ENERGY FUTURES GROUP

Public Version

A Review of Evergy Metro and Evergy Missouri West 2022 Annual IRP Update

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Table of Contents

Table of Tables

1 Introduction

Energy Futures Group ("EFG") was engaged by the Council for New Energy Economics ("NEE") and the Natural Resources Defense Council ("NRDC") to review and provide comments on Evergy's 2022 IRP Annual Update. EFG is a clean energy consulting company that performs IRP modeling and critically reviews IRPs in over a dozen states, provinces, and territories. Our work in these jurisdictions involves conducting our own simulations and/or reviewing modeling conducted using a wide variety of electric system modeling platforms including the PLEXOS software used by Evergy. Our review of Evergy's 2022 IRP Annual Update was more limited than the review usually performed by EFG due to the comment timeframe and the timeframe for receiving discovery responses.

Our recommendations throughout this report are intended to provide feedback on improvements Evergy could make in preparation for the 2023 Triennial IRP filing.

2 Evergy's 2022 IRP Annual Update

Evergy's 2022 IRP Annual Update includes several changes from the 2020 Triennial IRP Filing. These changes[1] include:

1. Updated information and forecasts including load forecasts, fuel forecasts, supply-side cost options, and proposed and potential environmental regulations.
2. Utilization of PROMOD to produce nodal market price forecasts.
3. Utilization of PLEXOS for capacity expansion and production cost modeling in place of developing expansion plans by hand and dispatching those plans in MIDAS.
4. Shifts in timing of near-term renewable additions from the 2021 IRP Preferred Portfolio.
5. Reduction in the 2023/2024 renewable additions from the 2021 IRP Preferred Portfolio.
6. Converting Lawrence 5 to operate on natural gas instead of retiring in 2024.

Evergy stated in the 2022 IRP Update that the timing shift and reduction in renewable resource additions was based on responses Evergy received as part of the 2021 Request for Proposals. The 2022 IRP Update accelerates the 2025 and 2026 wind additions from the 2021 IRP Preferred Plan to 2024 and 2025 and the solar additions are delayed from 2024 to 2026.

2.1 PLEXOS Modeling

EFG reviewed and presented capacity expansion and production cost modeling in response to Evergy's 2020 Triennial IRP filing. In comments filed in response to Evergy's 2020 IRP stakeholder workshops, and in the report submitted by EFG, we recommended that Evergy move away from developing expansion plans by hand and utilize a capacity expansion model to perform optimization of coal plant retirements and new resource additions. For this 2022 IRP Update, Evergy transitioned to using the PLEXOS model

[1] Evergy Kansas Central and Evergy Metro 2022 Annual Update, pages 8-10.

for capacity expansion and production cost modeling. However, we were not able to review all the modeling files in preparation for these comments. Given the short timeframe for comments and long turnaround time for discovery, we recommend that Evergy submit its modeling files along with future IRP Updates.

2.1.1 New Resource Constraints

In response to a question from the Kansas Corporation Commission ("KCC") Staff, Evergy provided the following description of the new resource build constraints that were applied within PLEXOS:

> *As discussed in the IRP, the capacity expansion modeling was first done at the Evergy joint level and then the final six years were balanced at the individual utility level. At the Evergy joint level, the builds prior to 2026 were fixed after testing Evergy's short term execution strategy against last year's preferred plan (plans AAAAA, BBAAA, CBAAA). For 2026-2035, the model was constrained to adding a maximum of three new renewable builds of 150 MW each per year. This constraint was employed based on balancing a few considerations including the volume of projects Evergy could reasonably expect to evaluate, find good value in, and execute on within a year, the amount of capital budget available, and the desire not to build new carbon-emitting generation, and rather postpone new "thermal" build until technology is expected to advance to the point that non-emitting, firm, dispatchable resources are available. The renewable builds chosen at the Evergy joint level 2026-2035 were fixed at the utility level based on the utility's allocation share (60% Kansas Central, 24% Metro, 16% Missouri West). This by-utility allocation is based on a blend between each utility's share of current capacity / energy and its share of expected plant retirements over the planning period. After 2035, all Evergy joint and utility level models were allowed to build a maximum of three new renewable builds, two Combined Cycles or four Combustion Turbines (or a similarly limited combination) per year. All models were allowed capacity balancing transactions, to buy or sell up to 100 MW per year of capacity only PPAs. All capacity expansion runs were conducted at the mid levels of load, NG price, and CO2 tax, and final economics were calculated using the same plan with all pricing endpoints.*[2]

Based on this response from Evergy, it is our understanding that the total wind and solar annual builds were limited to 450 MW at the Evergy joint level between 2026 to 2035.

