



MISSOURI PUBLIC SERVICE COMMISSION

STAFF REPORT ON

THE EMPIRE DISTRICT ELECTRIC COMPANY

**ELECTRIC UTILITY RESOURCE PLANNING
COMPLIANCE FILING**

FILE NO. EO-2021-0331

*Jefferson City, Missouri
August 29, 2022*

**** Denotes Confidential Information ****

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Executive Summary

On April 1, 2022, The Empire District Electric Company (“Empire” or “Company”), filed its 2022 Integrated Resource Plan (“IRP”) triennial compliance filing (“Filing”) in File No. EO-2021-0331, as required by 20 CSR 4240-22 Electric Utility Resource Planning. Staff provides this Report as required by Commission Rule 20 CSR 4240-22.080(7):

(7) The staff shall conduct a limited review of each triennial compliance filing required by this rule and shall file a report not later than one hundred fifty (150) days after each utility’s scheduled triennial compliance filing date. The report shall identify any deficiencies¹ in the electric utility’s compliance with the provisions of this chapter, any major deficiencies in the methodologies or analyses required to be performed by this chapter, and any other deficiencies and shall provide at least one (1) suggested remedy for each identified deficiency. Staff may also identify concerns² with the utility’s triennial compliance filing, may identify concerns related to the substantive reasonableness of the preferred resource plan or resource acquisition strategy, and shall provide at least one (1) suggested remedy for each identified concern.

As a result of its limited review, and as more fully discussed throughout this Report, Staff identified three concerns regarding Empire’s IRP Filing.

List of Staff’s Identified Concerns

Concern A: Staff has continued concern from the securitization case (EO-2022-0040) regarding the use of the Riverton unit 11 in the winter months. These units are described in Empire’s filing in this section as dual fuel (Natural gas (NG) and fuel oil when NG is unavailable) and able to be used in the winter months. However, as Staff discovered in the securitization case, the Company cannot utilize Riverton 11 with fuel oil as it did not tune it to operate at temperatures under 70 degrees for operations with fuel oil. Therefore, there is concern that the operation of Riverton 11 may not be possible during future cold weather events.

¹ 20 CSR4240-22.020(9) Deficiency means deficiencies in the electric utility’s compliance with the provisions of this chapter, any major deficiencies in the methodologies or analyses required to be performed by this chapter, and anything that would cause the electric utility’s resource acquisition strategy to fail to meet the requirements identified in Chapter 22.

² 20 CSR 4240-22.020(6) Concern means concerns with the electric utility’s compliance with the provisions of this chapter, any major concerns with the methodologies or analyses required to be performed by this chapter, and anything that, while not rising to the level of a deficiency, may prevent the electric utility’s resource acquisition strategy from effectively fulfilling the objectives of Chapter 22.

Concern B: Staff reiterates its concern from Empire’s 2019 IRP that Empire has potentially overstated avoided capacity cost benefits when calculating the total resource cost test (TRC) results for its demand-side programs and portfolio, therefore the programs may not be cost-effective and may not comply with 393.1075.4., SR Mo.³

Concern C: Risk potentially borne by ratepayers from Empire’s further shift toward renewable solar generation.

Variance Request and Special Contemporary Issues

On April 1, 2021, Empire filed an *Application for Variances* in File No. EO-2021-0331 seeking variances from portions of 20 CSR 4240-22.030 and 20 CSR 4240-20.094. On April 25, 2021, Empire filed a *Notice of Agreement Regarding Application for Variances* in which Empire, Staff, and the Office of the Public Counsel (OPC) agreed that the 20 CSR 4240-20.094 variance request should be approved, but on the condition that the Company agree to begin conducting residential and commercial surveys to collect the primary data needed for future market potential studies as soon as practical. Staff and OPC had no objection to the 20 CSR 4240-22.030 variance request. On May 12, 2021, the Commission issued its *Order Approving Agreement*.

On October 27, 2021, in File No. EO-2022-0057, the Commission issued its *Order Establishing Special Contemporary Resource Planning Issues* for Empire to analyze and document in its 2022 triennial compliance filing. Empire provided its response to these special contemporary issues in Volume 6 of its 2022 triennial compliance filing.

20 CSR 4240-22.010 Policy Objectives

20 CSR 4240-22.010 Policy Objectives, has a stated purpose that “This rule states the public policy goal that this chapter is designed to achieve and identifies the objectives that the electric utility resource planning process must serve.”

³ 393.1075.3. It shall be the policy of the state to value demand-side investments equal to traditional investments in supply and delivery infrastructure and allow recovery of all reasonable and prudent costs of delivering cost-effective demand-side programs. ... The commission shall consider the total resource cost test a preferred cost-effectiveness test.

20 CSR 4240-22.010(1) and (2) states:

(1) The commission’s policy goal in promulgating this chapter is to set minimum standards to govern the scope and objectives of the resource planning process that is required of electric utilities subject to its jurisdiction in order to ensure that the public interest is adequately served. Compliance with these rules shall not be construed to result in commission approval of the utility’s resource plans, resource acquisition strategies, or investment decisions.

(2) The fundamental objective of the resource planning process at electric utilities shall be to provide the public with energy services that are safe, reliable, and efficient, at just and reasonable rates, in compliance with all legal mandates, and in a manner that serves the public interest and is consistent with state energy and environment policies. The fundamental objective requires that the utility shall —

(A) Consider and **analyze demand-side resources, renewable energy, and supply-side resources on an equivalent basis**,⁴ subject to compliance with all legal mandates that may affect the selection of utility electric energy resources, in the resource planning process; [Emphasis added.]

