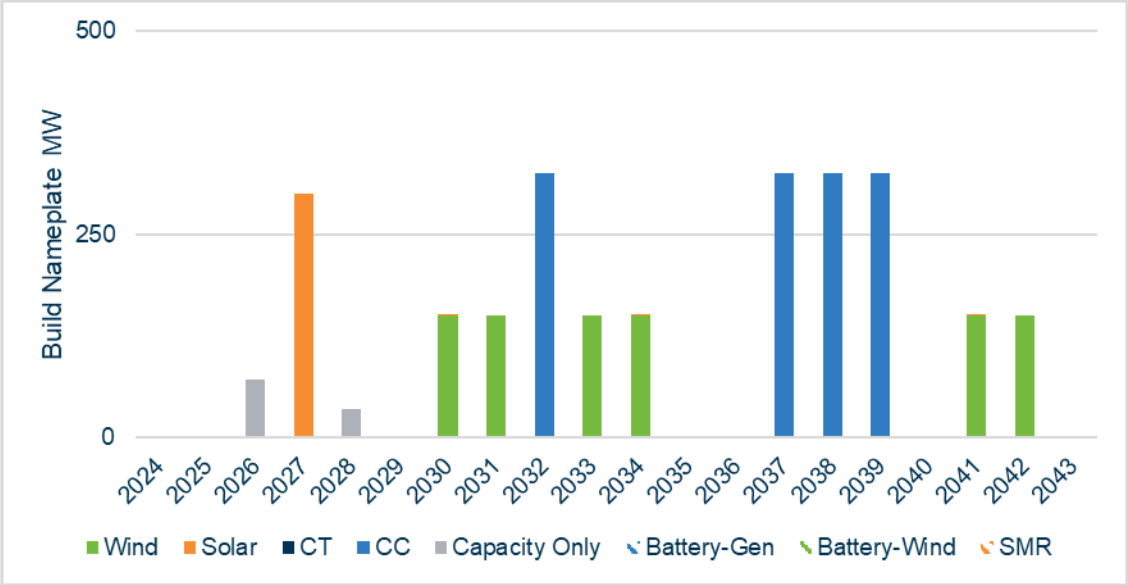
Figure 45: No Economic Development CAAA



8.5 Low Load Growth

Evergy Metro also developed an ARP using the low load forecast. The plan includes fewer resource additions than the Preferred Plan. The optimal resource additions would still include 300 MW of solar in 2027, but would not include 2028 solar and 2029 wind additions. Overall the plan includes 300 MW less solar, 150 MW less wind, and no combustion turbine (415 MW), which it moves up a combined cycle build to replace.

Figure 46: Low Load Growth Plan CAAG



8.6 Future Carbon Capture and Nuclear SMR Options

Combined cycles with carbon capture were available resource options for the high CO_2/high natural gas future alternative resource plan and GHG rule alternative resource plans. All plans with combined cycle builds were upgraded to include carbon capture beginning in 2035 for the High CO_2 restriction endpoints (with capital costs and resource modifications included).

Evergy allowed Nuclear SMR as a resource option in the high CO_2/high natural gas future alternative resource plan and in the GHG rule alternative resource plans. The high CO_2/high natural gas resource plan selected an SMR in 2039.

Evergy also tested SMR as a resource option for the preferred plan, CAAB, when optimizing builds for the mid/mid/mid future. No SMRs were selected.[17] This indicates that based on current assumptions of the economics and timing of SMR availability, SMR is not a lower cost option than the resources selected in the plan. However, when the

[17] Plans CAAK and CAAL have the same resource plan as CAAB, however the models allowed selection of Nuclear SMR beginning in 2039 and 2038 respectively.

technology becomes more mature and costs and timing are more certain, Evergy Metro will have better information to assess if it may be part of the lowest cost future portfolio.

Section 9: Performance Measures

Evergy Metro calculated performance measures for all of the ranked ARPs.

9.1 Plan Metrics[18]

Annual performance measures for each ARP include the expected revenue requirement, revenue requirement, levelized annual rates, and annual rate increase. The base planning assumption is that performance incentives are included as part of DSM programs, but each performance measure is also calculated without these incentives.

Annual revenue requirements and rates are determined assuming perfect ratemaking. Revenue requirement differences among ARPs reflect only the differences attributable to the resource plan, with all other company planning and operational decisions held constant across ARPs. The analysis does not take into consideration other factors such as company commitments and determinations from Commission Orders in other dockets that may impact the rate increase depicted each year. As such, rate increase percentages reflected in the various years of analysis should not be interpreted as actual planned rate increase requests anticipated by the company.

[18] 20 CSR 4240-22.060(2)(A)-(B)

Table 26: Annual Performance Measures for Preferred Plan CAAB[19]

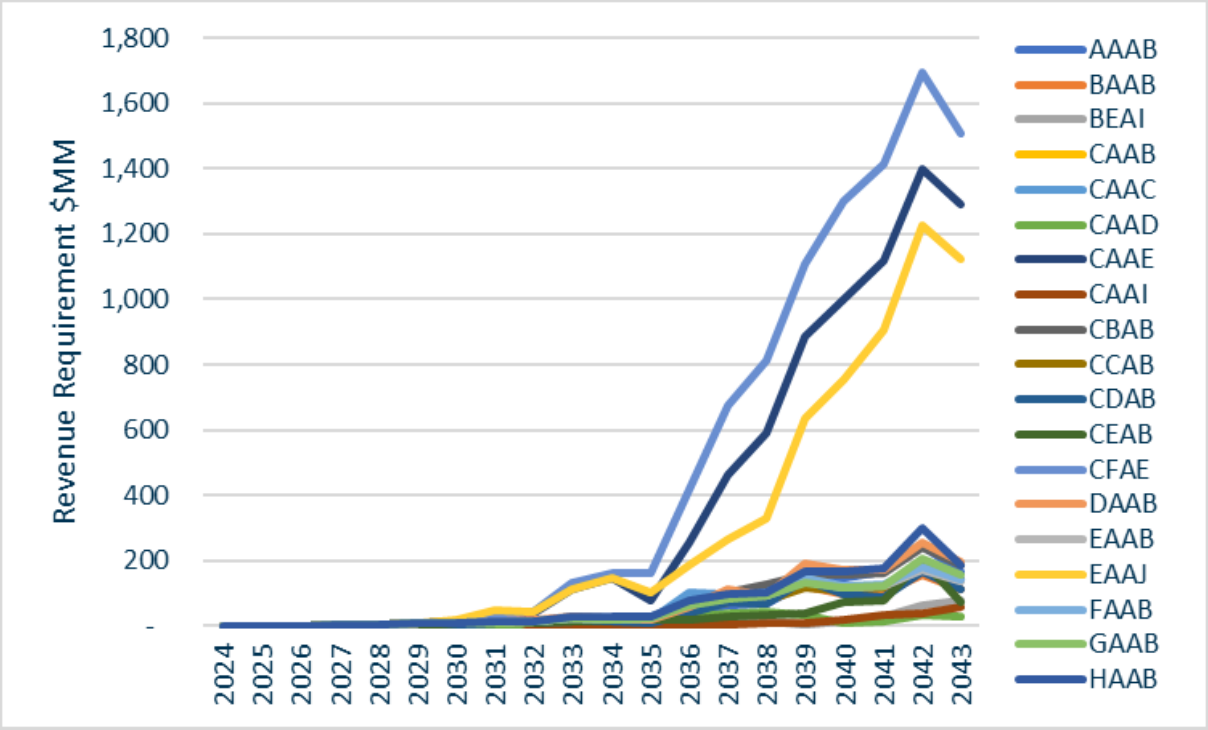
Year	Revenue Requirement ($MM)	Revenue Requirement Without DSM Performance Incentive ($MM)	Levelized Annual Rates ($/kw-hr)	Levelized Annual Rates Without DSM Performance Incentive ($MM)	Rate Increase	Rate Increase Without DSM Performance Incentive	Meets Financial Metrics
2024	1,614	1,614	0.10	0.10			YES
2025	1,675	1,675	0.10	0.10	-2%	-2%	YES
2026	1,732	1,732	0.10	0.10	-2%	-2%	YES
2027	1,824	1,817	0.09	0.09	-3%	-3%	YES
2028	1,876	1,869	0.09	0.09	1%	1%	YES
2029	1,921	1,913	0.10	0.10	2%	2%	YES
2030	1,985	1,977	0.10	0.10	3%	3%	YES
2031	2,067	2,059	0.10	0.10	4%	4%	YES
2032	2,151	2,143	0.11	0.11	4%	4%	YES
2033	2,398	2,390	0.11	0.11	2%	2%	YES
2034	2,230	2,221	0.11	0.11	2%	2%	YES
2035	2,279	2,270	0.11	0.11	2%	2%	YES
2036	2,393	2,385	0.12	0.12	4%	4%	YES
2037	2,471	2,462	0.12	0.12	3%	3%	YES
2038	2,573	2,565	0.12	0.12	4%	4%	YES
2039	2,736	2,727	0.13	0.13	6%	6%	YES
2040	3,444	3,435	0.14	0.14	3%	3%	YES
2041	2,901	2,893	0.14	0.14	4%	4%	YES
2042	3,049	3,042	0.15	0.15	4%	5%	YES
2043	3,638	3,631	0.15	0.15	0%	0%	YES

Annual probable environmental costs were calculated as the difference between the weighted average annual plan costs considering all endpoints and the weighted average annual plan costs at only the low-CO_2 endpoints (which have no CO_2 restrictions), representing the expected incremental value of the costs due to CO_2 restrictions. The ARPs with the highest probable environmental costs were the two developed based on a strategy of planning for a low CO_2, low natural gas price future (CAAE, CFAE), and the plan developed to minimally comply with Missouri Renewable Energy Standards (EAAJ).

[19] 20 CSR 4240-22.060(4)(C)1A-C. Tables for each plan are in Appendix 6D Evergy Metro Rankings and Performance Measures.

These plans have fewer renewable additions than other plans, and no wind additions, making compliance more expensive in endpoints with CO_2 restrictions.

Figure 47: Annual Probable Environmental Costs[20]



[20] 20 CSR 4240-22.060(4)(B)8

Table 27: Overall Performance Measures for All Ranked ARPs[21]

Plan	NPV Revenue Requirement ($MM)	NPV Probable Environmental Costs ($MM)	NPV DSM Performance Incentive Costs ($MM)	Average Annual Rates ($/kW-hr)	Maximum Rate Increase	Meets Financial Metrics
AAAB	23,190	379	22	0.11	6%	YES
BAAB	23,370	334	28	0.12	6%	YES
BEAI	30,424	96	28	0.17	123%	NO
CAAB	23,144	353	65	0.11	6%	YES
CAAC	23,274	400	65	0.11	6%	YES
CAAD	23,574	124	65	0.12	9%	YES
CAAE	24,936	2,451	65	0.13	13%	YES
CAAI	26,316	105	65	0.14	33%	NO
CBAB	23,307	438	65	0.12	5%	YES
CCAB	23,217	347	65	0.11	6%	YES
CDAB	23,881	301	65	0.12	10%	YES
CEAB	25,029	221	65	0.13	18%	YES
CFAE	25,130	3,150	65	0.13	12%	YES
DAAB	23,337	482	17	0.12	8%	YES
EAAB	23,394	376	0	0.12	0%	YES
EAAJ	25,079	1,950	0	0.13	11%	YES
FAAB	23,516	394	0	0.12	9%	YES
GAAB	23,271	384	28	0.12	6%	YES
HAAB	23,685	490	0	0.12	10%	YES

The expected value of performance measures for all ARPs was summarized using the net present values of the annual measures using the Evergy discount rate of 6.85%. Average annual rates and maximum rate increases over the planning horizon were also calculated.

[21] 20 CSR 4240-22.060(7)(A), 20 CSR 4240-22.060(7)(B)3

Table 28: Standard Deviation Plan Performance Measures[22]

Plan	NPV Revenue Requirement ($MM)	NPV Probable Environmental Costs ($MM)	Average Annual Rates ($/kW-hr)	Maximum Rate Increase
AAAB	651	569	0.0041	0.0024
BAAB	586	476	0.0036	0.0020
BEAI	1,668	349	0.0115	0.0106
CAAB	579	440	0.0036	0.0016
CAAC	601	518	0.0038	0.0031
CAAD	682	242	0.0042	0.0023
CAAE	1,701	1,537	0.0119	0.0094
CAAI	1,120	267	0.0075	0.0048
CBAB	708	706	0.0045	0.0022
CCAB	573	428	0.0036	0.0016
CDAB	655	538	0.0041	0.0028
CEAB	754	544	0.0046	0.0018
CFAE	2,182	2,040	0.0152	0.0103
DAAB	690	696	0.0045	0.0041
EAAB	631	457	0.0039	0.0016
EAAJ	1,203	531	0.0087	0.0064
FAAB	621	465	0.0039	0.0017
GAAB	615	457	0.0038	0.0021
HAAB	695	539	0.0044	0.0017

9.2 Performance Discussion

Most ARPs were developed with capital budget limits to ensure the company continues to meet financial metrics and maintain an investment-grade credit rating. The two ARPs with relaxed budget limits are not expected to be financially viable without changes to cost recovery mechanisms.[23] CAAI includes the RAP-Plus level of demand-side management and preferred plan retirements, with all new additions limited to renewables and storage with relaxed budget constraints. BEAI includes the MAP level of demand-side management and all earliest retirements, with all new additions limited to renewables and storage with relaxed budget constraints. The high volume of resource additions needed to meet SPP reliability requirements and customer needs would require larger

[22] 20 CSR 4240-22.060(7)(B)
[23] 20 CSR 4240-22.060(4)(C)2

cash outlays and additions to rate base. Both ARPs are projected to have the highest rates in the 20-year planning horizon, and highest maximum annual rate increases. CAAI has a 33% maximum annual rate increase, while BEAI reaches 123%, with all other ARPs ranging from 5% - 13%. Neither CAAI nor BEAI was selected as the Preferred Plan. However, if an all-renewables and storage strategy was pursued, the company would need to coordinate with regulators to manage the balance sheet and rate impacts.

While strategies to only build renewables and storage to meet future load needs and replace retirements are not financially viable, building renewables as part of a diversified future resource plan is cost effective for customers.[24] The plan EAAJ was developed to minimally comply with Missouri Renewable Energy Standards. It ranked 16th in expected overall costs out of the 19 plans ranked. The 15 higher-ranked (lower-cost) plans all had more renewable additions over the planning period.

While there are no legal mandates for energy efficiency and demand response programs, Evergy Metro also found that implementation of future demand-side portfolios was more cost effective than no demand-side management. ARPs with each of the four levels of demand-side management (RAP, RAP Plus, RAP Minus, MAP), were all higher ranked (lower cost) than a similar ARP with no demand-side management.[25] The demand-side management portfolios have varying levels of expected out-of-pocket costs, which are costs participants pay, net of incentives.

[24] 20 CSR 4240-22.060(4)(E)
[25] 20 CSR 4240-22.060(4)(F)

Table 29: Net Present Value Demand Side Out-of-Pocket Costs[26]

DSM Level	Costs $MM
RAP- Total	**9**
EE	38
DR	(29)
RAP Total	**16**
EE	50
DR	(34)
RAP+ Total	**28**
EE	66
DR	(37)
MAP Total	**(100)**
EE	(62)
DR	(38)

All ARPs were developed to meet the capacity and energy needs of load. The load forecast was a primary input for developing the optimal lowest cost plan taking into consideration future risks. The revenue requirements associated with each ARP were divided by load to determine average rates, assuming perfect ratemaking. As such, the price-elasticity of load was not considered ex-post in calculating rates. Price elasticity is considered in developing the load forecast, as explained in Volume 3.[27]

All ARPs assume expected SPP resource accreditation for new and existing resources and meet or exceed forecasted SPP reserve margin requirements, as detailed in Volume 4. SPP reserve margins are set based on loss of load expectation study results, to plan for a loss of load of one day in ten years. As such, all ARPs are expected to have no more than one day in ten years with unserved energy.[28]

9.3 Impacts and Interrelationships of Critical Uncertain Factors[29]

Each ARP was evaluated based on twenty-seven future endpoints, combining the risks of each critical uncertain factor forecast. The endpoint results were weighted based on

[26] 20 CSR 4240-22.060(2)(A)3
[27] 20 CSR 4240-22.060(4)(D)
[28] 20 CSR 4240-22.060(7)(C)4
[29] 20 CSR 4240-22.060(6)

the combined weightings of the critical uncertain factor scenarios for computation of weighted-average NPVRR and other statistics.

Table 30: Scenario Weighted Endpoint Probabilities

Weighting	Natural Gas Price	CO_2 Restriction	Construction Cost
0.56%	High	High	High
2.25%	High	Mid	High
0.94%	High	Low	High
1.88%	Mid	High	High
7.50%	Mid	Mid	High
3.13%	Mid	Low	High
1.31%	Low	High	High
5.25%	Low	Mid	High
2.19%	Low	Low	High
1.13%	High	High	Mid
4.50%	High	Mid	Mid
1.88%	High	Low	Mid
3.75%	Mid	High	Mid
15.00%	Mid	Mid	Mid
6.25%	Mid	Low	Mid
2.63%	Low	High	Mid
10.50%	Low	Mid	Mid
4.38%	Low	Low	Mid
0.56%	High	High	Low
2.25%	High	Mid	Low
0.94%	High	Low	Low
1.88%	Mid	High	Low
7.50%	Mid	Mid	Low
3.13%	Mid	Low	Low
1.31%	Low	High	Low
5.25%	Low	Mid	Low
2.19%	Low	Low	Low

Evergy Metro used regression analysis to assess the risk drivers for ARP cost. Each extreme risk driver (high, low) and combinations of risk drivers (natural gas price with CO_2 restriction) were tested to determine the effects and correlations.