Table **1** below outlines how the annual 450 MW build limit would be allocated across the three utilities in the amount of 270 MW for Kansas Central, 108 MW for Metro, and 72 MW for MO West.

[2] Evergy response to KCC Staff discovery request 20-1e., KCC Case Number 19-KCPE-096-CPL, also requested in the current Missouri cases as New Energy Economics discovery request 1-5.

Table 1. Annual Renewable Build Constraints

Time Period	KS Central	Metro	MO West
Prior to 2026	Fixed Builds	Fixed Builds	Fixed Builds
2026 – 2035	270 MW	108 MW	72 MW
2036 – 2041	450 MW	450 MW	450 MW

For Evergy's Preferred Plan, this 450 MW annual limit is binding for the years 2026 and 2029 through 2035. This indicates that the model may have selected a higher amount of renewable resources if the constraint allowed for a larger build of solar and wind resources. We recommend that Evergy increase the annual renewable build limit modeled in PLEXOS between 2026 through 2035 to a level that allows renewables (and storage once it is added to the optimization) to fill capacity needs. We do not think it is a reasonable assumption to impose the same level of constraint throughout the planning period. There has been significant attention paid to the headwinds for renewables including queue constraints and supply chain concerns, and significant efforts to mitigate those headwinds, so it would be reasonable to assume that those efforts bear fruit. Furthermore, as Evergy gains experience with renewable and storage project development it should be able to increase the rate at which it acquires those resources.

2.1.2 Nodal Market Prices

One of the other modifications Evergy made for the 2022 IRP Update is a move away from zonal market price forecasts to nodal pricing. Evergy said in response to a KCC Staff discovery request:

> *Evergy and 1898 & Co. determined that more detailed modeling of expected congestion at coal plant locations would be valuable to evaluate and compare coal plant economics, considering potential retirement decisions. Additionally, the team believed that price congestion at wind locations might be important to evaluating future wind economics because wind resources are typically located further from load. In contrast, other new resource types such as solar, CT, and CC would likely be sited closer to existing resource locations and likely would not be as affected by congestion.*
>
> *The results of the PROMOD model were translated into market price forecasts for each coal station, each of the three utility load zones, a generation aggregation for each utility, and a representative wind aggregation. All new and existing wind resources were mapped to the wind price forecast, all coal resources were mapped to their respective price forecasts, all other existing resources were mapped to their utility generation aggregation node, and all other new resources were mapped to the Metro generation aggregation node*.[3]

[3] Evergy response to KCC Staff discovery request 20-1c., KCC Case Number 19-KCPE-096-CPL, also requested in the current Missouri cases as New Energy Economics discovery request 1-5.

Given the complexity of this nodal modeling and its implications for resource optimization, it will be important for stakeholders to be able to review the different hourly forecasts that are developed under this approach and understand how the forecasts were set up in PLEXOS. This will be particularly important if Evergy is going to use this approach for the 2023 Triennial IRP filing.

2.2 Coal Retirement Dates

In the 2022 IRP Update, Evergy acknowledged that there are several factors which may impact the economic retirement of some of the coal units, which include the lease for LaCygne 2 ending in 2029, the pressure to retire Hawthorn 5 due to its location in the Kansas City Metro area, and certain plants could be impacted by environmental regulations.[4] For this 2022 IRP Update, Evergy assumed that Jeffrey 3 would retire in 2030, evaluated a 2030 retirement date for Jeffrey 2, a 2029 retirement date for Iatan 1, a 2029 retirement date for Hawthorn 5, and not extending the LaCygne 2 lease in 2029.

The 2022 IRP Preferred Plan selected by Evergy includes one early coal retirement, which is Jeffrey 3 in 2030. When the present value of revenue requirements ("PVRR") for the Evergy joint utilities are compared, there are five other alternate plans that have a lower cost PVRR than the Preferred Plan. Table 2 below shows the PVRR comparison and coal retirement dates from the subset of modeling runs that including one or more of the evaluated retirement dates. The five plans that have lower cost include a 2030 retirement date for Jeffrey 2 (Plan CCBAB and CBBAB), a 2029 retirement for Iatan 2 (Plan CCBAE), and not renewing the LaCygne lease in 2029 (Plan CCBAD).