Staff performed its review of Empire’s 2022 IRP Filing using the Commission’s policy goal in promulgating this Chapter and the fundamental objective of the resource planning process as the foundation of its review. Based on its limited review, Staff concludes Empire’s 2022 IRP Filing meets the requirements of rule 20 CSR 4240-22.010.

Staff Expert Witness: Brad J. Fortson

20 CSR 4240-22.030 Load Analysis and Forecasting

Summary

20 CSR 4240-22.030, Load Analysis and Forecasting, has a stated purpose of setting the minimum standards for the maintenance and updating of historical data, the level of detail required in analyzing loads, and the purposes to be accomplished by load analysis and by load forecast models. The load analysis for this rule is intended to support both demand-side management efforts of 20 CSR 4240-22.050 and the load forecast models of this rule. This rule

⁴ Although the rule does not specifically say renewable and non-renewable supply-side resources, it is implied by listing each separately and including an “and.”

also sets the minimum standards for the documentation of the inputs, components, and methods used to derive the load forecasts. The Load Analysis and Load Forecasting Rule allows the utility to describe and document why the selected load analysis methods best fulfill those purposes, and how the load analysis methods are consistent with one another and with the end-use consumption data used in the demand-side analysis as described in 20 CSR 4240-22.050.

Accurate models for electric power load forecasting are essential to the operation and planning of a utility company. Load forecasting helps an electric utility to make important decisions including decisions on purchasing and generating electric power, load switching, and infrastructure development. 20 CSR 4240-22.030 allows the utility to use multiple analytical methods for performing its load analysis and develop its forecasts, leaving it to the utility's discretion to choose the methods by which it achieves the stated purpose of the rule.

Empire has used a Statistically Adjusted End-Use ("SAE") model for the residential and commercial classes' sales forecast. Weather data are derived from the National Oceanic and Atmospheric Administration (NOAA) for Springfield, Missouri. Hourly weather for Springfield, Missouri from January 1, 1981, through April 30, 2021, are acquired from NOAA by Empire. These data are converted to monthly weather and used to calculate the normal weather forecast. Economic data is purchased from Woods and Poole, Inc. Peak weather is obtained by averaging the monthly peak producing weather events. The 2022 IRP forecast relies on historical monthly billing data, load research data, weather data, and economic data. The high and low economic forecasts are developed using the historical and forecast population growth rates. The high economic forecast is calculated based on the ratio of the historical annual average population growth rate to the forecast annual average population growth rate.

Regression model statistics show all variables are highly significant ($t \geq 2.58$) and the coefficient of determinations ($R^2 \geq 95$), except for Industrial Model Statistics ($R^2 = 0.883$). In all models, statistics show the models are significant and represent the proportion of the variance for a dependent variable that is explained by an independent variable. The statistical models demonstrate strong statistical model fits and variable statistics. The SAE modelling approach for the residential, small commercial, and large commercial classes, captures the improving efficiencies of existing end-use technologies. The economic drivers represent economic activity in the Joplin and Springfield area where most of Empire's customers reside.

The total system grows from 5,256,837 MWh in 2022 to 5,658,658 MWh in 2041 with an average annual growth rate of 0.39%. The summer and winter peaks (net system peaks) move consistently with the energy forecast with average annual growth rates of 0.39% (summer peak) and 0.43% (winter peak).

The Residential sales forecast (2022-2041) indicates a slight increase over the planning period. Sales growth, customer growth and average use growth are reported at ** [REDACTED] **, ** [REDACTED] ** and ** [REDACTED] **, respectively. The Small Commercial SAE model contains end-use information for heating, cooling, and base load technologies from Itron's 2021 SAE West North Central region. Small Commercial sales forecast shows average negative use growth ** [REDACTED] ** while sales growth and customer growth are ** [REDACTED] ** and ** [REDACTED] ** respectively. The similar pattern is observed in the Large Commercial sales forecast too. The Large Commercial SAE model contains end-use information for heating, cooling, and base load technologies from Itron's 2021 SAE West North Central region. Large commercial annual sales growth, customer growth, and average used growth use rates are 0.25%, 0.27%, and -0.02% respectively.

Industrial sales forecast shows the annual sales growth, customer growth, and average use growth rates are ** [REDACTED] **, ** [REDACTED] ** and ** [REDACTED] ** respectively. This model captures the recent usage patterns and Covid-19 impacts. Between January 2011 and April 2021, the class increased from 38 customers to 44 customers. The industrial customer forecast is based on known customer expansions and projects. From 2021 through 2023, the class is expected to increase by eight customers with an estimated annual consumption of 61,101,000 kWh and annual coincident peak demand of 10.5 MW.

Staff has not identified any deficiencies and/or concerns. In Staff's opinion, the Integrated Resource analysis filing meets the Load Analysis and Load Forecasting requirements of 20 CSR 4240-22.030.

Staff Expert Witness: Krishna L. Poudel, PhD

20 CSR 4240-22.040 Supply-Side Resource Analysis

Summary

Rule 4 CSR 240-22.040 Supply-Side Resource Analysis requires Empire to review existing resources for opportunities to upgrade or retire existing resources and also review a wide variety of supply-side resources options to determine cost estimates for each type of resource.