Figure 48: Regression Study Results

Regression Statistics	
Multiple R	0.455928753
R Square	0.207871028
Adjusted R Square	0.195297552
Standard Error	1914.450001
Observations	513

ANOVA

	df	SS	MS	F
Regression	8	484748707.4	60593588.43	16.5325
Residual	504	1847219878	3665118.806	
Total	512	2331968586		

	Coefficients	Standard Error	t Stat	P-value
Intercept	24297.718	280.338	86.673	0.000
High CO_2	989.624	327.364	3.023	0.003
Low CO_2	-751.730	327.364	-2.296	0.022
High Natural Gas	498.122	327.364	1.522	0.129
Low Natural Gas	-177.049	327.364	-0.541	0.589
High Construction Cost	709.324	207.043	3.426	0.001
Low Construction Cost	-708.622	207.043	-3.423	0.001
Natural Gas + CO_2	211.938	400.937	0.529	0.597
Natural Gas - CO_2	-204.920	400.937	-0.511	0.610

9.4 Cumulative Probabilities of Performance Measures[30]

Each ranked ARP was valued in all twenty-seven endpoints representing each combination of critical uncertain factor forecast. The cumulative probability of each performance measure represents the cumulative likelihood of each cost based on the endpoint probabilities.

[30] 20 CSR 4240-22.060(7)(C)2

Figure 49: Cumulative Probability NPVRR

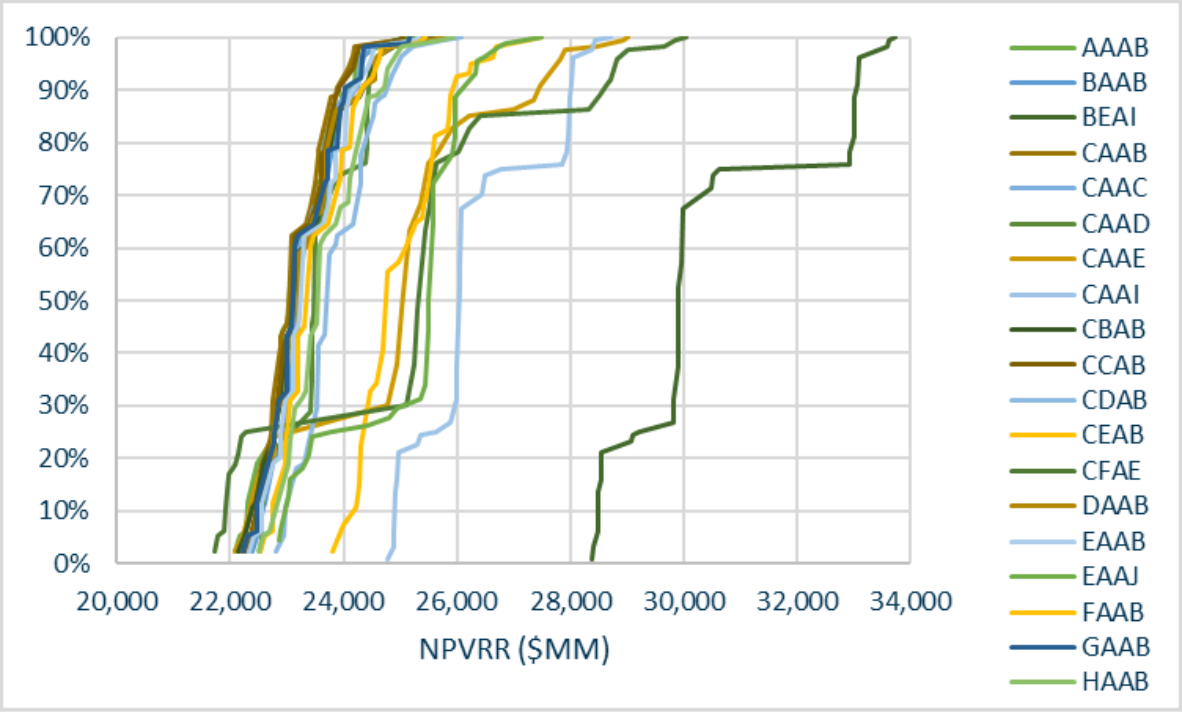


Figure 50: Cumulative Probability Probable Environmental Costs

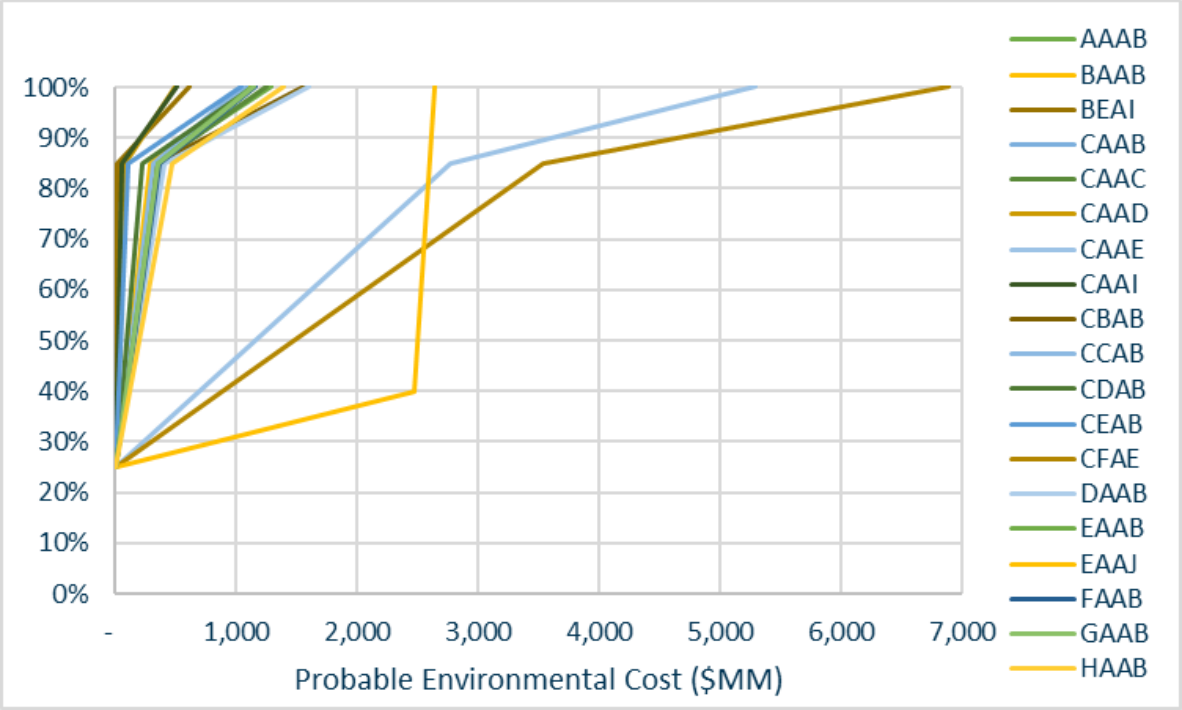


Figure 51: Cumulative Probability Average Rates

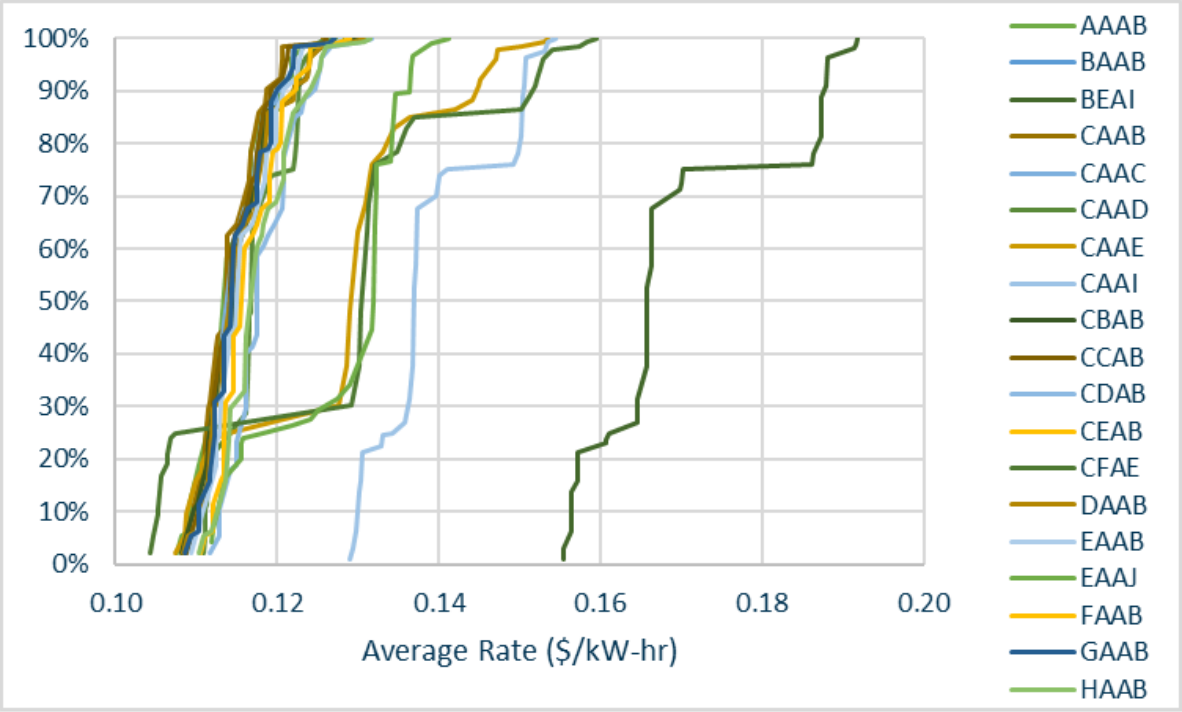
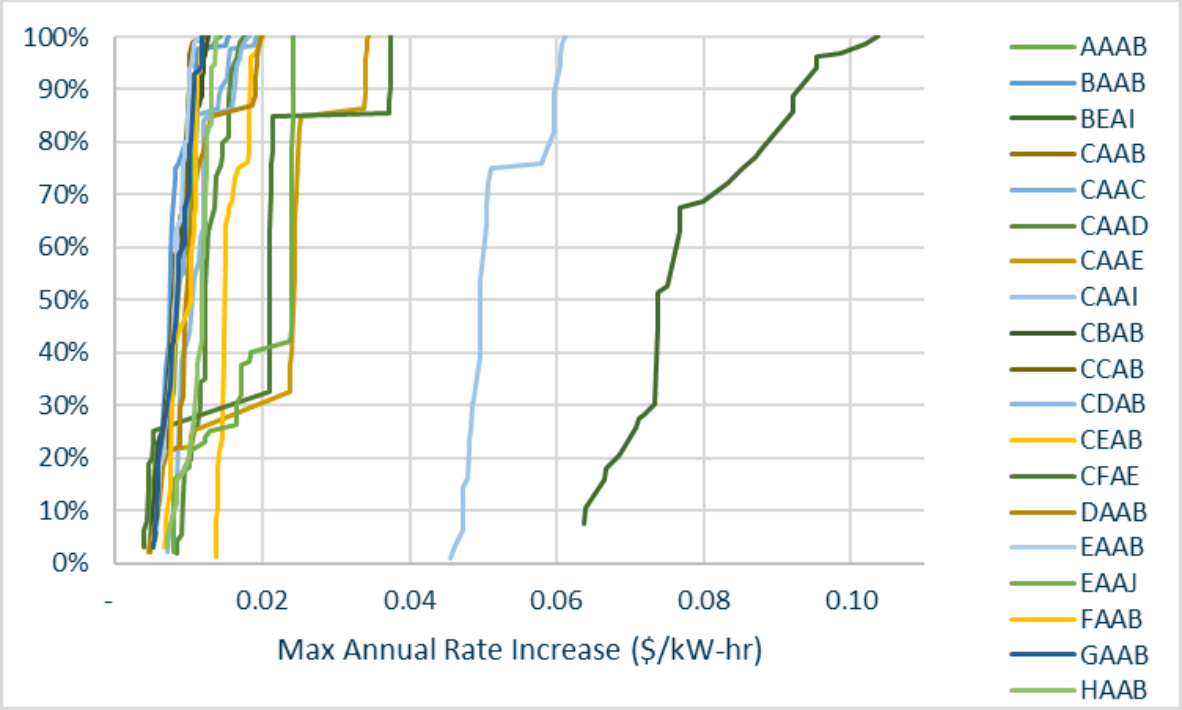


Figure 52: Cumulative Probability Max Annual Rate Increase



Section 10: Uncertain Factor Analysis

10.1 Overview of Uncertain Factor Analysis

The company developed a list of potential critical uncertain factors to consider in alternative resource plans.[31] The following factors were found to be critical based on a two-part analysis:

- Load
- CO_2 Restrictions
- Natural Gas Prices
- Total Build Costs

Table 31: Uncertain Factors Evaluated[32]

Uncertain Factor	Evaluated?	Critical?	Comments
Load Growth	✓	✓	
Interest Rate	✓	✗	
Legal Mandates	✓	✓	CO_2 restriction
Fuel Prices	✓	✗	Natural gas only
New Gen Construction / Permitting	✓	✓	
Purchased Power	N/A	✗	Uncertainty assessed using other factors
Emission Allowance Pricing	✓	✗	
Gen O&M costs	✓	✗	
Forced Outage Rates	✓	✗	
DSM Load Impacts	✓	✗	
DSM Costs	✓	✗	
Other potential uncertain factors	N/A	N/A	None identified

Uncertain factors were identified as critical based on two criteria: (1) whether the uncertain factor significantly changed the base optimal resource build plan, and (2)

[31] 20 CSR 240-22.060(5)

[32] Purchased power was not assessed because Evergy Metro plans to meet its customer energy needs as part of its long-term resource plan and includes a maximum level of hourly purchases to balance customer energy security with the benefits of participation in SPP. No other potential uncertain factors were identified beyond the categories named in the rules. 20 CSR 4240-22.060(5)(G),(M)

whether it significantly changed the NPVRR rankings of representative plans. Each test was conducted by varying the level of the uncertain factor, keeping all other variables constant.

A base plan and four variations were constructed at the Evergy level (Kansas Central, Metro, and Missouri West) using capacity expansion in PLEXOS with all of the mid-level and base assumptions in the IRP 2023 model. The base plan included the 2023 Preferred Plan retirements, the Preferred Plan Missouri demand response programs, and the Full Kansas demand response program option. Four other plans were also constructed to represent different future strategies that could be employed. These plans included an accelerated retirement, a delayed retirement, high renewable build, and no renewable build.

Table 32: Representative Plans

Plan	Builds Available	DSM Program	Retirement Changes
Base PP	All – Wind, Solar, Battery, Hybrid, CC, CT	RAP+ MO, Full KS	None (2023 PP)
Delayed Retirement	All – Wind, Solar, Battery, Hybrid, CC, CT	RAP+ MO, Full KS	Jeffrey 2 2039
Accelerated Retirement	All – Wind, Solar, Battery, Hybrid, CC, CT	RAP+ MO, Full KS	Iatan 1 2030
High Renewable	Wind, Solar, Battery, Hybrid	MAP MO, Full KS	None (2023 PP)
No Renewable	CC, CT	RAP+ MO, Full KS	None (2023 PP)