Table 2. Evergy Plan PVRR Comparison ($ million) and Coal Retirement Dates

		Coal Retirements (Changes from Book Life)				
Plan Name	NPVRR	Jeff 2	Jeff 3	Iatan 1	LaCygne 2	Hawthorn 5
CCBAB	$57,291	2030	2030	-	2039	-
CCBAE	$57,379	-	2030	2029	-	-
CCBAD	[redacted]	-	2030	-	2029	-
CBBAB	$57,451	2030	2030	-	2039	-
CCBAA	$57,461	-	2030	-	2039	-
CDAAA*	$57,541	-	2030	-	-	-
CCBAC	$57,565	-	2030	-	2039	2029
CBAAA	$57,688	-	2030	-	2039	-
BBAAA	$57,717	-	2030	-	2039	-
AAAA	$57,808	-	2030	-	2039	-

**Evergy's Preferred Plan*

[4] Evergy Metro IRP 2022 Annual Update, page 47.

Evergy discussed the rationale for not selecting a lower cost plan than the 2022 IRP Preferred Plan and stated that:

> *It was selected despite being higher cost than many of the accelerated retirement plans which were modeled at both the Evergy and Evergy Metro level due to the exclusion of specific additional accelerated retirements because of the significant uncertainty which exists related to such accelerated retirements (Section 6.2). This plan allows Evergy to continue building renewables at a ratable pace, consistent with its 2021 Triennial IRP, while maintaining flexibility to adjust as technology and policy change in the future. Ultimately, it seems likely that an additional retirement may occur in the late-2020s/early 2030s, but there is currently too much uncertainty to commit to a specific unit retirement*.[5]

Notably, the conclusion that accelerated retirements are more cost-effective is directionally consistent with the modeling we conducted on NEE's behalf in 2021. During the workshop held for Missouri stakeholders, Evergy verbally indicated that [redacted] These are all reasonable steps, but it's important that they aren't used to make the case for further delay in taking action and that Evergy fully explore retirement dates including more retirements in any given run and earlier dates to capture the plan that would provide the most value to customers.

Based on the capital expenditure ("capex") information provided in response to a Sierra Club discovery request and the information included in the 2022 IRP Update, the anticipated environmental regulations that would apply to the Jeffrey units would imply that Jeffrey unit 2 is "the most economic option [for retirement] based primarily on the expected need for significant environmental upgrades. If those upgrades are not ultimately needed, it is possible that another unit would become the most economic retirement option."[6] In the discussion on the possible environmental regulations for the Jeffrey units, Evergy stated:

> *Evergy currently assumes that all resources will need Best Available Control Technology ("BACT") before the end of the 20-year planning horizon. For Evergy's current fleet, that includes a need to install Selective Catalytic Reduction (SCR) and baghouses on all three Jeffrey units (only a baghouse is required for Jeffrey Unit 1 because an SCR has already been installed) in the middle decade of the planning horizon. This assumption represents Evergy's current expectation of when this technology may be required given expected tightening of environmental regulations*."[7]

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[5] Evergy Metro IRP 2022 Annual Update, page 73.
[6] Evergy Metro IRP 2022 Annual Update, page 47.
[7] Evergy Kansas Central and Evergy Metro 2022 Annual Update, page 93.

Table 3, below, shows the net present value ("NPV") of the total capex for Jeffrey 2 if it is retired in 2039 or in 2030. As the numbers indicate, there are significant cost savings from retiring Jeffrey 2 in 2030 and this is reflected in the PVRR results for plans CCBAB and CBBAB when Jeffrey 2 is retired in 2030.

Table 3. Net Present Value ("NPV") of Total Capex for Jeffrey 2 ($Millions)[8]

	NPV of Total Capex
Jeffrey 2 Retire 2039	[redacted]
Jeffrey 2 Retire 2030	[redacted]
Difference	[redacted]

Given that the lowest cost plans modeled for the 2022 IRP Update included early coal retirements, we recommend that Every continue to explore optimizing coal retirement dates within PLEXOS. We understand that model run times and model settings can make modeling optimized retirement dates challenging, and in the event that it is not possible to pursue that path, we recommend that Evergy evaluate plans that include additional combinations of earlier retirement dates.