Resource options are to be ranked based upon their relative levelized annual costs, including installed capital costs, fixed and variable operation and maintenance costs, and probable environmental costs levelized over the useful life of the potential supply-side resource options using the utility discount rate. Resources which do not have significant disadvantages pass this pre-screening process and are to be included in the integrated resource analysis process used to select a preferred resource plan.

Empire reviewed the following supply side resources for further investigation:⁵

1. Carbon Capture and Storage (“CCS”) – supercritical coal CCS, natural gas-fired combined cycle with CCS, retrofit CCS on existing plants
2. Natural gas-fired simple cycle – Aeroderivative CT and F-class frame CT
3. Natural gas-fired combined cycle – 1 x 1 H Class
4. Natural gas-fired reciprocating engines (“RICE”)*
5. Traditional nuclear and small modular nuclear reactor
6. Wind – on-shore and off-shore, including re-powering of existing assets
7. Biomass – wood waste and poultry waste
8. Landfill gas
9. Solar photovoltaic (“PV”)* – fixed tilt and single axis tracking, with and without paired storage
10. Energy storage – lithium-ion battery*, vanadium redox flow battery, molten salt, Energy Vault concrete block gravity storage, compressed air
11. Combined heat and power (“CHP”)*
12. Hydrogen – retrofit on existing gas-fired combined cycle units and new combined cycle combustion turbine

*Denotes a resource option evaluated as both a distributed and utility scale energy resource.

⁵ Empire’s 2022 Triennial IRP filing 22.040 (pg.27)

Empire performed two rounds of preliminary screening to determine a shortlist of supply-side candidate resource options prior to the full portfolio analysis. The first screening evaluated feasibility of the resource option within Empire’s service territory or surrounding SPP region (described in Section 2.3), and the second screening compared the levelized cost of electricity (“LCOE”) associated with installed capital costs plus fixed and variable operation and maintenance costs for the potential resource options using the utility’s discount rate.(section 2.4)⁶

Upgrades to existing Empire plants were examined during the development of the IRP. These upgrades include:⁷

1. The conversion of Riverton 12 (a CT) to a CC unit was completed in 2016.
2. New pollution control systems were installed at the Iatan 1 unit. A scrubber, SCR, fabric filter, and powder activated carbon system were installed at Unit 1 in 2009.
3. Turbines at State Line CC were upgraded in 2021. These projects consisted of both combustion turbines being upgraded to the FD3 level which will add about 70 additional MW (42 MW Liberty-Empire’s share) to the existing winter capacity of the unit, and 36 MW (22 MW Liberty-Empire’s share) to the summer capacity after completing the necessary SPP studies. In addition, efficiency increases are expected via heat rate improvements. Liberty-Empire’s normal, ongoing maintenance program at each of its plants addresses critical operational and mechanical issues to ensure the longevity of the units. `

In addition to completed upgrades, Liberty-Empire included and evaluated a potential upgrade project that would add generation at the existing Ozark Beach hydroelectric facility. To the 16 MW generating capacity currently at the site, the upgrade would add approximately 14 MW of generating capacity at a low estimated capacity factor, adding about 20% more generation per year on average. The upgrade would require approximately ** [REDACTED] ** in upfront capital and small increases in annual FOM and VOM. This upgrade was included and modeled in the 2022 IRP as a potential supply-side resource option.⁸

For the purposes of Liberty-Empire’s 2022 IRP, Liberty-Empire assigned transmission costs on a dollar per kilowatt basis for each candidate resource examined in this IRP. This cost was

⁶ Empire’s 2022 Triennial IRP filing 22.040 (pg.28&29)

⁷ Empire’s 2019 Triennial IRP filing 22.040 (pg.22)

⁸ Empire’s 2022 Triennial IRP filing 22.040 (pg. 23)

\$225/kW in 2022 dollars and was assumed to remain flat on a real basis through the long-term horizon. The interconnection cost estimate for the Liberty-Empire region was derived from a survey of the latest available Definitive Interconnection System Impact Study (“DISIS”) data. Many recent projects have been withdrawn from the transmission queue due to scarcity and prohibitive costs of interconnections. The higher cost DISIS projects in surrounding areas of Missouri, Arkansas, Oklahoma, and Kansas were found to have an average total allocated capital cost of \$225/kW in real 2022 dollars. In the current environment and in the face of significant uncertainty, Liberty-Empire deemed this cost level to be representative of the marginal project local to Liberty-Empire’s service territory.⁹

In 2021, 31 percent of Empire’s generation was supplied by coal, 58 percent from natural gas, and 11 percent was provided by renewable sources. The remaining generation was provided by non-contract purchases. The 2021 system input by fuel type are shown in the following table.¹⁰