10.2 Representative Plan Capacity Expansion Results

Figure 53: EVG Base PP

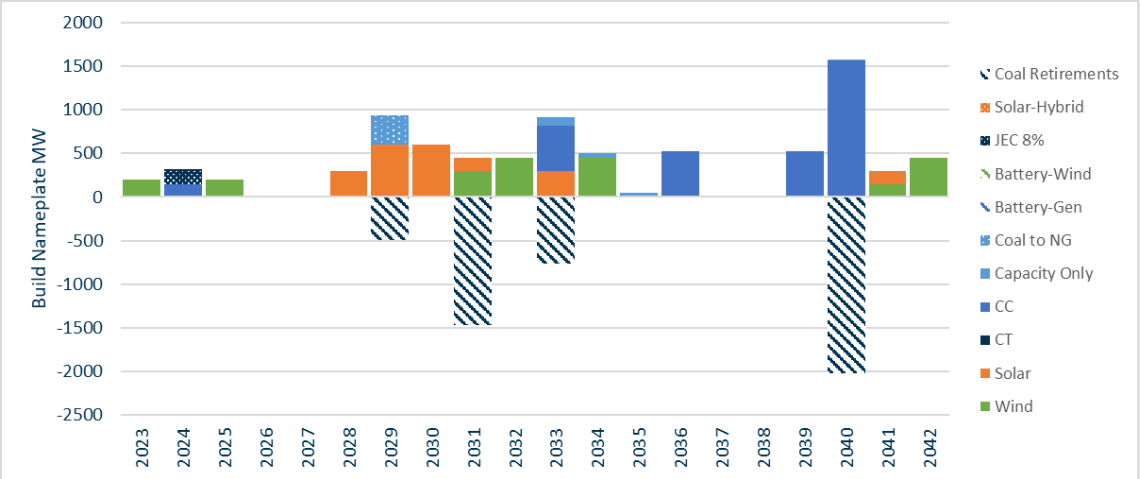


Figure 54: EVG Delayed Retirement Plan

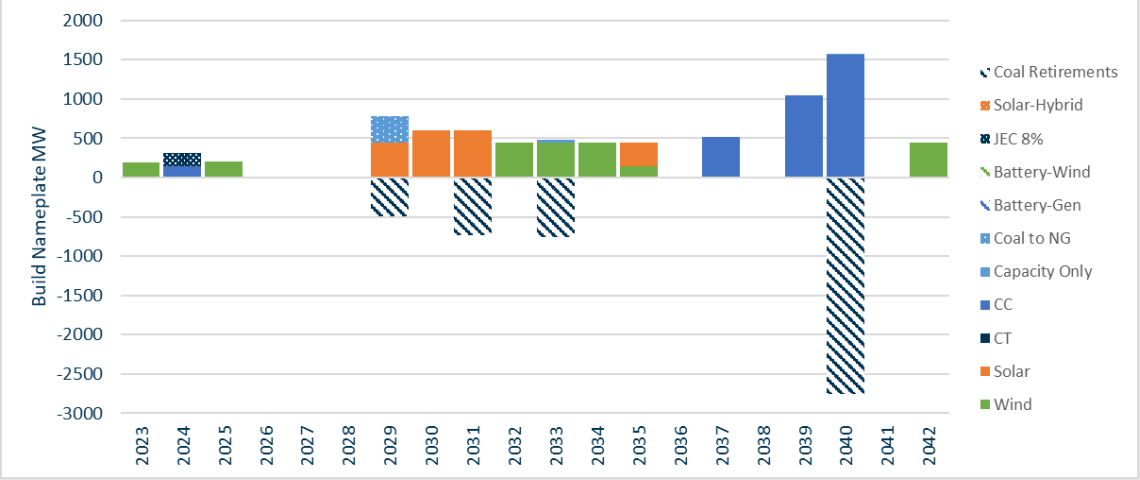


Figure 55: EVG Accelerated Renewable Plan

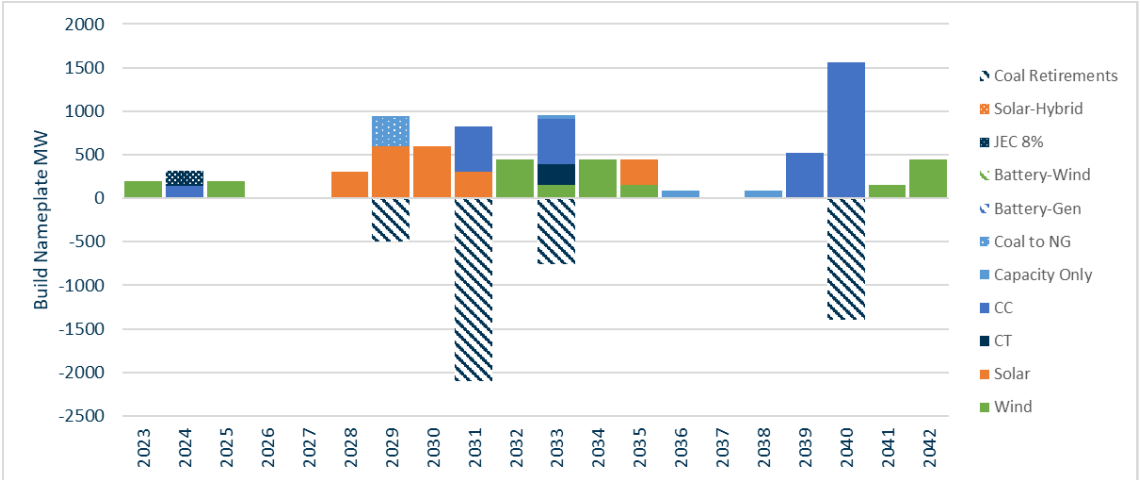


Figure 56: EVG High Renewable Plan

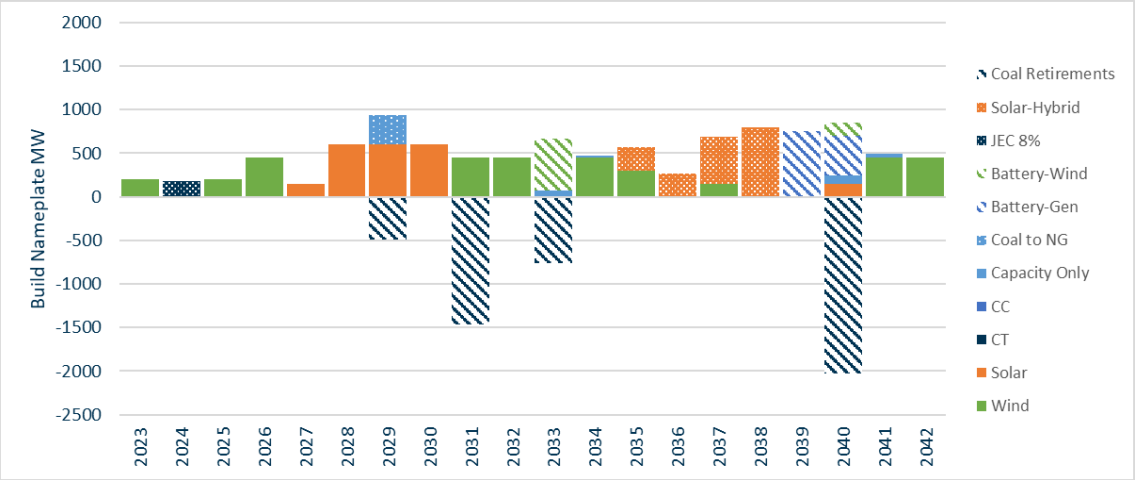
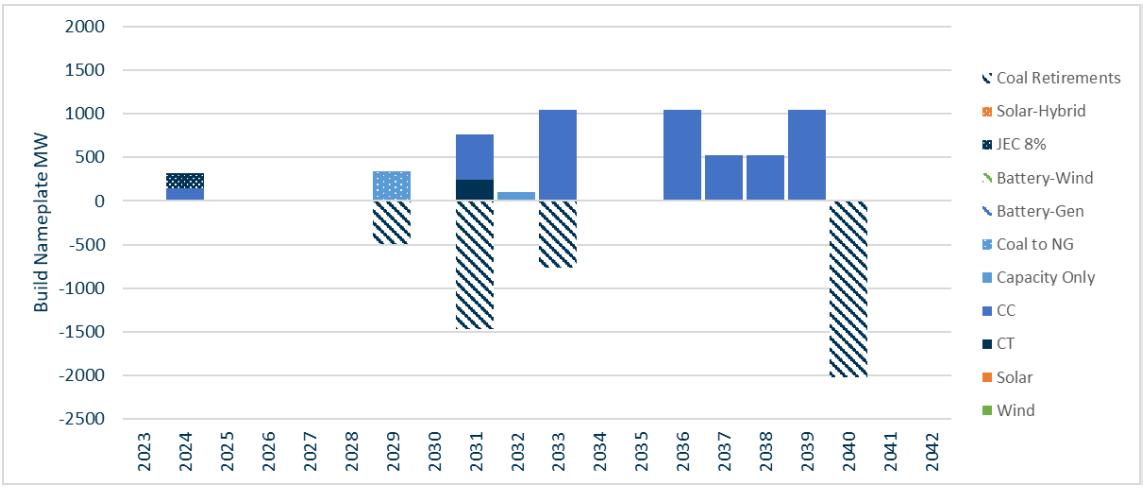


Figure 57: EVG No Renewable Plan



10.3 Uncertain Factor Testing Method

Each uncertain factor was researched, and a low and high sensitivity was developed (if applicable).[33]

For the first test, the base plan was re-run through capacity expansion with a high and low level of each uncertain factor sensitivity listed below. The build decision outcomes were then compared to the base plan.

[33] 20 CSR 4240-22.060(7)(C)1A. See descriptions of each uncertain factor forecast below.

For the second test, all five representative plans were re-run through the production cost model with each uncertain factor sensitivity. Capacity expansion was not used, as the build plans were fixed. Each plan was ranked based on economics using the net present value revenue requirements (NPVRR) metric. The rankings were compared to the original rankings using all mid-level and base assumptions.

Table 33: Summary of Results

Uncertain Factor	Build Test	Rankings Test	Critical?
Load Growth	n/a	n/a	Yes
Interest Rates	Minor Change	Minor Change	No
CO_2 Restrictions	Significant	Significant	Yes
Coal Prices	No Change	No Change	No
Natural Gas Prices	Change	Change	Yes
Interconnection Costs	No Change	No Change	No
Construction Costs	Change	Change	No
Total Build Costs	Significant	Significant	Yes
Emissions Allowances	No Change	No Change	No
Fixed O&M	Minor Change	No Change	No
Outage Rates	No Change	No Change	No
Load Reductions DSM	Minor Changes	No Change	No
Costs DSM	No Change	No Change	No

10.4 Uncertain Factor Sensitivity Discussion

10.4.1 Load Growth[34]

Load is critical in that it determines how much capacity is required, which drives the creation of resource plans. Load has historically been incorporated as an endpoint in evaluating revenue requirements, but evaluated resource plans were not adjusted to reflect more or less required capacity. For the 2024 triennial IRP, Evergy evaluated load as a high and low contingency plan to reflect that different resource decisions could be made if load was higher or lower than the expected base case. These high and low scenarios also capture the range of uncertainty around future SPP resource adequacy requirements that could drive more or less future capacity need. Load growth scenario results are discussed in more detail in sections 2.3.2, 8.3 and 8.4.

[34] 20 CSR 4240-22.060(5)(A)

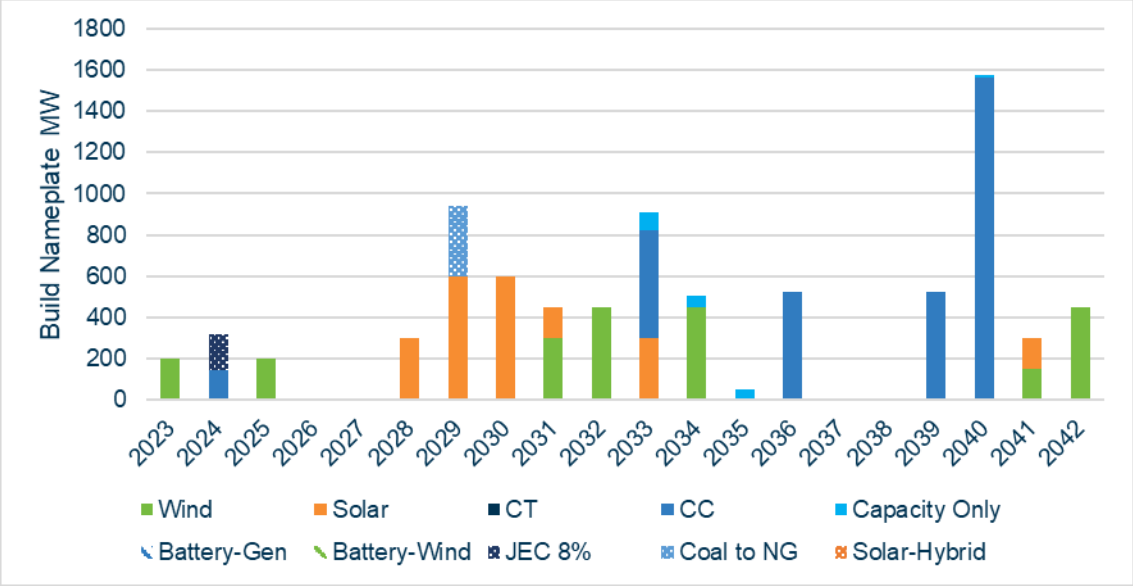
10.4.2 Cost of Capital[35]

Evergy used a 7.13% WACC in its 2023 IRP update, representing the average forward-looking cost of capital across the combined company. For uncertain factor sensitivity testing, the low WACC was 6.5% and high WACC was 9%.

Build Test

The high WACC scenario pushes solar back, includes a solar-hybrid build, and additional combined cycle generation. The low WACC scenario build plan is very similar to the base preferred plan.

Figure 58: EVG Base PP



[35] 20 CSR 4240-22.060(5)(B)

Figure 59: EVG High WACC

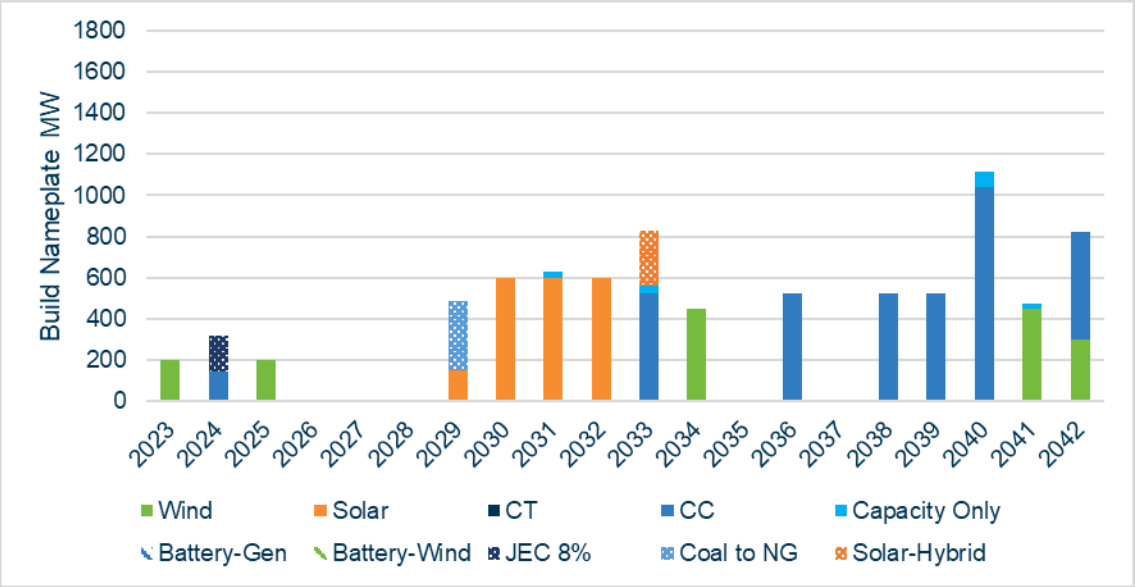
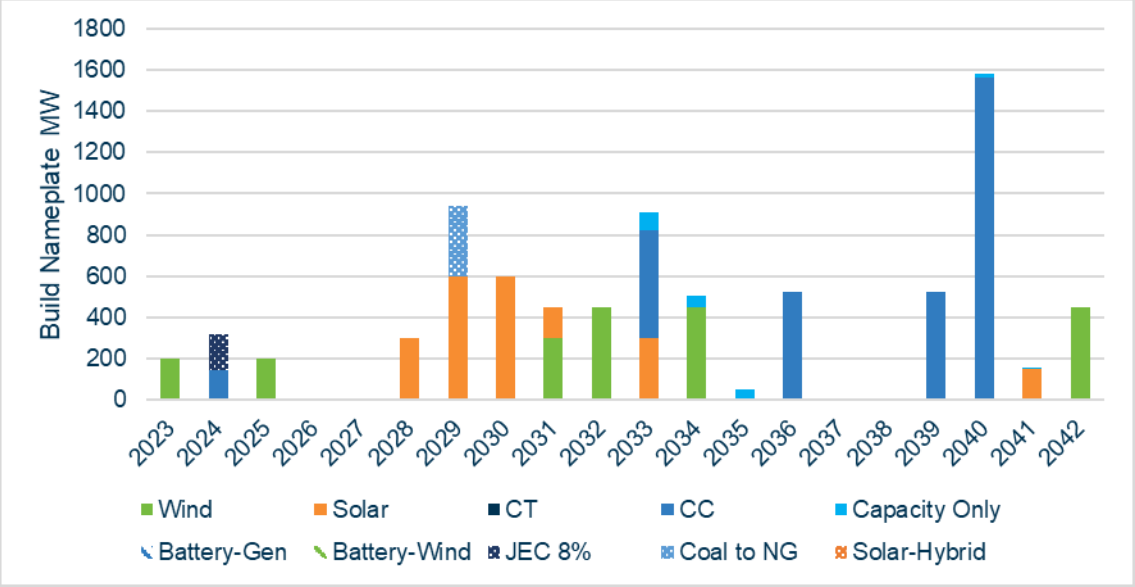


Figure 60: EVG Low WACC



Rankings Test

Plan rankings did not change under the low WACC scenarios. The higher WACC caused the No Renewable plan to rank higher than the Accelerated Retirements and High Renewables plans. These changes, along with the changes to the build plan, were relatively minor compared to the other factors that were deemed critical.

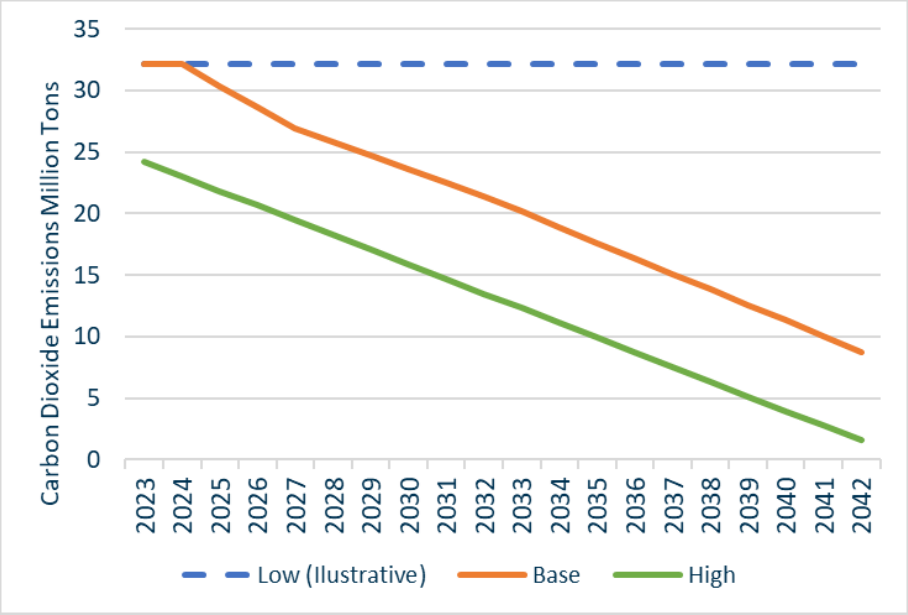
Table 34: WACC Rankings Test

Ranking	Base	High WACC	Low WACC
1	Base PP	Base PP	Base PP
2	Delayed Retirement	Delayed Retirement	Delayed Retirement
3	Accelerated Retirement	Accelerated Retirement	Accelerated Retirement
4	High Renewable	No Renewable	High Renewable
5	No Renewable	High Renewable	No Renewable

10.4.3 Carbon Emissions Restrictions[36]

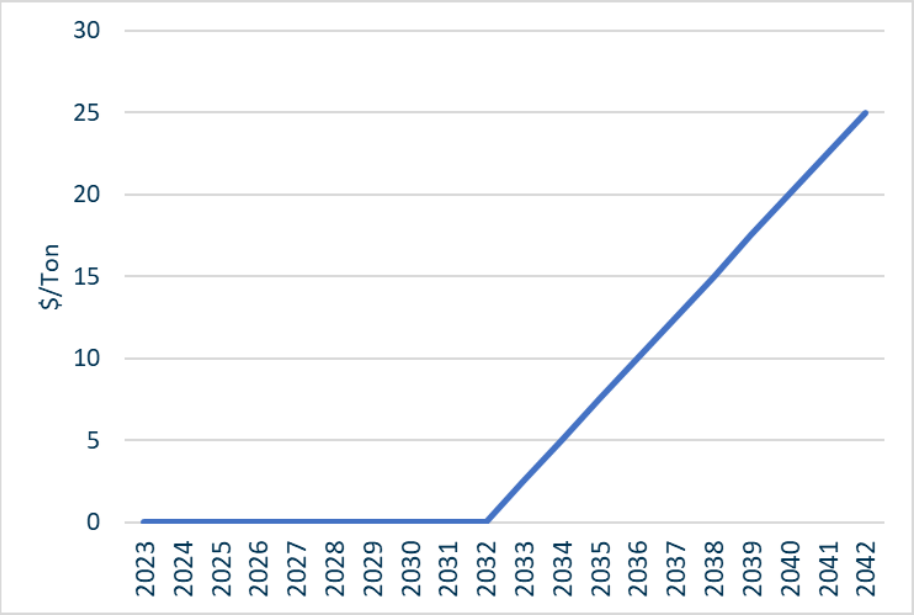
Carbon emissions restriction forecasts developed for the 2023 IRP and corresponding market price endpoints were used for uncertain factor testing. For the low forecast, no emissions restrictions were assumed. For the high forecast, emissions were based on the SPP integrated transmission planning Future 3 model which was engineered with an explicit carbon reduction goal of an approximately 95% reduction in CO_2 production from 2017 levels. Evergy used the same logic to ratably restrict emissions from historic 2017 CO_2 production levels to culminate in 2042 with a 95% reduction. The high forecast also incorporates a carbon tax which ramps to $25/ton by the end of the twenty-year horizon, consistent with Future 3.[37]

Figure 61: Evergy-Level Carbon Emissions Restrictions



[36] 20 CSR 4240-22.060(5)(C) Future changes in legal mandates
[37] Carbon Constraint Values CUF Workpaper.