2.2.1 Securitization

Based on the 2022 IRP Update narrative, it does not seem that Evergy considered potential securitization benefits for the early retirement of any of its coal plants. The Commission Order EO-2022-0055 on Special Contemporary Issues stated:

> *Provide details of its plan, if any, to utilize securitization. Details should include, but not be limited to: 1) type of items to be securitized; 2) explanation for need of securitization for each item; 3) how it plans to utilize securitization for each item; 4) estimated costs of securitized items; and 5) comparison of ratepayer costs and benefits related to its IRP planning.*[9]

In the 2022 IRP Update Evergy said "Evergy Metro currently does not have any specific plans to utilize securitization."[10] While simply saying that Evergy has no plans to utilize securitization may meet the letter of the requirement, it is not a good faith effort to account for the benefits of securitization. In the EFG report submitted in response to Evergy's 2020 IRP, not only did we look at optimized coal retirement dates, but we also considered the potential benefits from securitization and found significant savings for Evergy Kansas Central, Evergy Metro, and Evergy Missouri West. We recommend that Evergy include the impacts of securitization for all of the early coal plant retirement plans that are modeled in the IRP because the point of an IRP is to develop a plan that minimizes customer cost and risk. Evergy ought to be utilizing all tools available to it in pursuit of that goal.

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[8] Evergy response to Sierra Club discovery request 5-1, Kansas Corporation Commission Case No. 19-KCPE-096-CPL, also requested in the current Missouri cases as New Energy Economics discovery request 1-2. Workbook named "SC5-1_CONF_Total_Capex_Combined".
[9] Evergy Metro IRP 2022 Annual Update, page 91.
[10] Evergy Metro IRP 2022 Annual Update, page 91.

2.2.2 Seasonal Cycling

Another topic that Evergy included in the 2022 IRP Update is a discussion of the possibility of utilizing seasonal cycling, or only operating coal plants during the winter and summer. In the 2022 IRP Update Evergy said "In some cases, seasonal cycling (i.e., operating only during winter and summer) could be an alternative to retirement which creates significant cost savings while maintaining valuable capacity for when it's needed most."[11] We recommend that Evergy should include this topic for evaluation in the 2023 Triennial IRP update and it should be modeled in addition to the option for early retirement.

2.3 Supply Side Resources

2.3.1 Solar Hybrid and Battery Storage Resources

In response to Evergy's 2020 Triennial IRP filing, EFG and NEE recommended that Evergy should evaluate solar hybrid and standalone battery storage resources as new supply side resources. In the 2022 IRP Update, Evergy stated:

> *As discussed with parties following the 2021 IRP, Evergy plans to evaluate energy storage and hybrid options in more detail in its 2023 Annual Update. Evergy is optimistic that these technologies (and their economics) will continue to improve and will ultimately become a key part of the Company's medium- and long-term plans*.[12]

Evergy has committed to including solar hybrid and standalone battery storage as part of the modeling performed for the 2023 Triennial IRP filing. In the modeling that EFG conducted in response to Evergy's 2020 Triennial IRP filing, we found solar hybrid and battery storage resources were selected within the capacity expansion model. Accurately reflecting the performance of those resources as well as the applicable tax credits will be critical to correctly capturing the value of these resources.

2.3.2 Ownership

The new supply side resources that Evergy modeled for the 2022 IRP Annual Update included solar, wind, combined cycle, and combustion turbines. Evergy assumed that all new supply side resources, aside from capacity only purchases, would be Evergy owned and operated assets. Evergy reported that resources were modeled in this way because:

> *This enabled the model to consider the relative economics of different resource portfolios, including different resource types and timing of additions, on consistent terms. In practice, as Evergy executes on its resource plan it will consider the specific terms and conditions of*

[11] Evergy Metro IRP 2022 Annual Update, page 83-84.
[12] Evergy Metro IRP 2022 Annual Update, page 12.

particular offers it receives, as well as alternative ownership and contracting structures, as part of RFP processes and negotiations with counterparties.[13]

We recommend that resource options should be evaluated in a manner that is neutral on ownership because the point is to minimize consumer cost, not maximize utility return.

2.3.3 Investment Tax Credit ("ITC")

In the report EFG filed in response to Evergy's 2020 Triennial IRP filing, we recommended that Evergy assume monetization instead of normalization for the ITC. We identified this as a deficiency and continue to believe it is a deficiency in the modeling and contrary how the ITC is modeled in other jurisdictions. Monetization assumes that the upfront capital cost of the solar resource is reduced by the ITC in the first year of a project whereas normalization spreads the ITC across the book life of the asset. As a result, the normalization approach tends to raise the cost of solar and solar hybrid resources. Assuming that the ITC can only be normalized can have important implications for whether the IRP model selects solar resources or not and disregards the opportunities that Evergy has to leverage the ITC through PPAs, tax equity partnerships, etc. We continue to recommend that Evergy should assume monetization of the ITC, especially given the recent federal legislation that could extend tax credits for solar and solar hybrid resources, introduce direct pay, and introduce tax credits for battery storage resources. Indeed, all the changes and expansion of tax credits for renewables and storage in the Inflation Reduction Act ought to be fully reflected in Evergy's modeling.