Power Plant Resource	Fuel Type	State	Interest (%)	Capacity (MW)	Start Date	Facility Age (Years)
Iatan 1	Coal	MO	12	84	1980	42
Iatan 2	Coal	MO	12	108	2010	12
Plum Point	Coal	AR	7.52	50	2010	12
Riverton 10 CT ¹	Natural Gas	KS	100	13	1988	54
Riverton 11 CT	Natural Gas	KS	100	15	1988	54
Riverton 12 CT	Natural Gas	KS	100	257	2007	15
Empire Energy Center 1 CT	Natural Gas/Oil	MO	100	81	1978	44
Empire Energy Center 2 CT	Natural Gas/Oil	MO	100	80	1981	41
Empire Energy Center 3 CT	Natural Gas/Oil	MO	100	40	2003	19
Empire Energy Center 4 CT	Natural Gas/Oil	MO	100	43	2003	19
State Line CT	Natural Gas/Oil	MO	100	93	1995	27
State Line CC	Natural Gas	MO	60	300 ²	1997 & 2001 ³	25 & 21
Ozark Beach	Hydro	MO	100	16	1913	109
Total Empire Installed Capacity				1,361		
Long Term Power Purchases		Type		Capacity (MW)	End Date	Term
Plum Point		Coal		50	2040	30 years
Elk River Wind Farm ⁴ (150 MW PPA)		Wind		22	2025	20 years
Meridian Way Wind Farm (105 MW PPA) ⁵		Wind		9	2028	20 years
1. Riverton 10 and 11 were manufactured in 1967 but were installed at Empire in 1988; they are 51 years old.						
2. Represents Empire’s 60 percent share of a 495 MW State Line Combined Cycle unit.						
3. One of the gas turbines at State Line CC was installed in 1997 and hence is 21 years old. The other gas turbine and the steam turbine were installed in 2001.						
4. The Elk River Wind Farm consists of 100 1.5 MW turbines for a total of 150 MW. For purposes of the IRP, 15 MW of its installed capacity is counted toward Empire’s reserve margin. This firm capacity is subject to rerating in the future. Although the term of the PPA is 20 years, the term can be extended once for a period of 5 years at Empire’s option.						
5. The Meridian Way Wind Farm began commercial operation on December 15, 2008. The facility is rated at 105 MW and approximately 10 MW is counted toward Empire’s reserve margin. This firm capacity is subject to rerating in the future.						
6. Empire is currently proposing the addition of 600 MW of nameplate capacity through three new wind farms. This would represent 90 MW of capacity credit.						

⁹ Empire’s 2022 Triennial IRP filing 22.040 (pg.77)

¹⁰ Empire’s 2022 Triennial IRP filing 22.040 (pg.10)

Supply Side Resources & The Missouri Renewable Energy Standard (RES)

Rule 20 CSR 4240-22.040, Supply-Side Resource Analysis, requires Empire to review a wide variety of supply-side resource options, including a wide variety of renewable generation technologies and technologies for distributed generation. Empire included the following renewable technologies, which have the potential to be eligible for Missouri RES compliance, in its supply-side analysis:

1. Wind
2. Solar PV – Single Axis Tracking
3. Single Axis Tracking – Distributed
4. Solar PV –Fixed Tilt
5. Landfill Gas
6. Biomass

Empire selected all of the listed renewable technologies as final candidate resource options to represent renewable options. In addition to the renewable technologies listed, Empire included battery storage in several alternative resource plans.

Staff has not identified any deficiencies but has one concern related to Empire's supply-side resource analysis.

Concern A: Staff has a continued concerns from the securitization case (EO-2022-0040) regarding the use of the Riverton unit 11 in the winter months. These units are described in Empires filing in this section as dual fuel (Natural gas (NG) and fuel oil when NG is unavailable) and able to be used in the winter months. However, as Staff discovered in the securitization case, the Company cannot utilize Riverton 11 with fuel oil as it did not tune it to operate at temperatures under 70 degrees for operations with fuel oil. Therefore, there is concern that the operation of Riverton 11 may not be possible during future cold weather events.

To remedy this concern Empire should ** [REDACTED] ** test, as it is required to do at a minimum of every three years (NERC requirement), at sub-freezing (Below 32 Fahrenheit) temperatures to prove its capabilities of firing on fuel oil in winter emergency situations before the end of 2022. If a sub-freezing day does not occur in 2022, testing shall be completed by the end of January 2023. Once completed, within a week of the testing,

Empire shall file in this EFIS Docket (EO-2021-0331) the result of the testing and if the units were successfully fired.

Staff Expert Witness: Jordan T. Hull

20 CSR 4240-22.045 Transmission and Distribution Analysis

Summary

Rule 20 CSR 4240-22.045 Transmission and Distribution Analysis specifies minimum standards for the scope and level of detail required for transmission and distribution network analysis and reporting. Rule 20 CSR 4240-22.045 does not prescribe how analyses are to be done, but rather allows a utility to conduct its own analysis or adopt the regional transmission operator (“RTO”) or Independent Transmission System Operator (“ISO”) transmission plans. Rule 20 CSR 4240-22.045 requires analysis and documentation of the RTO/ISO transmission projects and requires the electric utility to review transmission and distribution for the reduction of power losses, interconnection of new generation facilities, facilitation of sales and purchases, and incorporation of advance technologies for the optimization of investment in transmission and distribution resources.

Staff has not identified any deficiencies or concerns related to Empire’s transmission and distribution analysis.

Staff Expert Witness: Jordan T. Hull

20 CSR 4240-22.050 Demand-Side Resource Analysis

Summary

Rule 20 CSR 4240-22.050, Demand-Side Resource Analysis, “specifies the principles by which potential demand-side resource options shall be developed and analyzed for cost-effectiveness, with the goal of achieving all cost-effective demand-side savings.” The rule identifies the objectives to be achieved by the demand-side programs and portfolios, and gives each utility the option of developing demand-side programs or portfolios from the top down (starting with program designs and filling in the cost-effective measures) or from the bottom up (starting with screening a comprehensive menu of measures and ending with program designs). The rule clarifies the distinction between demand-side programs and demand-side rates. The rule includes the calculation of the Total Resource Cost (“TRC”) test,

which meets the requirement of the Missouri Energy Efficiency Investment Act (“MEEIA”). The rule requires documentation regarding how the potential demand-side resources were analyzed and screened to identify demand-side candidate resource options to advance to the integrated resource analysis. Finally, Rule 20 CSR 4240-22.050 requires the assessment of technical potentials, maximum achievable potentials (“MAP”), and realistic achievable potentials (“RAP”) and the selection of demand-side candidate resource options that are passed on to integrated resource analysis in Rule 20 CSR 4240-22.060.