Figure 62: Carbon-Tax - High Emissions Restriction



Build Test

The build test demonstrates that optimal build decisions would be notably different in the high and low carbon emissions restriction scenarios. The plan for high restrictions includes earlier solar build, significantly more wind build, and other differences. The plan for low (no) restrictions pushes back solar build and includes no wind build.

Figure 63: EVG Base PP

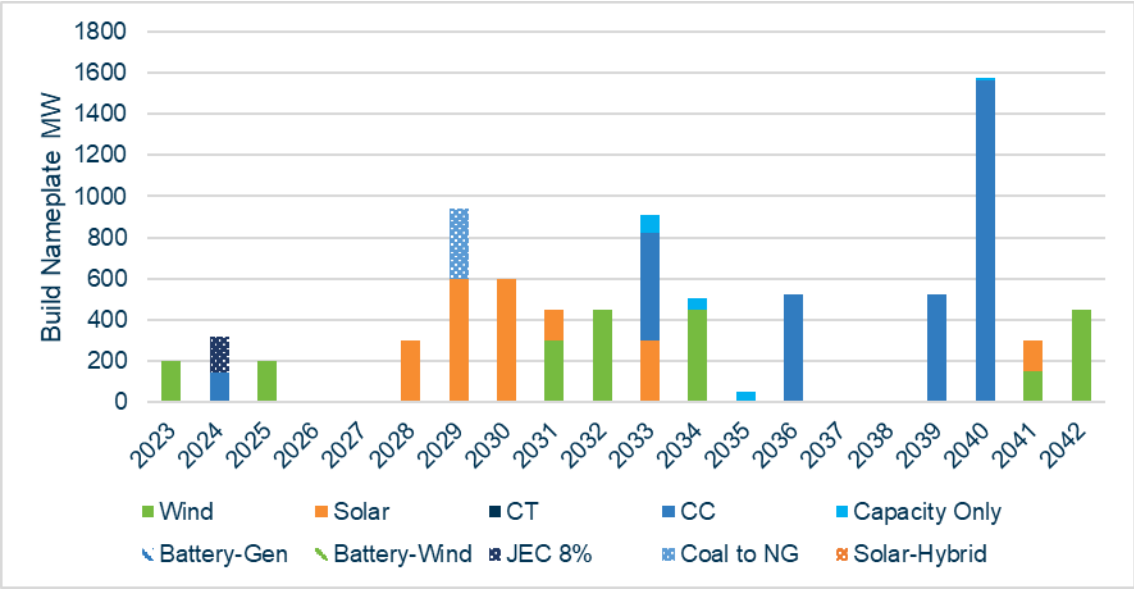


Figure 64: EVG High Emissions Restrictions

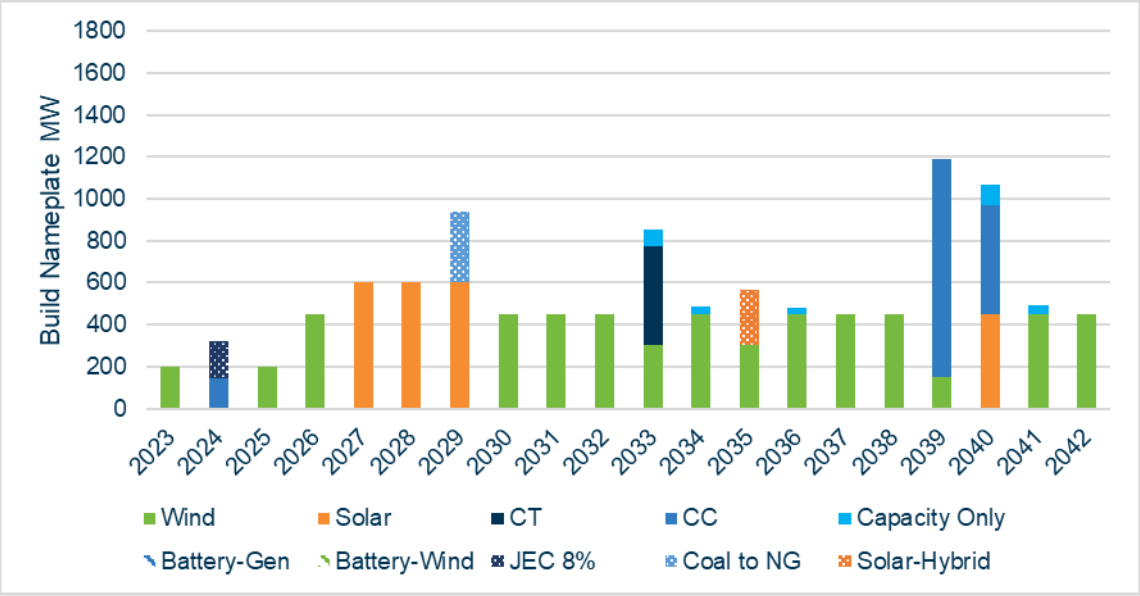
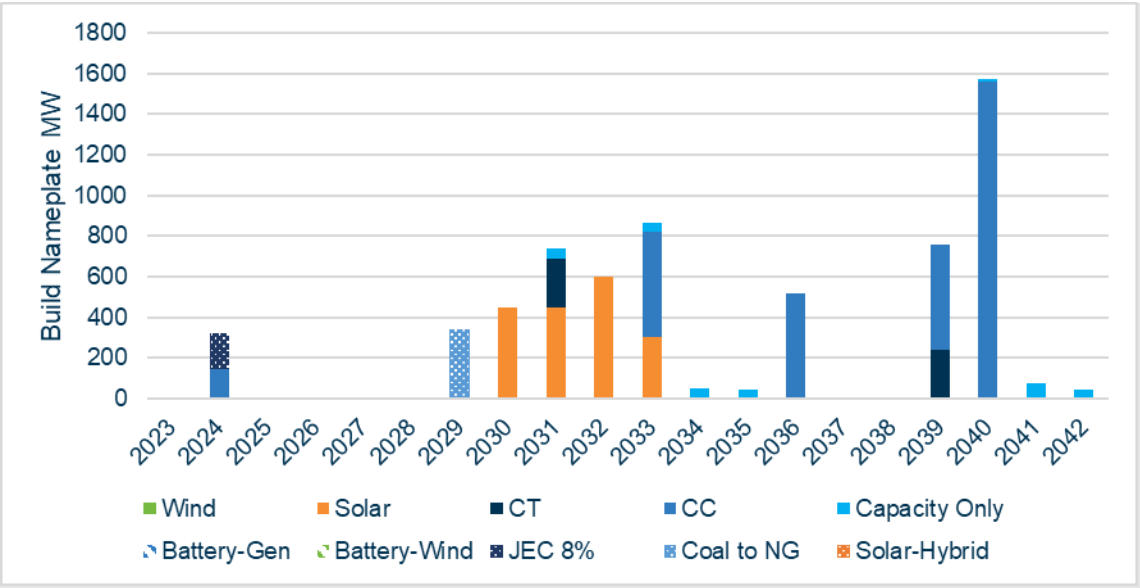


Figure 65: EVG Low Emissions Restrictions



Rankings Test

Plan rankings changed significantly with the High CO_2 restriction forecast. The lowest NPVRR plan was the fourth ranked plan under the base scenario. Rankings also changed in the Low forecast.

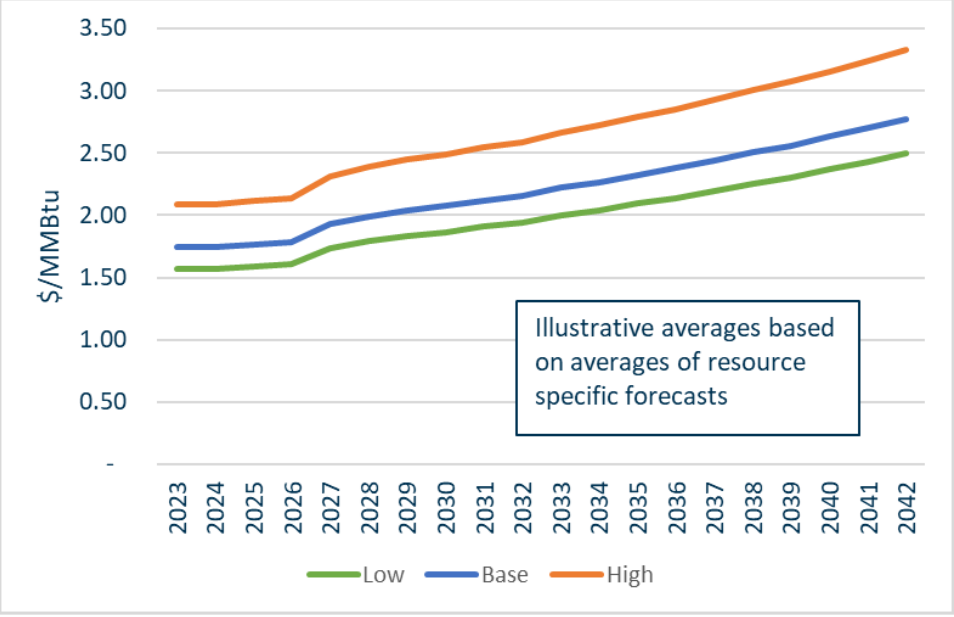
Table 35: Emissions Restriction Rankings Test

Ranking	Base	High CO_2 Restriction	Low CO_2 Restriction
1	Base PP	Accelerated Retirement	Base PP
2	Delayed Retirement	High Renewable	Delayed Retirement
3	Accelerated Retirement	Delayed Retirement	High Renewable
4	High Renewable	Base PP	No Renewable
5	No Renewable	No Renewable	Accelerated Retirement

10.4.4 Coal Prices[38]

Evergy coal resources source fuel from the Powder River Basin, WY. Historically, this fuel source has not experienced much commodity price volatility because it is not exported internationally, and therefore has been insulated from the global market pressure influencing oil, natural gas, and other coal sources (Illinois Basin, Atlantic). Evergy does experience delivery cost risk based on negotiated rates with rail companies, which may be influenced by labor costs, rail traffic, and availability of alternative routes to plant sites. The coal price uncertain factor sensitivity was tested with an increase of 20% (high) and a decrease of 10% (low).[39]

Figure 66: Coal Price Forecast Sensitivities



[38] 20 CSR 4240-22.060(5)(D)
[39] CONF Coal Prices CUF Workpaper.

Build Test

Estimated high and low future coal prices lead to no significant change in the preferred build plan.

Figure 67: EVG Base PP

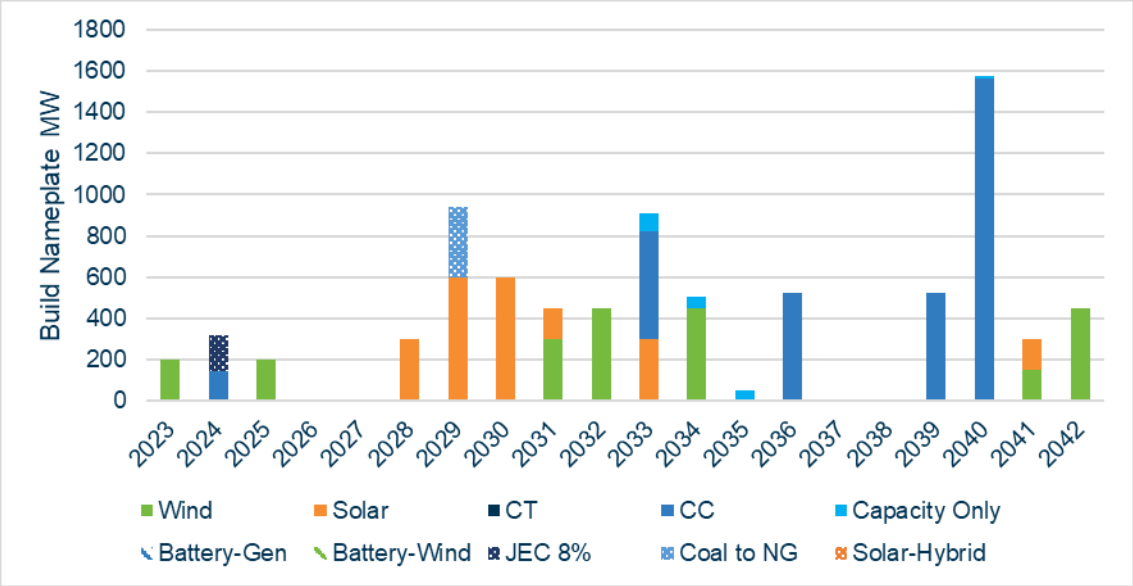


Figure 68: EVG High Coal

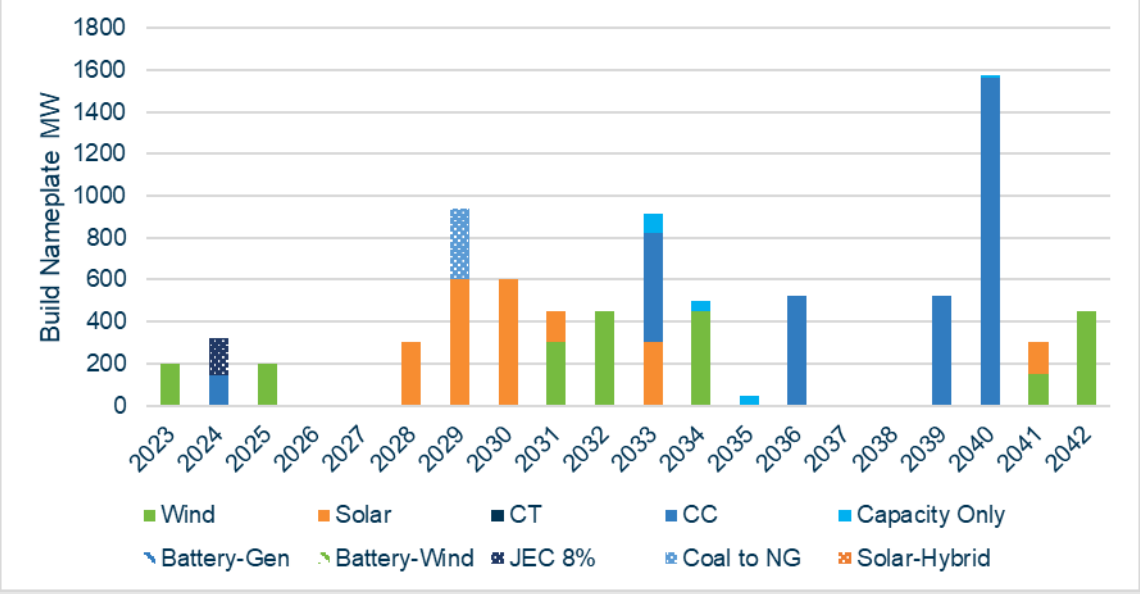
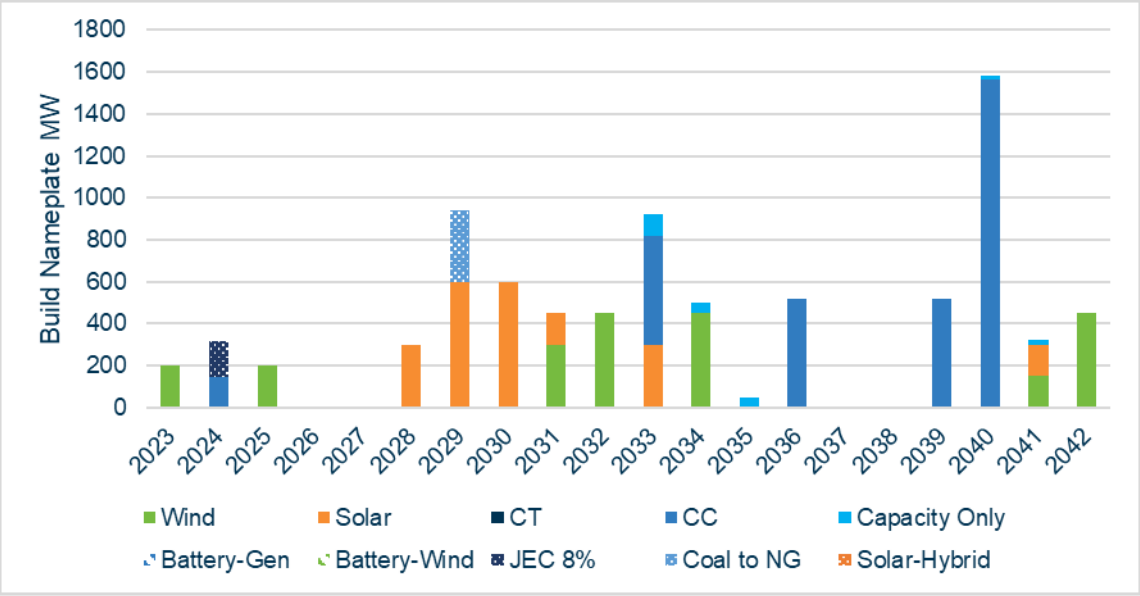


Figure 69: EVG Low Coal



Rankings Test

The plan rankings did not change in high or low coal price scenarios.