2.3.4 Reuse of Interconnection Rights

In the 2022 IRP Update Evergy discussed the possibility of reusing interconnection rights to help circumvent some of the uncertainty in the SPP Interconnection Queue. Under the SPP replacement process, new resources can use the interconnection rights of a retiring unit.[14] We suggest that Evergy could add language to any Request for Proposals released to seek potential projects that could take advantage of the opportunity to reuse existing interconnection rights, for example, through a tie line.

2.4 Demand Side Management ("DSM")

As part of the modeling that EFG performed in response to Evergy's 2020 Triennial IRP filing, we evaluated the MEEIA level of DSM savings. Evergy agreed to include the MEEIA level of savings in the 2022 IRP Update. We appreciate that Evergy included this as a sensitivity in the 2022 IRP Update, but Evergy did not fully capture the potential benefits of this higher level of savings. We would strongly recommend that it re-optimize plans that have a higher level of DSM to see what the model might choose to build less of. Evergy's approach was to evaluate the MEEIA level of DSM savings by fixing the expansion plan and then layering in the additional savings. This approach doesn't allow the model to capture the ability of DSM to defer or avoid capacity. Table 4 shows the PVRR comparison for the Metro

[13] Evergy response to Sierra Club discovery request 5-4., Kansas Corporation Commission Case No. 19-KCPE-096-CPL, also requested in the current Missouri cases as New Energy Economics discovery request 1-4.
[14] Evergy Metro IRP 2022 Annual Update, page 84.

plans with the RAP level of DSM[15] compared to the MEEIA level of DSM and Table 5 shows the same PVRR comparison for the Missouri West plans.

Table 4. Evergy Metro DSM Sensitivity Results ($000)[16]

Resource Plan	PVRR
Preferred Planned (CDAAA)	$18,199
MEEIA Goals Plan (CDABA)	$18,258

Table 5. Evergy Missouri West DSM Sensitivity Results ($000)[17]

Resource Plan	PVRR
Preferred Planned (CDAAF)	$10,013
MEEIA Goals Plan (CDABF)	$10,083

If the plan with the MEEIA savings had been re-optimized to consider the additional DSM savings, it is likely that the higher level of savings would offset some of the supply side capacity in the Preferred Plan, which can bias the PVRR results against the higher level of DSM. We recommend that Evergy continue to evaluate higher levels of DSM.

3 Evergy's 2024 Triennial IRP

As Evergy prepares for the 2024 IRP cycle, we would also like to make some recommendations about how the Company can improve stakeholder engagement. The prior stakeholder process largely involved stakeholders reacting to charts and tables of information shared a few days before the scheduled meetings. This was typically summary information such as the PVRRs of different modeling runs. It is difficult to have meaningful reaction to this level and timing of information, as there is little explanation for the results. We strongly recommend that Evergy make its input data and modeling files available along the way for intervenors to review and comment on. Ideally, this will help narrow the issues of dispute once the IRP is filed, and also has the benefit of facilitating dialogue about the major factors that influence the utility's IRP modeling by providing greater insight into the rationale and reasoning for the utility's assumptions.

If Evergy intends to engage in a request for proposals ("RFP") as part of the Triennial filing, we request that the language of the RFP, the evaluation criteria, and the shortlisting process ensures the RFP generates the broadest and most desirable pool of projects possible.

[15] Both the Evergy Metro and Evergy Missouri West Preferred Plans include the RAP level for DSM.
[16] Evergy Metro IRP 2022 Annual Update, Table 33, page 70.
[17] Evergy Missouri West IRP 2022 Annual Update, Table 35, page 58.

4 Summary

Based on our review of Evergy's IRP 2022 Annual Update, we offer the following recommendations for future IRPs and IRP Updates:

1. Provide the Company's PLEXOS modeling files with future IRPs and IRP Updates to facilitate transparency and stakeholder review.
2. Loosen build constraints for new renewables.
3. Explore earlier retirement dates and broaden the combination of retirements evaluated.
4. Explore the impacts of securitization on those plans that advance coal retirement dates.
5. Evaluate seasonal cycling of thermal generators.
6. Model renewable and storage assets under owned and contracted ownership assumptions.
7. Model all the available tax credits for renewable and storage assets.
8. Explore reusing injection rights of retiring generators.
9. Allow increasing levels of DSM to defer or avoid capacity as well as energy.