Empire engaged Applied Energy Group (“AEG”) to conduct a Demand-Side Management (“DSM”) Potential Study to assess the future potential for savings through its programs and to identify refinements that will enhance savings. AEG first assessed Empire’s service territory. The market assessment defined the market segments (building types, end uses, and other dimensions) that are relevant in the Empire service territory. AEG used detailed billing and customer data with minimal augmentation from secondary sources to allocate energy use and customers to the various sectors and segments. The total number of households and electricity sales for the service territory were obtained from Empire’s customer database. AEG utilized commercial and industrial customer billing data and secondary sources to develop the commercial and industrial market segments. The nonresidential sector excludes customers that opt-out of Empire’s DSM tariff (as of January 2019) and is segmented into small and large nonresidential segments based upon a 1,000 MWh annual use threshold. Customers with usage greater than or equal to the 1,000 MWh threshold were characterized as large nonresidential; all other customers were considered small nonresidential.

AEG analyzed potential demand-side resources for all major end uses as identified by the Residential Customer Energy Survey and secondary sources. The major end uses considered include:

- Residential sector: cooling, space heating, water heating, interior lighting, exterior lighting, appliances, electronics, and miscellaneous.
- Non-Residential sector: space heat, space cooling, ventilation, water heating, refrigeration, interior and exterior lighting, office equipment, food preparation, motors, process, and miscellaneous.

AEG developed four program design scenarios to assess the optimal demand-side programs for potential further consideration. Programs were designed for the 20-year time period from 2022 to 2039, with 2020 representing a half-year to allow for implementation planning and contractor procurement. The recommended near-term demand-side management programs for 2022-2024 include:

- Residential Prescriptive
- Residential Lighting
- Appliance Recycling (beginning in 2030)
- Residential Whole House Efficiency
- Commercial Prescriptive
- Commercial Custom
- Small Business Direct Install (SBDI)
- Midstream Food Service
- Strategic Energy Management (SEM)
- Retrocommissioning

AEG assessed the three most common demand-side rate options for the Liberty-Empire service territory for a variety of different customer segments. The three most common types of demand-side rates are as follows:

• **Time-of-Use.** Customers pay a higher price during the designated peak period and lower prices during off-peak periods. The designated peak and off-peak periods are typically defined by the season, day and time of day. An interval meter is required. • **Critical Peak Price.** Customers pay higher peak period prices during a critical peak event day and pay a discounted off-peak price for the remainder of the year. A critical peak event day occurs multiple times a year and is typically called a day in advanced when wholesale prices are forecasted to be highest. An interval meter is required. • **Real Time Pricing.** Customers pay for energy at a rate that is linked to the hourly market price for electricity. Depending on their size, participants are typically made aware of the hourly prices on either a day-ahead or hour-ahead basis. Typically, only the largest customers — above one megawatt of load — face hour-ahead prices. An interval meter is required.

Liberty-Empire's avoided demand cost projections are based on a combination of sources that aim to develop a reasonable benchmark for the value of capacity. Because the SPP market does not have a formal capacity market and because Liberty-Empire's own supply-demand balance dynamics will evolve over time, it is necessary to consider a combination of fundamental SPP market drivers and utility-specific cost drivers in developing the estimate. The following section presents the rationale and drivers behind Liberty-Empire's avoided demand cost projections for three distinct periods.