Table 36: Coal Prices Rankings Test

Ranking	Base	High Coal	Low Coal
1	Base PP	Base PP	Base PP
2	Delayed Retirement	Delayed Retirement	Delayed Retirement
3	Accelerated Retirement	Accelerated Retirement	Accelerated Retirement
4	High Renewable	High Renewable	High Renewable
5	No Renewable	No Renewable	No Renewable

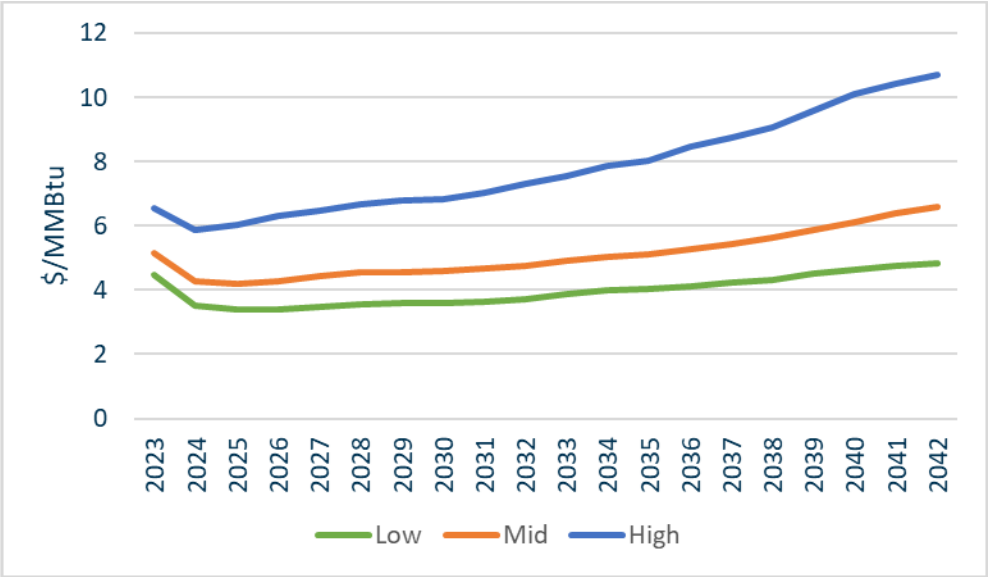
10.4.5 Natural Gas Prices[40]

Natural gas price forecasts for high and low cases were developed for the 2023 IRP. The high and low forecasts were developed by using the mid forecast and scaling it based on the fundamental supply and demand forecasts in the EIA Annual Energy Outlook model. Evergy used the “High Oil and Gas Supply” to calculate the low natural gas price forecast, and the “Low Oil and Gas Supply” for the high natural gas price forecast. These natural

[40] 20 CSR 4240-22.060(5)(D)

gas price forecasts and the corresponding market price forecasts were used to test the high and low uncertain factor sensitivities.[41]

Figure 70: Natural Gas Price Forecasts



Build Test

The high natural gas sensitivity pulled solar build forward, while the low natural gas sensitivity pushed it back in the time horizon. The high also resulted in more wind and CT builds, while the low was similar to the base plan.

[41] Natural Gas Price Forecasts CUF Workpaper

Figure 71: EVG Base PP

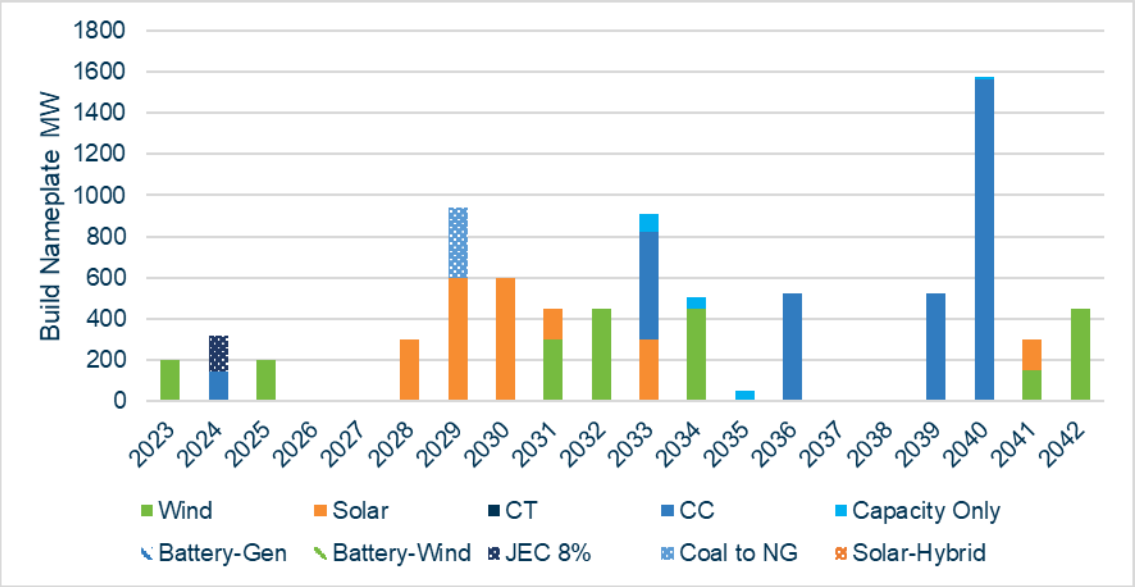


Figure 72: EVG High Natural Gas

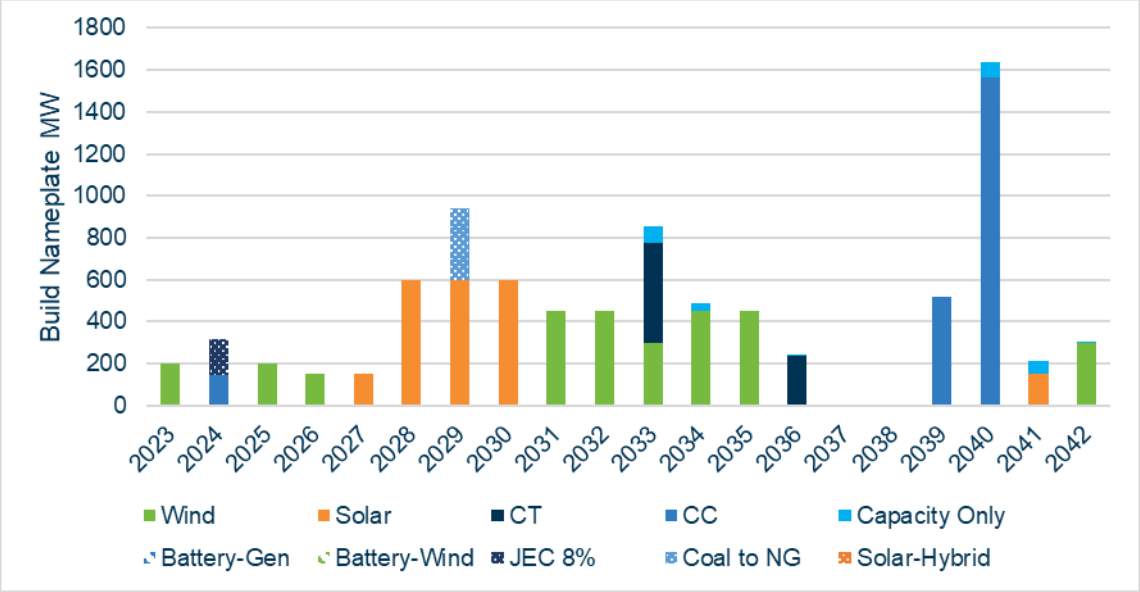
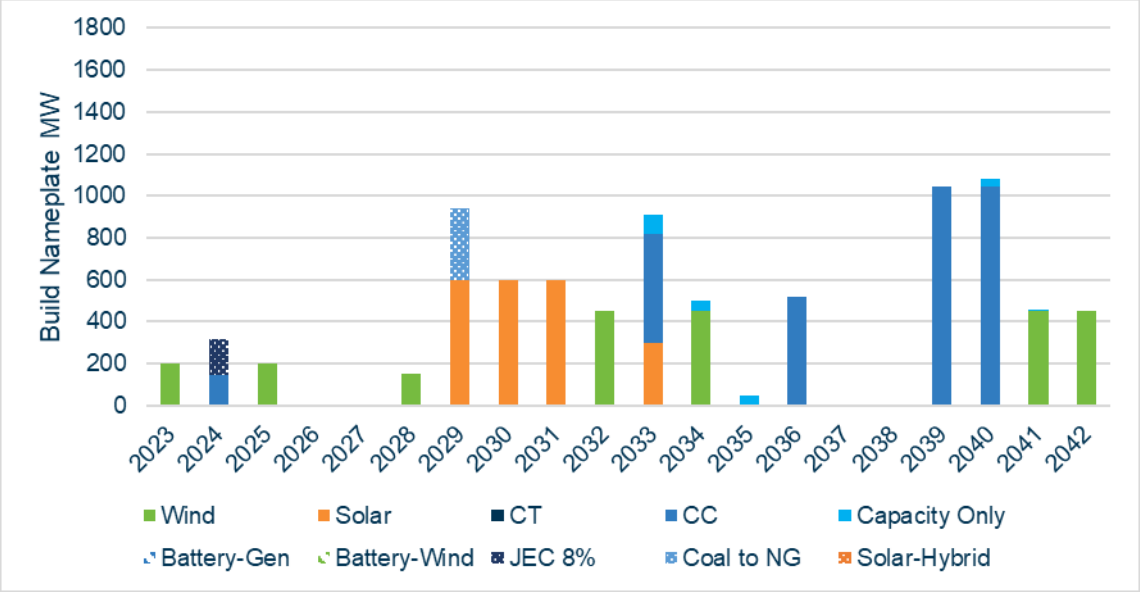


Figure 73: EVG Low Natural Gas



Rankings Test

The plan rankings did not change for the low natural gas price forecast relative to the base forecast. The Delayed Retirement plan was ranked first in the high natural gas price forecast sensitivity, changing the rankings slightly.

Table 37: Natural Gas Prices Rankings Test

Ranking	Base	High NG	Low NG
1	Base PP	Delayed Retirement	Base
2	Delayed Retirement	Base	Delayed Retirement
3	Accelerated Retirement	Accelerated Retirement	Accelerated Retirement
4	High Renewable	High Renewable	High Renewable
5	No Renewable	No Renewable	No Renewable

10.4.6 Interconnection Costs[42]

SPP Interconnection cost data compiled by Berkeley Lab[43] from 2002 to early 2023 was used to assess the impact of interconnection costs. Interconnection cost variation was found to have only a minor impact on Evergy capacity expansion plans and does not change NPVRR plan rankings.

[42] 20 CSR 4240-22.060(5)(E)
[43] https://emp.lbl.gov/publications/generator-interconnection-cost-0

Berkeley Lab's SPP interconnection cost data provides point of interconnection and broader network upgrade costs for individual projects from 2002 to early 2023. The data shows that interconnection costs vary widely by fuel type, year, and location. Renewables and storage projects typically have higher interconnection costs than natural gas plants. Broader transmission system upgrade costs are the primary cost driver and costs have grown over time. Projects that withdraw have significantly higher costs than projects that are completed or still active.

Since the impact of recent cost increases is the primary concern, total interconnection cost data ($/kW) from 2019-2023 for active and completed projects was analyzed to obtain estimates of high and low interconnection costs by fuel type. The smallest and largest 5% of estimates were dropped from the sample due to extreme outliers ($0 interconnection costs, for example). Those estimates were used to assess the impact on the IRP model's capacity expansion plans and NPVRR.

Interconnection costs were included in the 2023 IRP as part of a new build's capital expenditures. CT and CC estimated interconnection costs in the 2023 IRP were slightly higher than the SPP high estimate. Renewables interconnection costs in the 2023 IRP were integrated into the total cost of project estimates obtained from recent RFPs.

The sample median observation for each fuel type was used as the midpoint estimate. The 25th and 75th percentile of each fuel type was used as the high and low estimated costs.

Table 38: 2019-2023 SPP Interconnection Costs

Active and Completed Projects ($/kW)

	Sample Size	Low Estimate	Median	High Estimate
Hybrid	7	$34.50	$41.01	$65.14
Natural Gas	15	$12.99	$48.01	$52.89
Solar	123	$31.57	$60.89	$117.23
Storage	58	$26.61	$72.28	$116.58
Wind	136	$17.57	$43.32	$77.35
		25th Percentile		*75th Percentile*

Build Test

Interconnection costs had a minor impact on the timing of solar and wind builds.

Figure 74: EVG Base PP

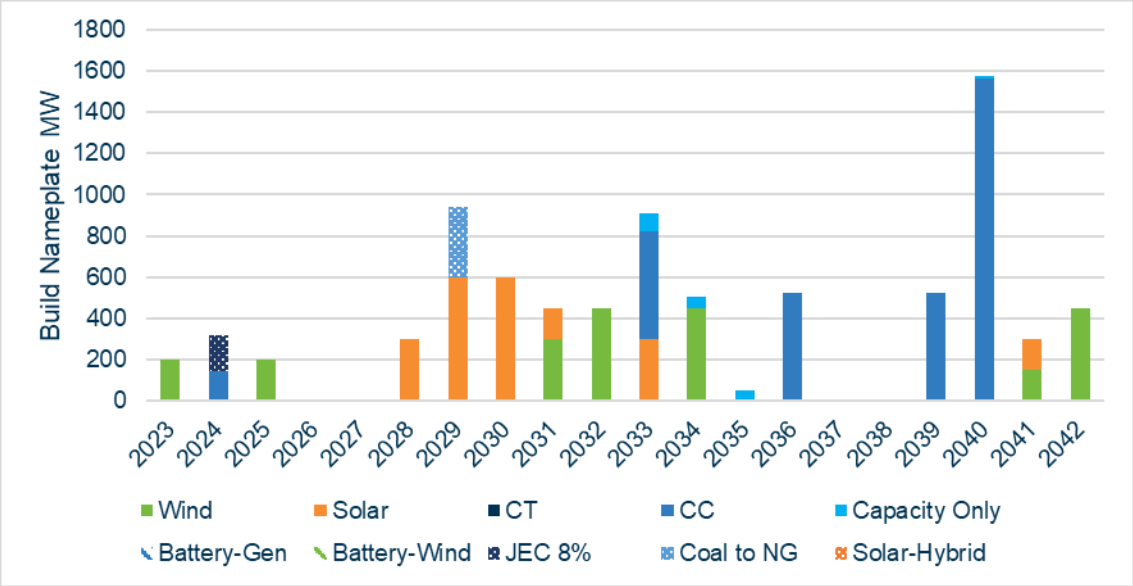


Figure 75: EVG High Interconnection Costs

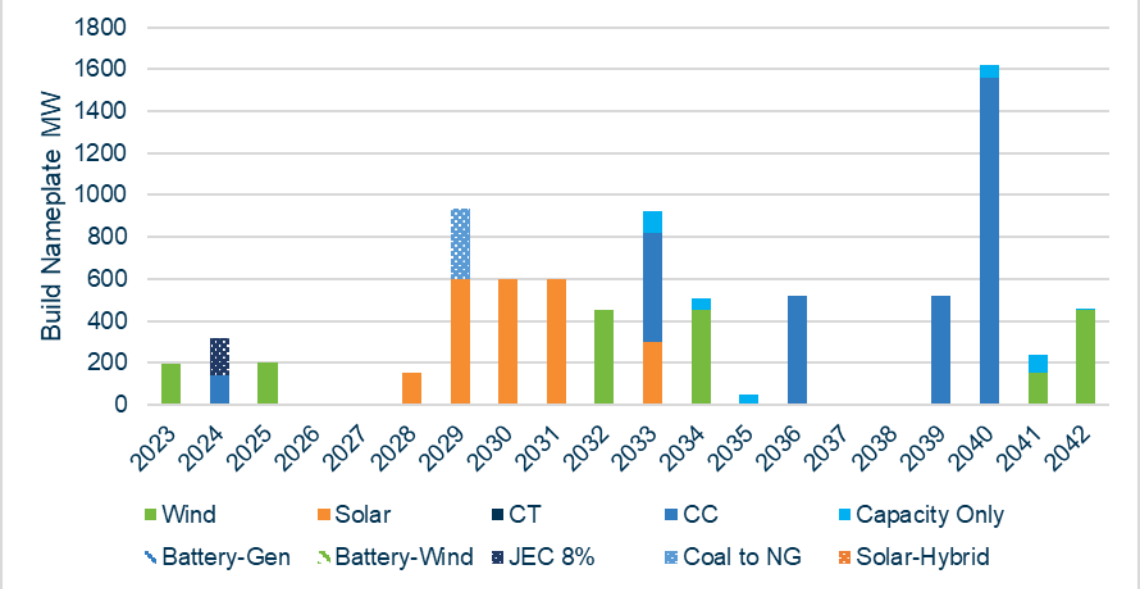
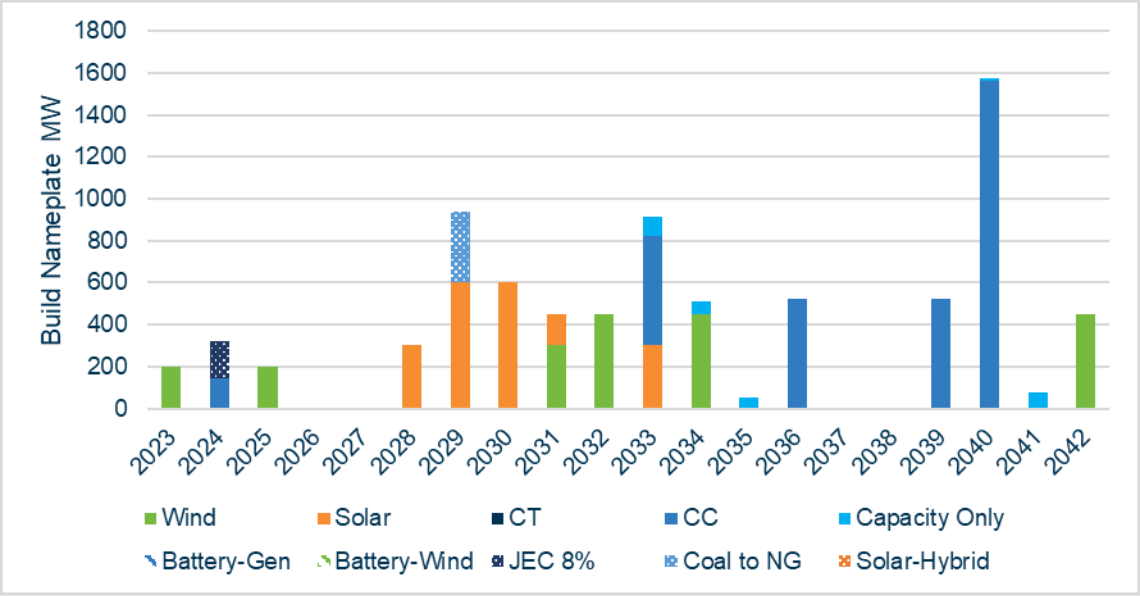


Figure 76: EVG Low Interconnection Costs



Rankings Test

The plan rankings did not change for the high or low interconnection cost scenarios relative to the base forecast.

