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VOLUME 7

RESOURCE ACQUISITION STRATEGY SELECTION

THE EMPIRE DISTRICT ELECTRIC COMPANY D/B/A LIBERTY ("LIBERTY-EMPIRE")

20 CSR 4240-22.070

FILE NO. EO-2021-0331

April 2022

20 CSR 4240-2.135(2)(A)5-7

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RESOURCE ACQUISITION STRATEGY SELECTION

Commission Rule 20 CSR 4240-22.070, Resource Acquisition Strategy Selection, provides in part as follows:

PURPOSE: 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.

SECTION 1 PREFERRED RESOURCE PLAN

(1) The utility shall select a preferred resource plan from among the alternative resource plans that have been analyzed pursuant to the requirements of 4 CSR 240-22.060. The utility shall describe and document the process used to select the preferred resource plan, including the relative weights given to the various performance measures and the rationale used by utility decision-makers to judge the appropriate tradeoffs between competing planning objectives and between expected performance and risk. The utility shall provide the names, titles, and roles of the utility decision-makers in the preferred resource plan selection process. The preferred resource plan shall satisfy at least the following conditions:

1.1 Preferred Plan Selection Criteria

(A) In the judgment of utility decision-makers, strike an appropriate balance between the various planning objectives specified in 4 CSR 240-22.010(2);

Consistent with 20 CSR 4240-22.010(2), Liberty-Empire's 2022 IRP analysis was intended to select a resource strategy that provides energy services that are safe, reliable, and efficient, at just and reasonable rates, consistent with state energy and environmental policies, in compliance with all legal mandates, and in a manner that serves the public interest. Further, consistent with 20 CSR 4240-22.010(2)(C), the selected resource strategy was based on the minimization of the present value of long-run utility costs as well as the mitigation of risks associated with critical uncertain factors ("CUF"), legal compliance, and rate increases. Finally, Liberty-Empire also considered the capability of the Preferred Plan to allow for the significant reduction of carbon emissions over the long term. While Liberty-Empire used the minimization of the present worth of long-run utility costs as the primary selection criterion for the Preferred Plan, it also considered these

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additional objectives as priorities and used them as guidelines for developing and evaluating the alternative resource plans.

1.2 Preferred Plan Selection Process

Liberty-Empire developed and evaluated 15 alternative resource plans to meet the objectives described in 20 CSR 4240-22.010(2). The development of the 15 alternative resource plans is described in more detail in Volume 6.

To document the process and rationale used by Liberty-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, Liberty-Empire's 2022 IRP deployed an IRP scorecard. The scorecard is a means of reporting key metrics for different alternative resource plans to facilitate the evaluation of relative portfolio performance and key tradeoffs. Liberty-Empire's scorecard did not produce a single ranking of portfolios but served as a tool to help facilitate structured tradeoff discussions and support the internal decision-making and approval process.

Liberty-Empire identified five major planning objectives and seven performance metrics as summarized in Figure 7-1. The objectives included Customer Affordability, Risk Mitigation, Reliability, Environmental Sustainability, and Compliance and Safety. By populating the 2022 IRP Scorecard metrics for all of the alternative resource plans, Liberty-Empire was able to evaluate the plans holistically and recommend a preferred resource plan based on a transparent set of selection criteria.

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Figure 7-1 – 2022 IRP Scorecard Metrics

Objective	Metric	Metric Description
Customer Affordability	NPV Revenue Requirement	NPV of long-term (30-year) total annual costs paid by ratepayers under the Base Case scenario
Risk Mitigation	Resilience to Critical Uncertain Factors	Expected value of 30-year PVRRs when evaluated against all critical uncertain factor probabilities
		Range between higher-cost (P95) and median (P50) PVRR outcomes when calculated against the CUF probabilities
Reliability	Operational Flexibility	Dispatchable capacity (Summer UCAP MW) included in portfolio by 2041
Environmental Sustainability	Carbon Reduction	Million short tons CO2 emissions in 2041 (scope 1/2 only)
Compliance and Safety	Environmental and Legal Compliance	Adherence to legal mandates and energy policies
	Safety	Adherence to safety standards

To determine the 2022 IRP Preferred Plan, Liberty-Empire analyzed the costs and tradeoffs associated with each alternative resource plan (shown in Table 7-1). As discussed in Volume 6, all alternative plans include the retirement of Energy Center 1 and 2 in 2035 and Riverton 10 and 11 in 2025. Liberty-Empire has determined that while a potential earlier retirement of the Energy Center units could result in a lower-cost plan under the base planning assumptions, the savings were minimal (approximately 0.1% of total present value revenue requirements ("PVRRs") over a 30-year period) and would remove significant reliability benefits from the portfolio.

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Table 7-1 – Description of Alternative Resource Plans

Plan	Plan Description
1	Gas – Utility
2	Gas – Utility + Distributed
3	Gas – Utility + Distributed
4	Mix – Utility
5	Mix – Utility + Distributed
6	Mix – Utility + Distributed
7	Renewable - Utility
8	Renewable – Utility + Distributed
9	Renewable – Utility + Distributed
10	Net Zero 2050 – Renewable + Storage
11	Net Zero 2050 – Nuclear SMR
12	Net Zero 2050 – Hydrogen
13	Net Zero 2035 – Renewable / Storage
14	Net Zero 2035 – Nuclear SMR
15	Net Zero 2035 – Hydrogen

Notes:
Plans 1-15 include retirement of Riverton 10 and 11 in 2025 and Energy Center 1 and 2 in 2035
Plans 10-12 include retirement of Riverton CC in 2045 and State Line CC in 2050
Plans 13-15 include retirement of Riverton CC and State Line CC in 2035

Minimization of the present worth of long-run utility costs, as measured by the present value of revenue requirements ("PVRR"), was the primary selection criterion for the Preferred Plan, with all remaining planning objectives given consideration. In the judgment of utility decision-makers, the Preferred Plan represented an appropriate balance between the various planning objectives specified in 20 CSR 4240-22.010(2).