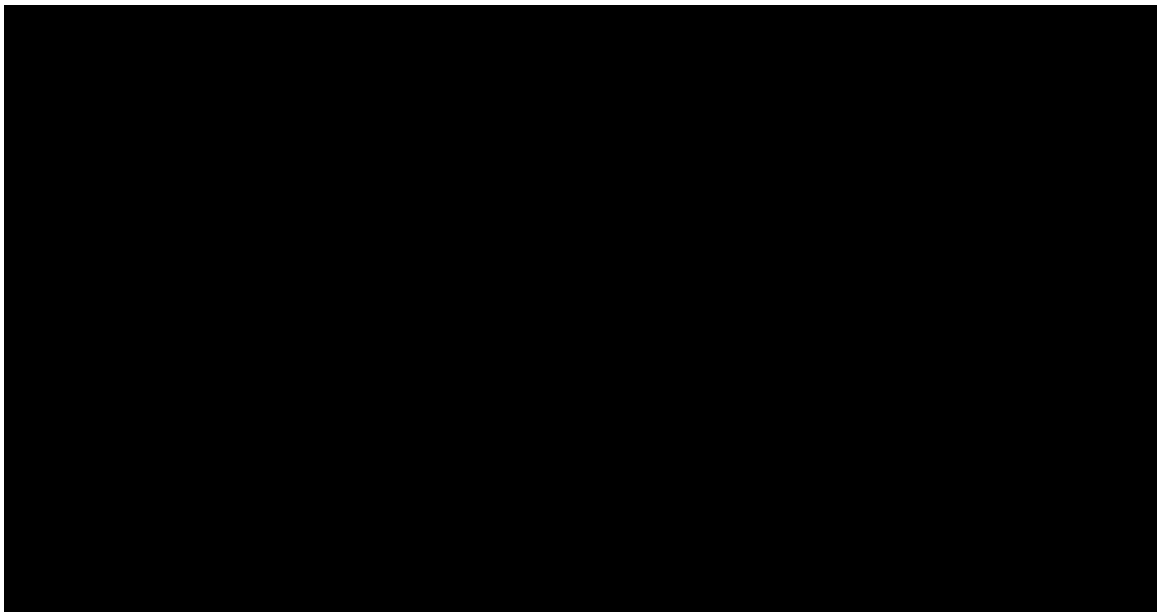
Years 2022-2026: For the forecast period in which Liberty-Empire has an adequate reserve margin, the avoided cost of capacity is based on the net avoidable "going-forward" costs (fixed operations and maintenance costs and annual new capital expenditures, less projected energy margins) of the marginal plant in Liberty-Empire's existing generation portfolio. The marginal plant in Liberty-Empire's existing generation portfolio was determined by analyzing each existing plant's most recent budgeted fixed O&M costs and new capex less the projected energy margins that each plant was projected to earn in the SPP power market under Liberty-Empire's Base Case market conditions, producing the "net going-forward cost" of each plant. Based on a comparison of the net going-forward costs at each plant, Liberty-Empire determined that Iatan 1 has the highest going-forward costs on average for the period and is thus the marginal retirement candidate in the portfolio. Therefore, the plant's going-forward costs are representative of the costs needed for Liberty-Empire to avoid a capacity deficit.

Years 2027-2028: For the period in which it was uncertain whether or not Liberty-Empire would have an adequate reserve margin because it was dependent on the retirement date of Energy Center 1 and 2, Liberty-Empire took an average of Iatan 1's net avoidable going-forward cost and the fundamentally-derived CRA SPP capacity price forecast. The rationale for this approach is that while Liberty-Empire is currently long capacity, this situation is dependent on maintaining all capacity resources in the existing fleet. While Liberty-Empire may have significant going-forward Iatan 1 costs during this time period, Liberty-Empire could, in theory, retire Iatan 1 and find a bilateral capacity opportunity in the market. Therefore, the 2027-2028 avoided demand cost splits the difference between the CRA SPP capacity price and the Iatan 1 going-forward cost.

Years 2029+: In the years in which it is certain that Liberty-Empire would require new additional generation capacity, the avoided demand cost projection is based on a transition to the projected cost of new entry (“CONE,” which includes capital costs and ongoing fixed operations and maintenance costs) in SPP, net of expected energy margins in the SPP market. CRA’s fundamentals-based SPP power market forecast projects a need for new capacity in the late 2020s and early 2030s as reserve margins decline due to growing SPP load, regional plant retirements, and declining ELCC. The cost of the new entrant in this time period is set by a blend of gas CC, gas CT, and battery storage, based on the rationale that the marginal capacity type is currently uncertain but is most likely to be one of these technology types. The value of capacity grows in the broader SPP market over this period due to larger “missing money” resulting from declining storage ELCC and lower energy margins as renewables push prices down.

The avoided demand cost projection used by Liberty-Empire in the 2022 IRP is shown in 2020 dollars per kW-year.

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Based on its limited review, Staff has identified one concern with Empire and 20 CSR 4240-22.050.

Concerns

Concern B: Staff reiterates its concern from Empire’s 2019 IRP that Empire has potentially overstated avoided capacity cost benefits when calculating the total resource cost test (TRC) results for its demand-side programs and portfolio, Therefore, the programs may not be cost-effective and may not comply with 393.1075.4., SR Mo.¹¹

In 2019, Staff’s remedy was that Empire should 1) screen demand-side resources using zero avoided capacity costs until Empire needs capacity to meet SPP resource adequacy requirements at which point it could use the most recent ABB Midwest Power Reference Case as the avoided capacity cost for any near term MEEIA application and Chapter 22 compliance filing and calculate the TRC and other cost-effectiveness tests for those demand side programs that pass the screening; and 2) select MEEIA programs which have TRCs greater than 1.00¹² and are expected to provide benefits for all customers.

For Empire’s MEEIA Cycle 1, starting January 1, 2022, the Company agreed to use zero avoided capacity costs until such time that the Company needs capacity to meet SPP resource adequacy requirements, at which time the avoided capacity costs will be assumed to be equal to the ABB projected capacity cost for SPP for years in which the Company can defer supply-side resources.

To remedy this concern, Empire should continue to use the avoided cost methodology agreed to in MEEIA cycle 1 to verify cost effectiveness of its demand side programs for the remainder of its MEEIA Cycle 1. The Company and stakeholders can further discuss avoided cost methodology for MEEIA Cycle 2.

Staff Expert Witnesses: Jordan T. Hull

¹¹ 393.1075.3. It shall be the policy of the state to value demand-side investments equal to traditional investments in supply and delivery infrastructure and allow recovery of all reasonable and prudent costs of delivering cost-effective demand-side programs. ... The commission shall consider the total resource cost test a preferred cost-effectiveness test.