Table 39: Interconnection Cost Rankings Test

Ranking	Base	High Interconnection Costs	Low Interconnection Costs
1	Base PP	Base PP	Base PP
2	Delayed Retirement	Delayed Retirement	Delayed Retirement
3	Accelerated Retirement	Accelerated Retirement	Accelerated Retirement
4	High Renewable	High Renewable	High Renewable
5	No Renewables	No Renewables	No Renewables

10.4.7 Construction Costs[44]

Construction cost estimates have been fairly volatile over the past few years. Supply chain issues and inflation have increased costs and cost uncertainty. The average year over year cost estimate differences in the past two IRPs were 28% for solar projects and 27% for wind projects. On an absolute value basis, the cost estimate differences were 22% for CTs and 24% for CCs. For this uncertain factor test, construction costs (net of

[44] 20 CSR 4240-22.060(5)(F)

interconnection costs) were increased by 25% for the high sensitivity and decreased 25% for the low sensitivity.

Build Test

Higher construction costs pushes solar back, reduces wind, and increases combined cycle builds. Lower construction costs push solar forward, increases wind, and builds combustion turbine and solar hybrid resources.

Figure 77: EVG Base PP

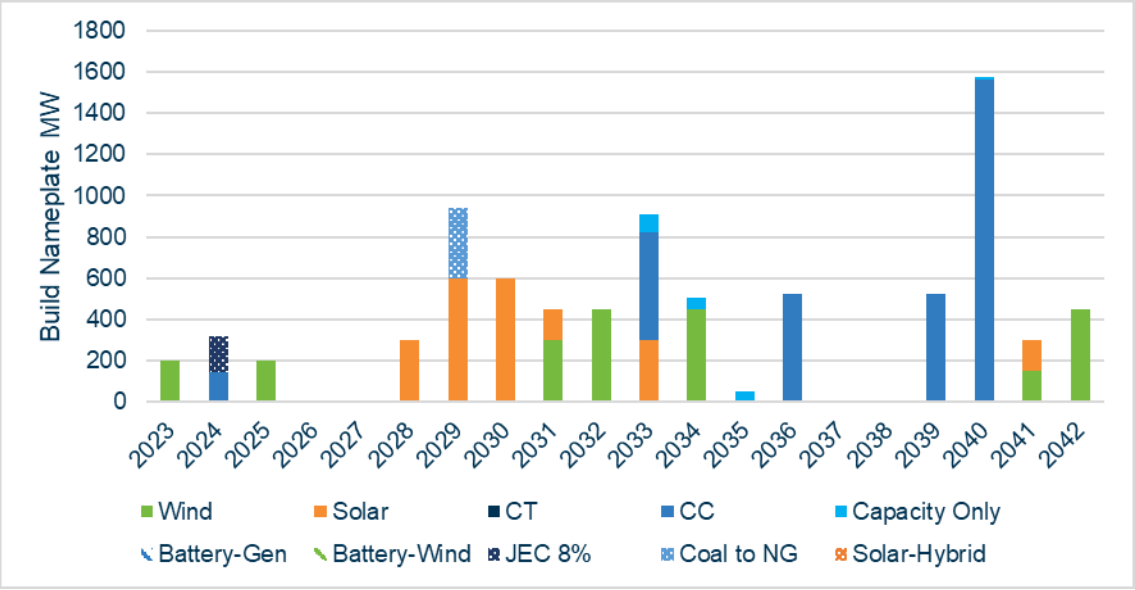


Figure 78: EVG High Construction Costs

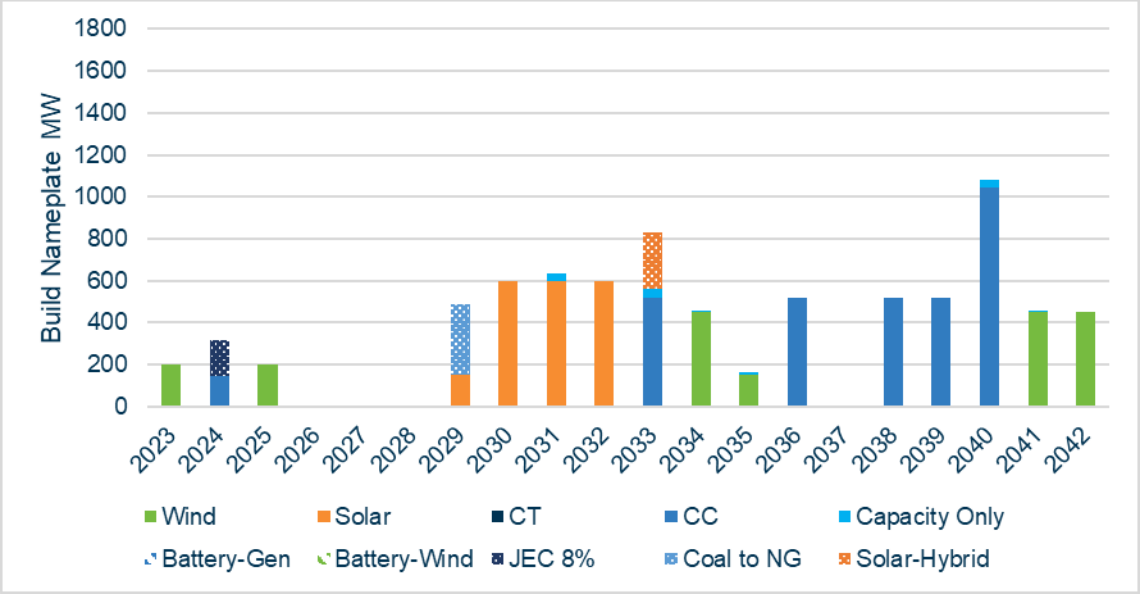
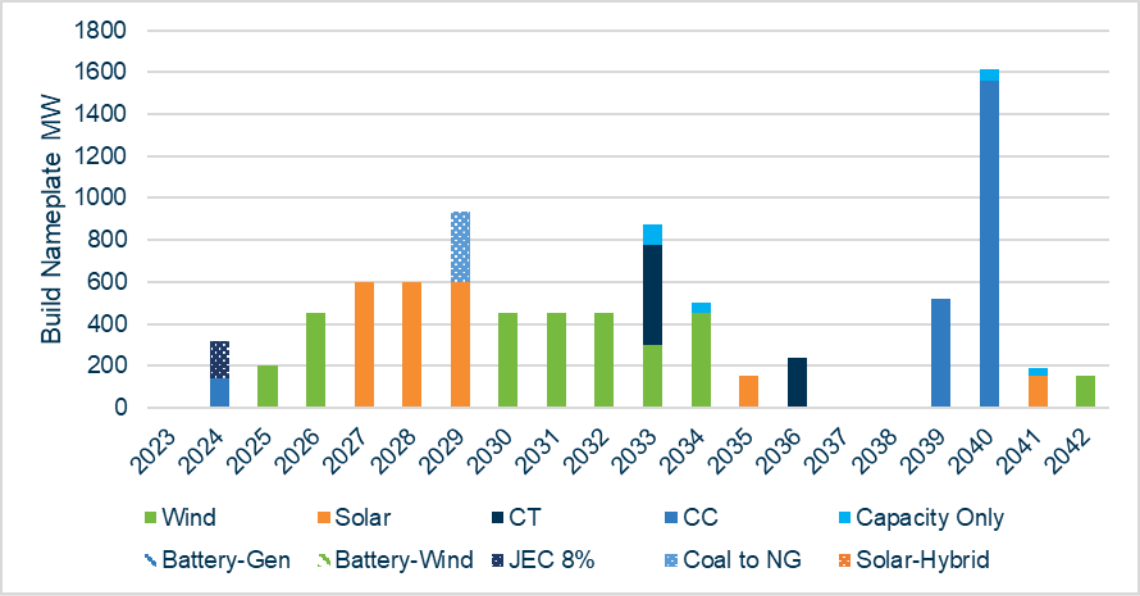


Figure 79: EVG Low Construction Costs



Rankings Test

Construction costs changed the order of the high renewable plan and no retirements plan in the high construction costs scenario.

Table 40: Construction Cost Rankings Test

Ranking	Base	High Construction Costs	Low Construction Costs
1	Base PP	Base PP	Base PP
2	Delayed Retirement	Delayed Retirement	Delayed Retirement
3	Accelerated Retirement	Accelerated Retirement	Accelerated Retirement
4	High Renewable	No Renewables	High Renewable
5	No Renewables	High Renewable	No Renewables

10.4.8 Total Build Costs (Combined Construction & Interconnection)

A combination of construction costs and interconnection costs were created to assess the impact of an increase or decrease of all build costs. Estimates from the high and low construction cost and interconnection cost tests described above were added together to create high and low build cost scenarios.

Build Test

Higher build costs push solar back, reduces wind, and increases combined cycle builds. Lower construction costs push solar forward, increases wind, and builds combustion turbine and solar hybrid resources.

Figure 80: EVG Base PP

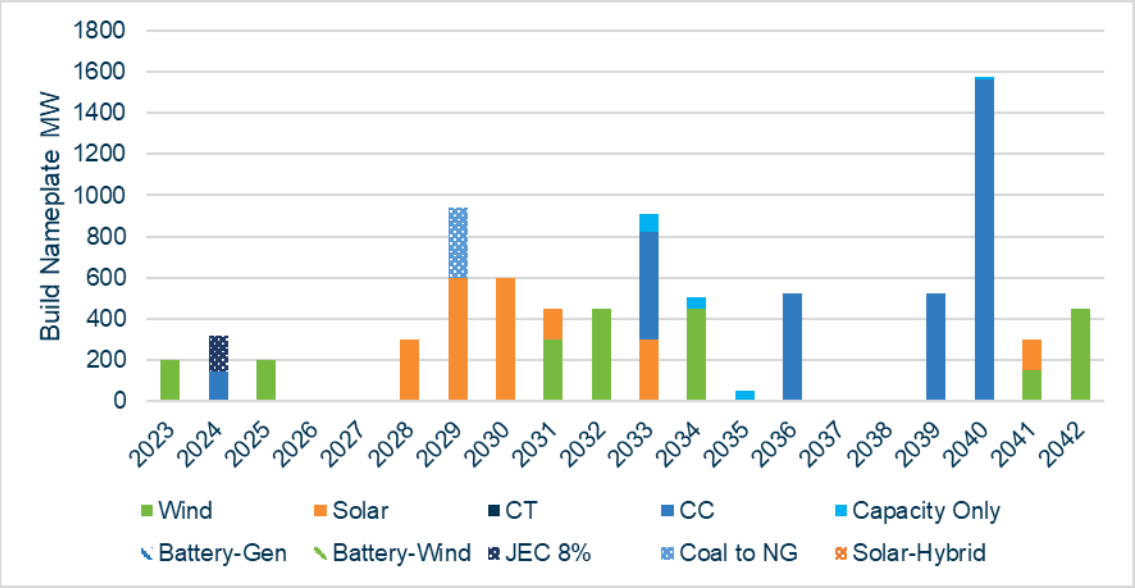


Figure 81: EVG High Total Build Costs

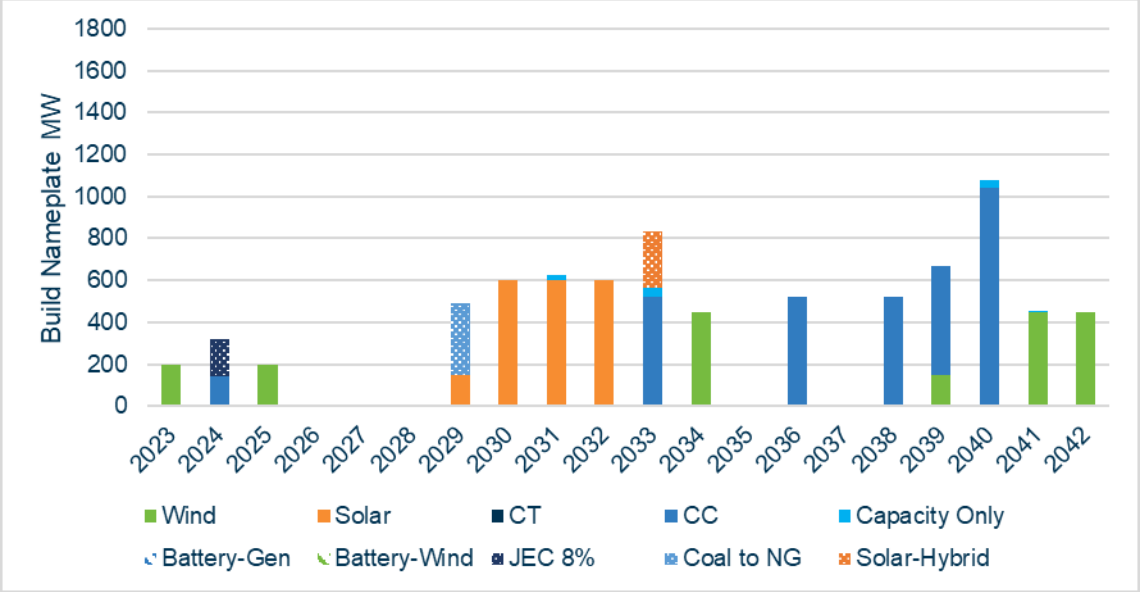
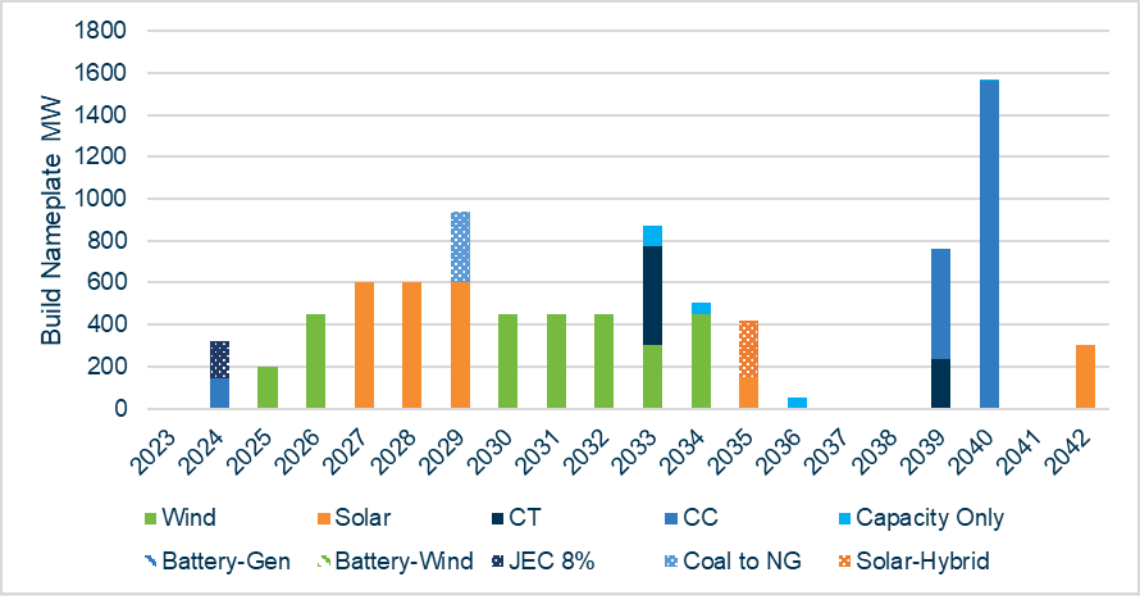


Figure 82: EVG Low Total Build Costs



Rankings Test

Build costs change the order of the high renewable plan and no retirements plan in the high build costs scenario.

Table 41: Total Build Cost Rankings Test

Ranking	Base	High Total Build Cost	Low Total Build Cost
1	Base PP	Base PP	Base PP
2	Delayed Retirement	Delayed Retirement	Delayed Retirement
3	Accelerated Retirement	Accelerated Retirement	Accelerated Retirement
4	High Renewable	No Renewables	High Renewable
5	No Renewables	High Renewable	No Renewables

10.4.9 Prices of Emissions Allowances[45]

Evergy examined the risk that it faces with CO_2, NO_x, and SO_2 allowances. The CO_2 risk is covered in an earlier analysis, based on the "Change in Legal Mandates" uncertain factor. Evergy does not see risks with annual SO_2 or NO_x allowances, and did not create high and low sensitivities.