¹² 393.1075.4. ... Programs targeted to low-income customers or general education campaigns do not need to meet a cost-effectiveness test, so long as the commission determines that the program or campaign is in the public interest. Nothing herein shall preclude the approval of demand-side programs that do not meet the test if the costs of the program above the level determined to be cost-effective are funded by the customers participating in the program or through tax or other governmental credits or incentives specifically designed for that purpose.

20 CSR 4240-22.060 Integrated Resource Plan and Risk Analysis

Summary

This rule requires the utility to design alternative resource plans to meet the planning objectives identified in Rule 20 CSR 4240-22.010(2), and sets minimum standards for the scope and level of detail required in resource plan analysis and for the logically consistent and economically equivalent analysis of alternative resource plans. The utility is to identify the critical uncertain factors that affect the performance of alternative resource plans and establishes minimum standards for the methods used to assess the risks associated with these uncertainties.

The goal is to develop a set of alternative plans based on substantively different mixes of supply-side resources and demand-side resources and variations in the timing of resource acquisition to assess their relative performance under expected future conditions as well as their robustness under a broad range of future conditions.

Empire and its IRP modeling consultant, Charles River Associates (“CRA”), developed, considered, and analyzed the present worth of long-run utility costs for 15 alternative resource plans by calculating the present value of revenue requirements (“PVRR”) for each plan. The minimization of PVRR as the primary criterion for evaluating the comparative performance of the alternative resource plans is subject to certain constraints as defined in 20 CSR 4240-22.010(2)(C). In addition to calculating the PVRR for each plan, Empire identified five major planning objectives to test each plan against. These planning objectives are Customer Affordability, Risk Mitigation, Reliability, Environmental Sustainability, and Compliance and Safety. The alternative resource plans are based on substantively different mixes of demand-side resources and supply-side resources and variations in the timing of resource acquisition to assess their relative performance under expected future conditions as well as their robustness under a broad range of future conditions.

Based on its limited review, Staff has not identified any deficiencies or concerns related to Empire and 20 CSR 4240-22.060.

Staff Expert Witness: Brad J. Fortson

20 CSR 4240-22.070 Resource Acquisition Strategy Selection

Summary

This rule requires the utility to select a preferred resource plan, develop an implementation plan, and officially adopt a resource acquisition strategy. The rule also requires the utility to prepare contingency plans and evaluate the demand-side resources that are included in the resource acquisition strategy.

20 CSR 4240-22.070(2) requires the Company to specify the ranges or combinations of outcomes for the critical uncertain factors that define the limits within which the preferred resource plan is judged to be appropriate and explain how these limits were determined. A critical uncertain factor is any uncertain factor that is likely to materially affect the outcome of the resource planning decision. Empire identified the following critical uncertain factors: load growth, carbon prices, natural gas prices and capital costs.

To document the process and rationale used by Empire's decision-makers to assess the tradeoffs and determine the appropriate balance between minimization of expected utility costs and other resource planning considerations and metrics, Empire's 2022 IRP deployed an IRP scorecard. The color-coded scorecard with populated metrics is attached as Confidential Addendum A.

Confidential Addendum B includes Empire's 2022 IRP alternative resource plans (also considered Empire's contingency resource plans) which includes Empire's adopted preferred resource plan (Plan 8). Finally, the summer and winter capacity balance sheets for Empire's adopted preferred resource plan is included as Confidential Addendum C.

Based on its limited review, Staff has identified one concern for Empire's preferred resource plan and resource acquisition strategy.

Concern C: Risk potentially borne by ratepayers from Empire's further shift toward renewable solar generation.

Empire's preferred plan adds 175 MW of solar and storage at existing interconnection sites in a 4:1 solar to storage ratio by 2030. By 2041, the plan adds 200 MW of utility-scale solar, 600 MW of utility-scale 2:1 solar plus storage, 50 MW of flow battery, and 132 MW of distributed solar and/or storage. Empire's preferred plan does not provide for much excess capacity over its load plus required reserve margin in the summer months, but more concerning

is the lack of excess capacity the preferred plan provides in the winter months, particularly starting in 2035. In February 2021, Empire was greatly affected by Winter Storm Uri. Natural gas prices increased tremendously costing ratepayers millions of dollars. Staff's concern is that the Company's preferred resource plan may not adequately provide enough capacity to cover its load in the case of another emergency weather event. The Company is making a large shift toward solar, a resource that is often not reliable during an emergency winter event. The Company's preferred plan also relies heavily on battery storage, a technology that is not yet feasible.

20 CSR 4240-22.080(7) requires Staff to provide at least one (1) suggested remedy for each identified concern. Staff's concern here is one of a general nature. However, Staff recommends the Company 1) continue to provide a detailed analysis in its triennial IRP filings comparing ratepayer risks and shareholder risks for additional generation resources that are not required to meet federal, state, or RTO requirements, and 2) provide details of its plan for handling future emergency events such as the recent COVID pandemic and the Winter Storm Uri weather event with the details provided giving a clear plan for maintaining supply-side resource generation and public welfare during emergency events, as was previously ordered by the Commission in Case No. EO-2022-0057.¹³

Staff Expert Witness: Brad J. Fortson

20 CSR 4240-22.080 Filing Schedule and Requirements

Summary

This rule specifies the requirements for electric utility filings to demonstrate compliance with the provisions of Chapter 22. The purpose of the compliance review required by Chapter 22 is not Commission approval of the substantive findings, determinations, or analyses contained in the filing. The purpose of the compliance review required by Chapter 22 is to determine whether the utility's resource acquisition strategy meets the requirements of Chapter 22. However, if the Commission determines that the filing substantially meets these requirements, the Commission may further acknowledge that the preferred resource plan or resource acquisition strategy is reasonable in whole, or in part, at the time of the finding. This

¹³ *Order Establishing Special Contemporary Resource Planning Issues*, issued on October 27, 2021.

rule also establishes a mechanism for the utility to solicit and receive stakeholder input to its resource planning process.

The Filing Schedule, Filing Requirements, and Stakeholder Process Rule establish a filing deadline for all electric utilities on April 1 of each year. A triennial compliance filing is due every third year with more informal annual update filings during the years between the full triennial compliance filings. The annual updates are coupled with a stakeholder workshop to communicate changing conditions and utility plans and to seek comments and suggestions from stakeholders during the planning process. Preliminary plans are reviewed with stakeholders to receive input regarding potential concerns and deficiencies. However, once plans are filed, stakeholders again have the opportunity to identify potential concerns and deficiencies. The Commission, with input from stakeholders, will identify special contemporary issues each year for each utility to analyze during its planning process. To make the resource planning process more meaningful, the rule requires action from the utility if its business plan or acquisition strategy becomes inconsistent with the latest adopted preferred resource plan filed by the utility. The rule also requires certification that any request of action from the Commission is consistent with the utility's adopted preferred resource plan.

Based on its limited review, Staff has not identified any deficiencies or concerns related to Empire and 20 CSR 4240-080.

Staff Expert Witness: Brad J. Fortson

BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF MISSOURI

In the Matter of the 2022 Triennial)
 Compliance Filing Pursuant to 20 CSR)
 4240-22 by The Empire District Electric)
 Company d/b/a Liberty)
File No. EO-2021-0331

AFFIDAVIT OF BRAD J. FORTSON

STATE OF MISSOURI)
) ss.
 COUNTY OF COLE)

COMES NOW BRAD J. FORTSON, and on his oath declares that he is of sound mind and lawful age; that he contributed to the foregoing *Staff Report*; and that the same is true and correct according to his best knowledge and belief.

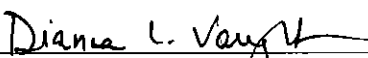
Further the Affiant sayeth not.



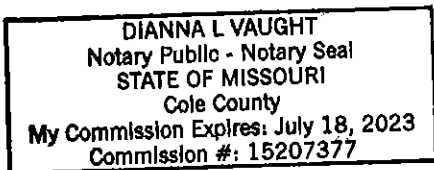
BRAD J. FORTSON

JURAT

Subscribed and sworn before me, a duly constituted and authorized Notary Public, in and for the County of Cole, State of Missouri, at my office in Jefferson City, on this 25th day of August, 2022.



 Notary Public



BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF MISSOURI

In the Matter of the 2022 Triennial)
Compliance Filing Pursuant to 20 CSR)
4240-22 by The Empire District Electric)
Company d/b/a Liberty)
File No. EO-2021-0331

AFFIDAVIT OF JORDAN T. HULL

STATE OF MISSOURI)
) ss.
COUNTY OF COLE)

COMES NOW JORDAN T. HULL, and on his oath declares that he is of sound mind and lawful age; that he contributed to the foregoing *Staff Report*; and that the same is true and correct according to his best knowledge and belief.

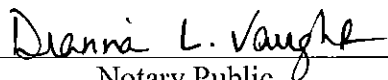
Further the Affiant sayeth not.



JORDAN T. HULL

JURAT

Subscribed and sworn before me, a duly constituted and authorized Notary Public, in and for the County of Cole, State of Missouri, at my office in Jefferson City, on this 22nd day of August, 2022.



Notary Public

DIANNA L VAUGHT Notary Public - Notary Seal STATE OF MISSOURI Cole County My Commission Expires: July 18, 2023 Commission #: 15207377
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BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF MISSOURI

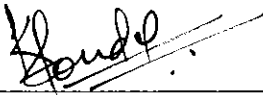
In the Matter of the 2022 Triennial)
Compliance Filing Pursuant to 20 CSR) **File No. EO-2021-0331**
4240-22 by The Empire District Electric)
Company d/b/a Liberty)

AFFIDAVIT OF KRISHNA L. POUDEL, PhD

STATE OF MISSOURI)
) ss.
COUNTY OF COLE)

COMES NOW KRISHNA L. POUDEL, PhD, and on his oath declares that he is of sound mind and lawful age; that he contributed to the foregoing *Staff Report*; and that the same is true and correct according to his best knowledge and belief.

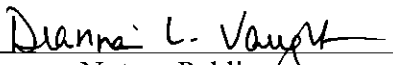
Further the Affiant sayeth not.



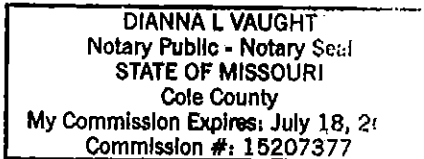
KRISHNA T. POUDEL, PhD

JURAT

Subscribed and sworn before me, a duly constituted and authorized Notary Public, in and for the County of Cole, State of Missouri, at my office in Jefferson City, on this 25th day of August, 2022.



Notary Public



**ADDENDUM A,
ADDENDUM B,
and
ADDENDUM C**

HAVE BEEN DEEMED

CONFIDENTIAL

IN THEIR ENTIRETY