[45] 20 CSR 4240-22.060(5)(H)

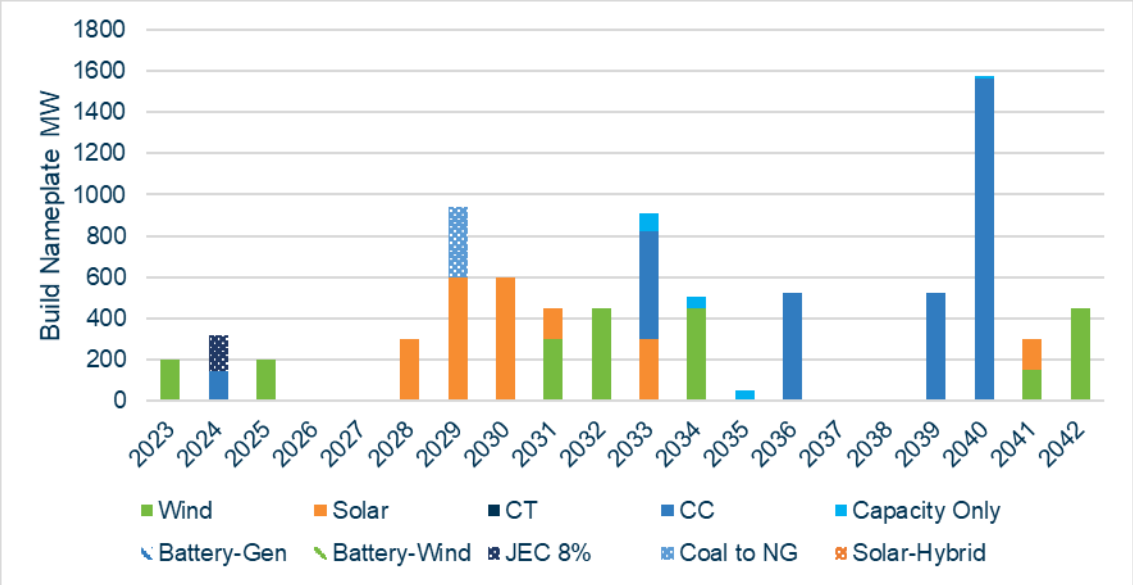
Evergy may have a compliance cost risk affecting Ozone season NO_x allowances associated with potential changes in the Good Neighbor Rule. Currently all Evergy facilities are operating in the Group 2 Ozone region. EPA was moving to place both Missouri and Oklahoma in Group 3, however, the 8th and 10th Federal Circuit Courts of Appeal have stayed EPA from doing so. It is unlikely the judicial process will complete until late 2024 into 2025. Based on current annual allocations from EPA, Evergy will not need to purchase any allowances under the status quo.

For uncertain factor analysis, Evergy created a potential compliance scenario in which it would limit future Ozone season NO_x emissions from Missouri resources.[46]

Build Test

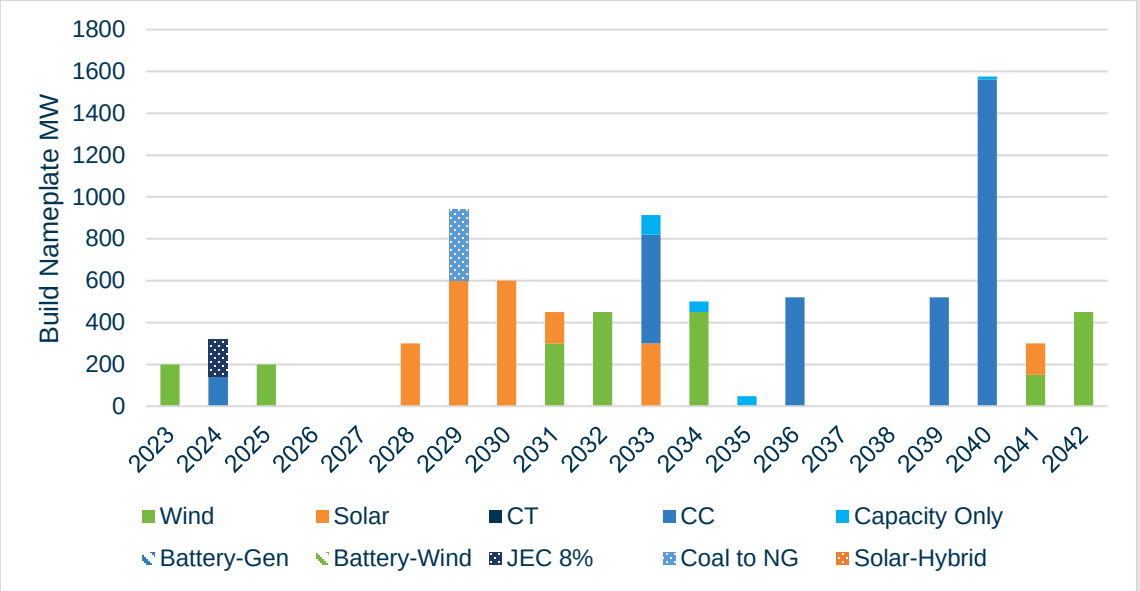
Additional ozone season NO_x emission restrictions for Missouri did not change the preferred build plan.

Figure 83: EVG Base PP



[46] CONF Ozone NO_x CUF Workpaper

Figure 84: EVG NO_x CUF



Rankings Test

Rankings did not change.

Table 42: NO_x Restriction Rankings Test

Ranking	Base	High Ozone NO_x Restriction
1	Base PP	Base PP
2	Delayed Retirement	Delayed Retirement
3	Accelerated Retirement	Accelerated Retirement
4	High Renewable	High Renewable
5	No Renewables	No Renewables

10.4.10 Fixed Operations and Maintenance Costs[47]

To test the sensitivity of the plans to fixed operations and maintenance (FOM) costs, high and low-cost scenarios were created. In the high scenario, costs were 10% higher for all renewable and natural gas options. In the low sensitivity, costs were 10% lower for all renewable and natural gas options. Evergy's coal FOM costs are currently in the lowest quartile of costs in the industry. Coal sensitivities were set to +20% in the high cost and -5% in the low-cost scenario.

[47] 20 CSR 4240-22.060(5)(I)

Build Test

The changes to fixed operations and maintenance costs had a very minor impact on the build plan for both the high and low-cost scenarios.

Figure 85: EVG Base PP

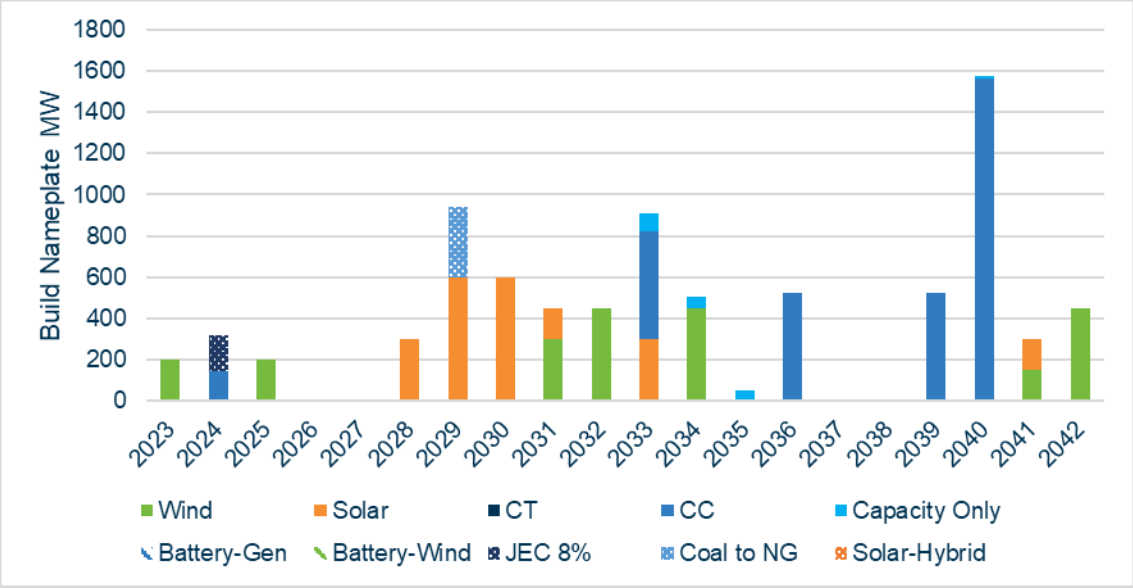


Figure 86: EVG High FOM

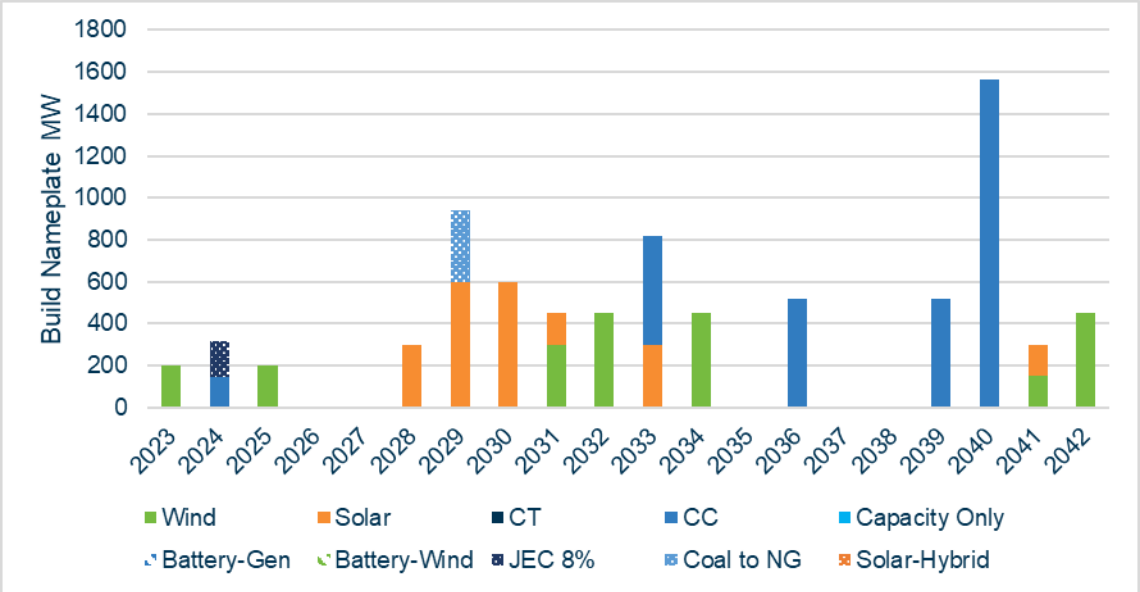
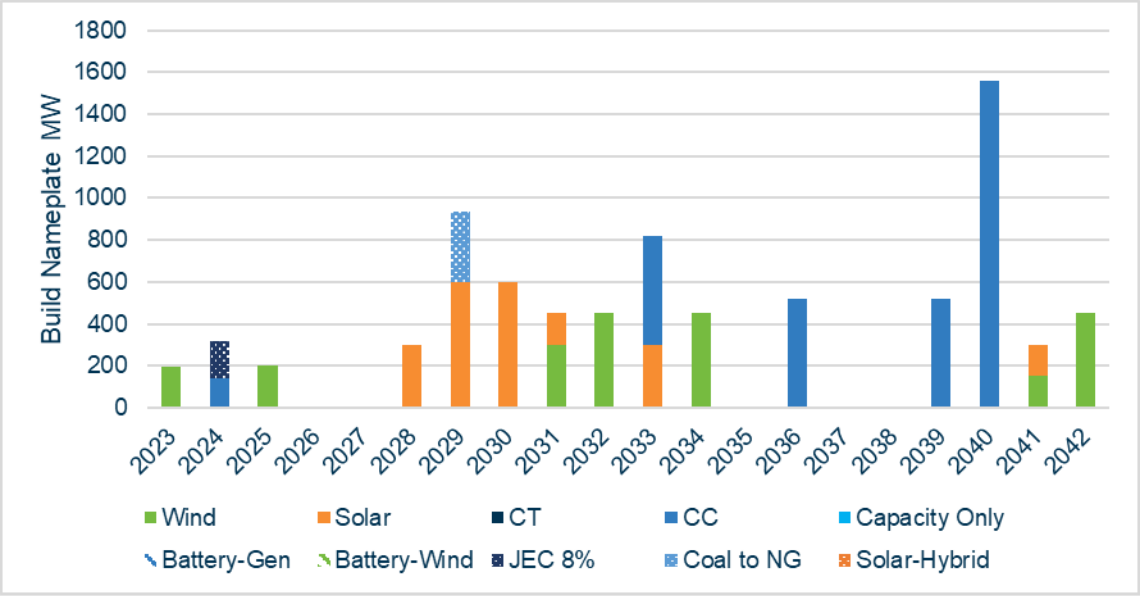


Figure 87: EVG Low FOM



Rankings Test

Changes in fixed operations and maintenance costs did not change the plan rankings.

Table 43: FOM Rankings Test

Ranking	Base	High FOM	Low FOM
1	Base PP	Base PP	Base PP
2	Delayed Retirement	Delayed Retirement	Delayed Retirement
3	Accelerated Retirement	Accelerated Retirement	Accelerated Retirement
4	High Renewable	High Renewable	High Renewable
5	No Renewables	No Renewables	No Renewables

10.4.11 Outage Rates[48]

Outage rates in the 2023 IRP were based on 5-year historical averages. For uncertainty factor analysis, the worst and best year weighted average availability factors were calculated. The low sensitivity decreases outage rates by 3.5%, scaling the fleet to the best availability year, and the high sensitivity increases outage rates by 5.7%, scaling the fleet to the worst availability year.[49]

[48] 20 CSR 4240-22.060(5)(J)
[49] Outage Rates CUF Workpaper

Build Test

The change in outage rates had a minor impact on the build plan for both the high and low outages. Solar and wind builds in 2041 were changed to capacity only.

Figure 88: EVG Base PP

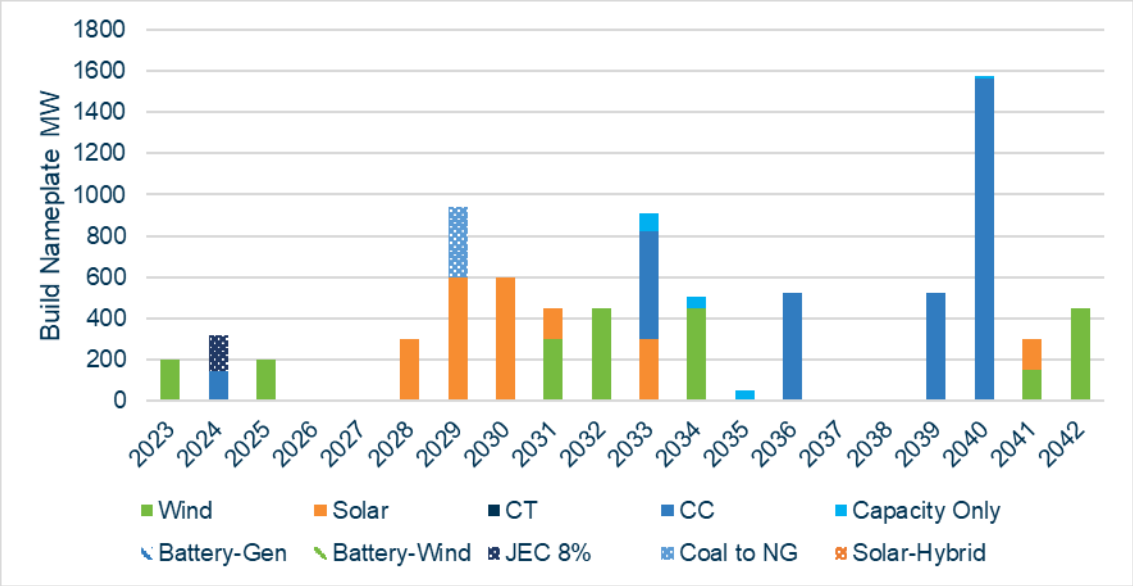


Figure 89: EVG High Outages

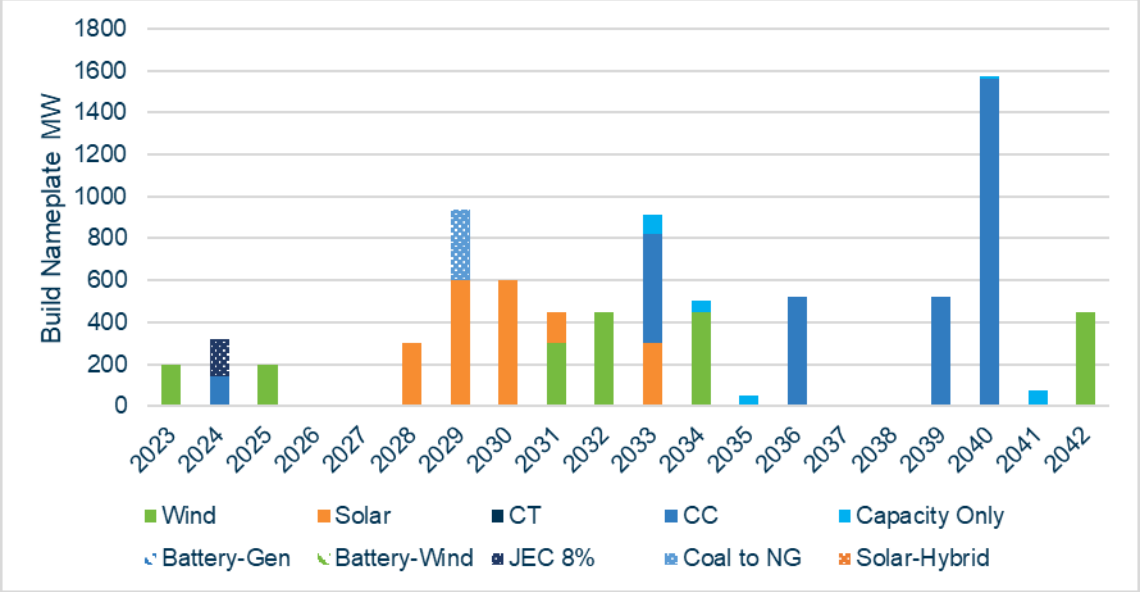
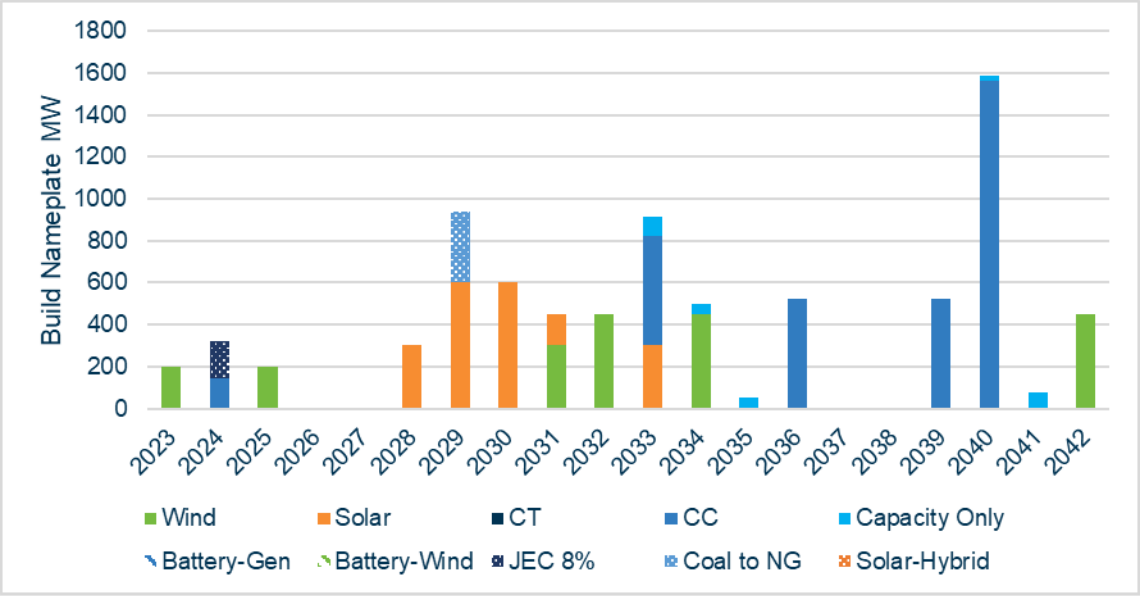


Figure 90: EVG Low Outages



Rankings Test

Changes in outage rates did not change the plan rankings.

Table 44: Outages Rankings Test

Ranking	Base	High Outages	Low Outages
1	Base PP	Base PP	Base PP
2	Delayed Retirement	Delayed Retirement	Delayed Retirement
3	Accelerated Retirement	Accelerated Retirement	Accelerated Retirement
4	High Renewable	High Renewable	High Renewable
5	No Renewables	No Renewables	No Renewables

10.4.12 Load Reductions from Demand-Side Programs[50]

To test the uncertainty of load reduction quantity, sensitivities were created to vary the amount of load reduction achieved by DSM Potential programs. In the high sensitivity, load reductions were 5% higher despite the same program costs, and in the low sensitivity, load reductions were 5% lower.

[50] 20 CSR 4240-22.060(5)(K)

Build Test

Higher load reduction moved new builds further into the future and lower load reduction increased capacity purchases from SPP to meet capacity requirements. While the DSM scenarios did alter the optimal build plans these changes are not significant.

Figure 91: EVG Base PP

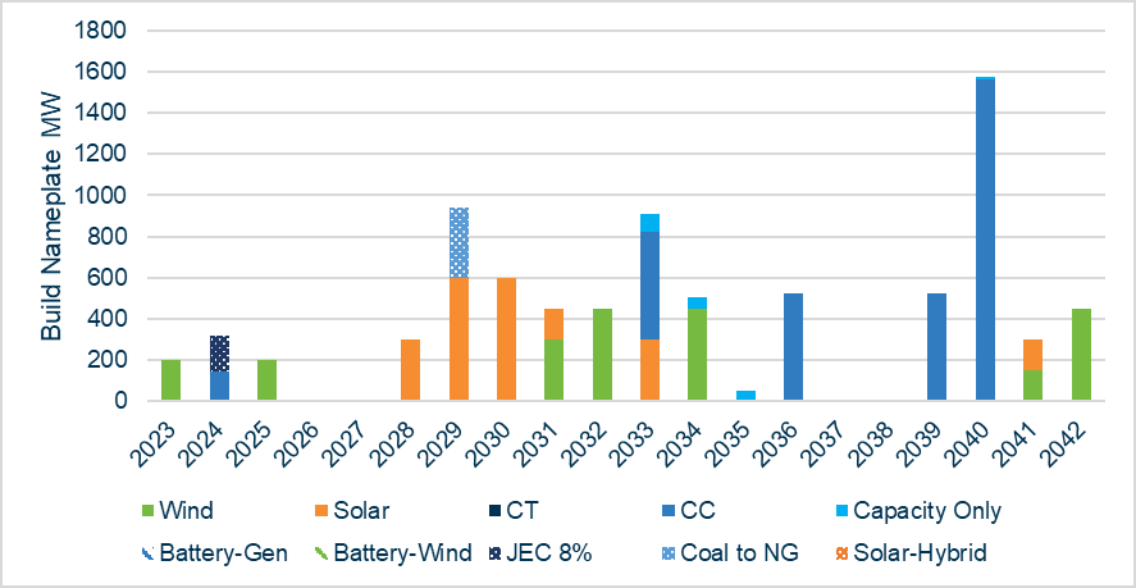


Figure 92: EVG High DSM Load Reduction

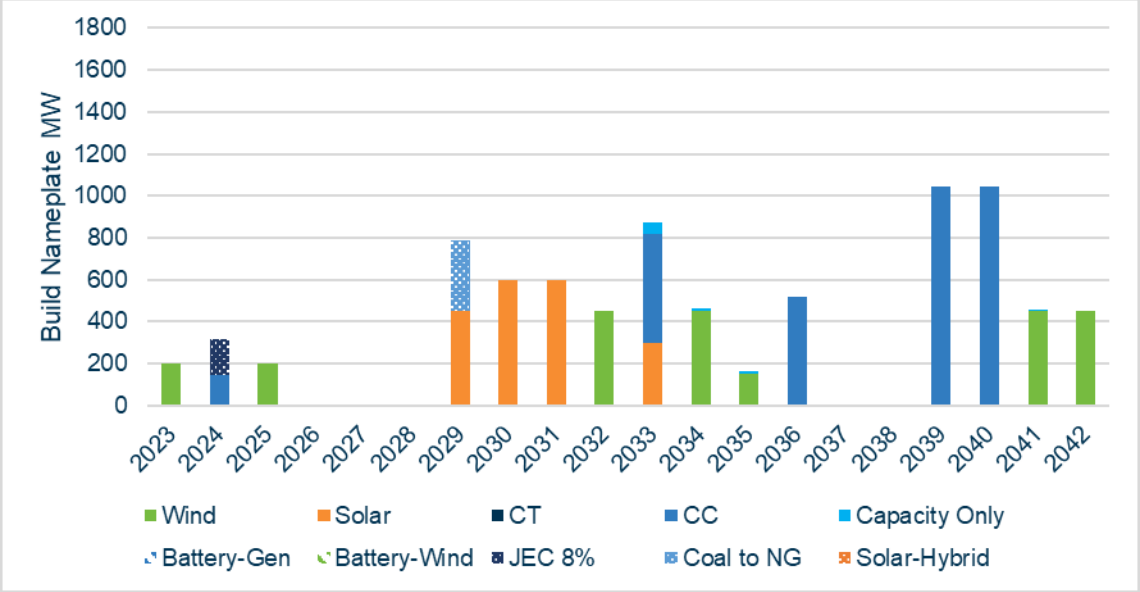
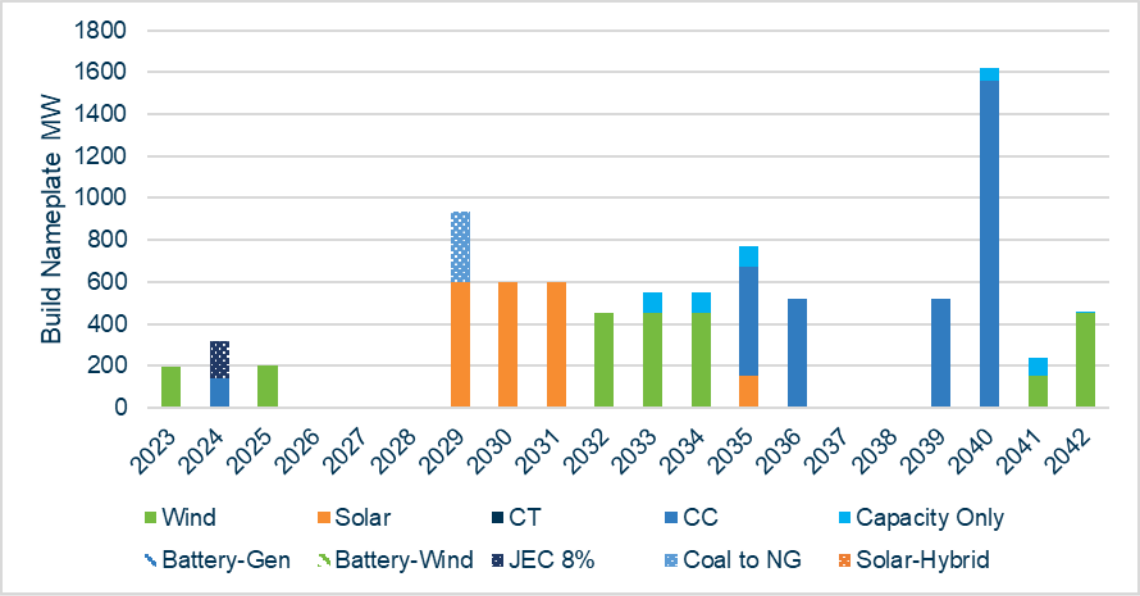


Figure 93: EVG Low DSM Load Reduction



Rankings Test

The plan rankings did not change under high and low load reduction scenarios.

Table 45: DSM Load Reduction Rankings Test

Ranking	Base	High DSM Reduction	Low DSM Reduction
1	Base PP	Base PP	Base PP
2	Delayed Retirement	Delayed Retirement	Delayed Retirement
3	Accelerated Retirement	Accelerated Retirement	Accelerated Retirement
4	High Renewable	High Renewable	High Renewable
5	No Renewables	No Renewables	No Renewables

10.4.13 Costs of Demand-Side Programs[51]

To test the uncertainty of DSM program costs, sensitivities were created to vary the cost of DSM Potential programs. In the high sensitivity, costs were 5% higher despite the same load reduction, and in the low sensitivity, costs were 5% lower.

Build Test

A 5% increase or reduction in DSM program costs did not alter the preferred build plan.

[51] 20 CSR 4240-22.060(5)(L)

Figure 94: EVG Base PP

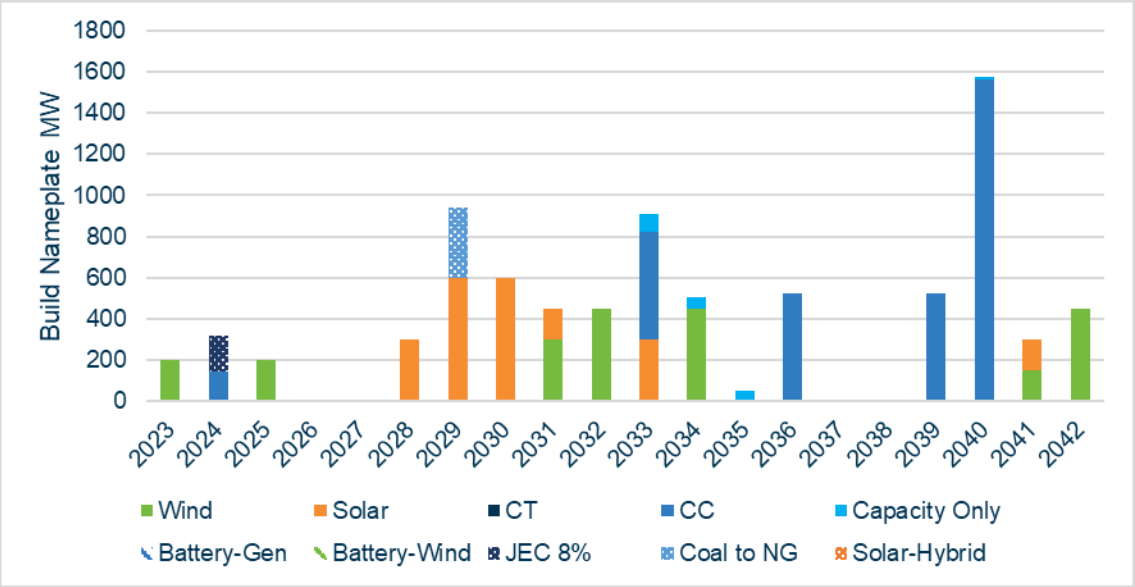


Figure 95: EVG High DSM Costs

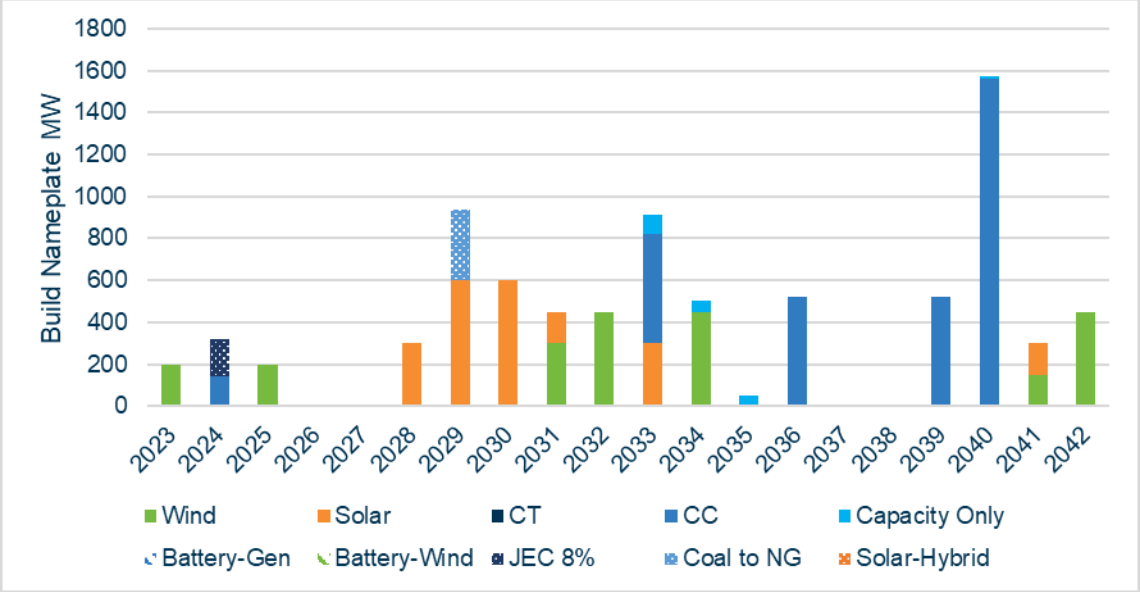
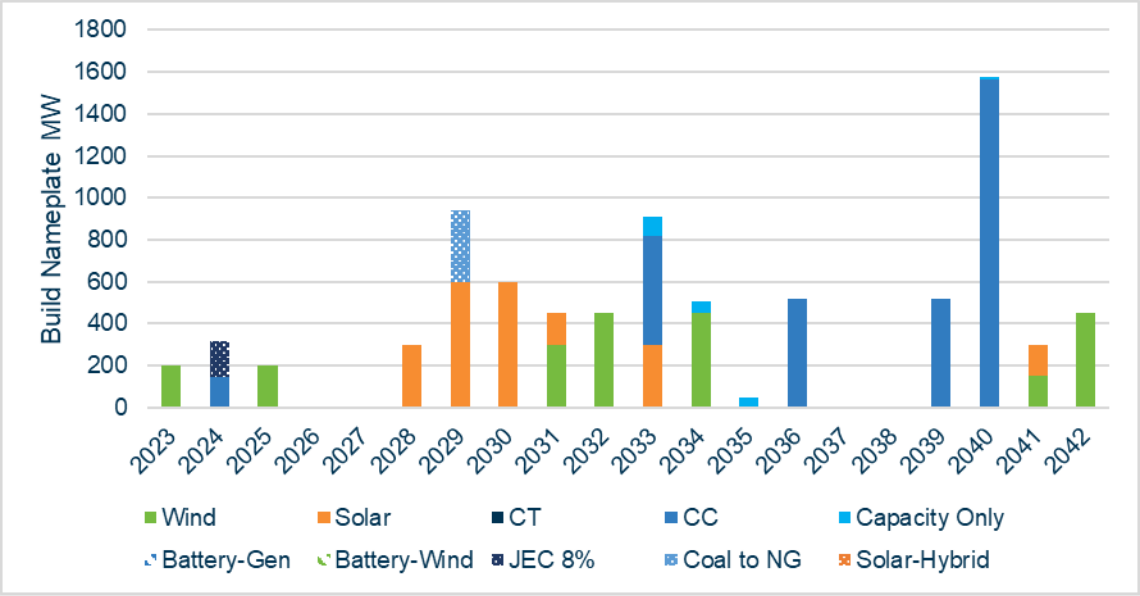


Figure 96: EVG Low DSM Costs



Rankings Test

Plan rankings did not change under high and low DSM cost scenarios.

Table 46: DSM Cost Rankings Test

Ranking	Base	High DSM Costs	Low DSM Costs
1	Base PP	Base PP	Base PP
2	Delayed Retirement	Delayed Retirement	Delayed Retirement
3	Accelerated Retirement	Accelerated Retirement	Accelerated Retirement
4	High Renewable	High Renewable	High Renewable
5	No Renewables	No Renewables	No Renewables