Liberty-Empire's populated 2022 IRP Scorecard is shown in Figure 7-2. While the scorecard does not include all performance metrics evaluated in Volume 6, it represents the criteria that utility decision-makers weighed most heavily in determining Liberty-Empire's Preferred Plan. For each metric in the populated scorecard, values in darker shades of green illustrate a "stronger" performance of the plan (i.e., more favorable), and values in darker shades of red illustrate a "weaker" performance (i.e., less favorable).

Figure 7-2 – Populated 2022 IRP Scorecard

Objective	Metric	Metric Description	Portfolio 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Customer Affordability	NPV Revenue Requirement	Total long-term (20-year) annual costs paid by customers on a net present value basis under Base Case scenario	8,025	8,011	8,041	7,992	7,991	7,992	7,967	7,965	7,965	7,964	7,962	7,963	8,058	8,259	9,368
Risk Mitigation	Resilience to Critical Uncertain Factors	Expected value of 20-year PVRRs when evaluated against all critical uncertain factor probabilities	8,286	8,280	8,312	8,286	8,284	8,284	8,266	8,262	8,262	8,263	8,264	8,265	8,385	8,556	9,530
		Range (delta) between higher-cost (P95) and median (P50) PVRR outcomes when calculated against the CUF probabilities	641	615	637	885	880	880	901	871	870	879	785	853	1,292	1,321	821
Reliability	Operational Flexibility	Dispatchable capacity (Summer UCAP MW) included in portfolio by 2041	1,266	1,237	1,264	1,037	1,037	1,037	1,027	1,030	1,030	1,053	1,101	1,087	1,076	1,003	1,052
Environmental Sustainability	Carbon Reduction	Million short tons CO2 emissions in 2041 (scope 1/2 only)	1.97	1.90	1.95	1.53	1.53	1.53	1.45	1.45	1.45	1.45	1.45	1.45	0.10	0.10	0.10
Compliance and Safety	Environmental and Legal Compliance	Adherence to legal mandates and energy policies	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
	Safety	Adherence to safety standards	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*

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1.3 Preferred Plan Selection

Minimization of PVRR was the primary criterion for the selection of the Preferred Plan. Figure 7-3 displays the PVRR of all 15 plans under Base Case planning assumptions, prior to introducing uncertainty for specific market factors, for the twenty-year planning period of the IRP. The 30-year PVRRs of all the alternative resource plans are shown in Figure 7-4.

Figure 7-3 – 20-Year PVRR for All Plans (2022-2041) ($ millions)

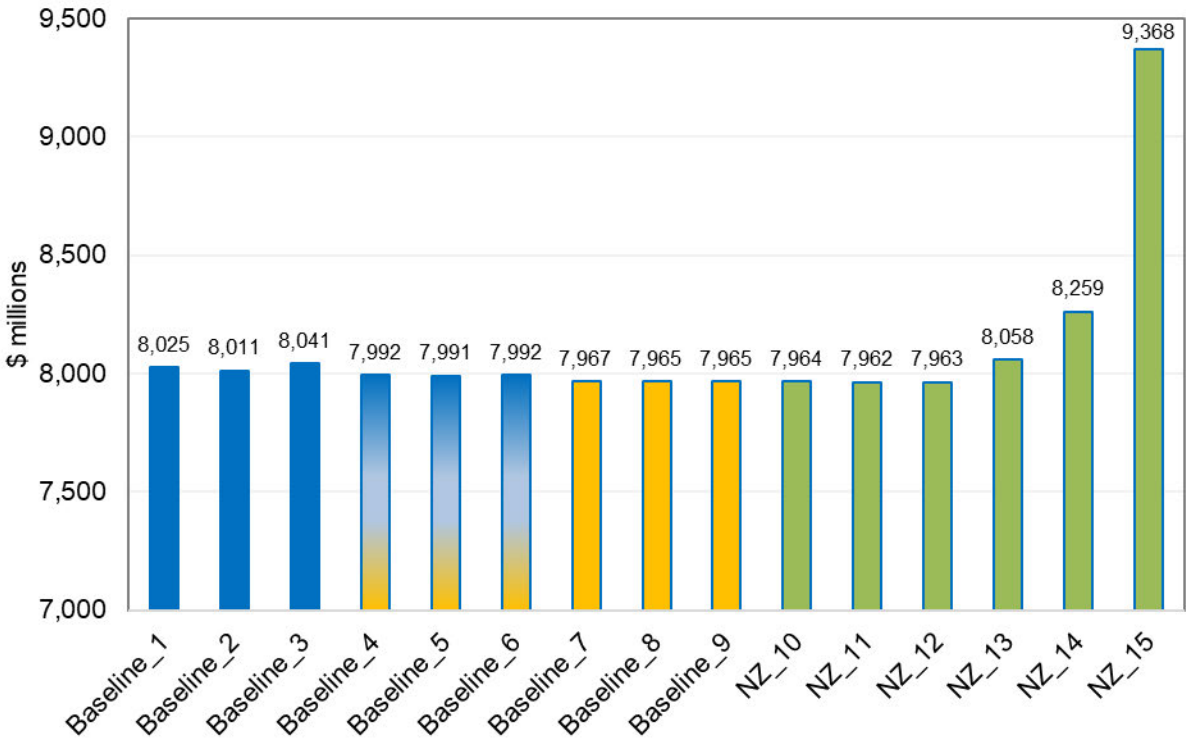

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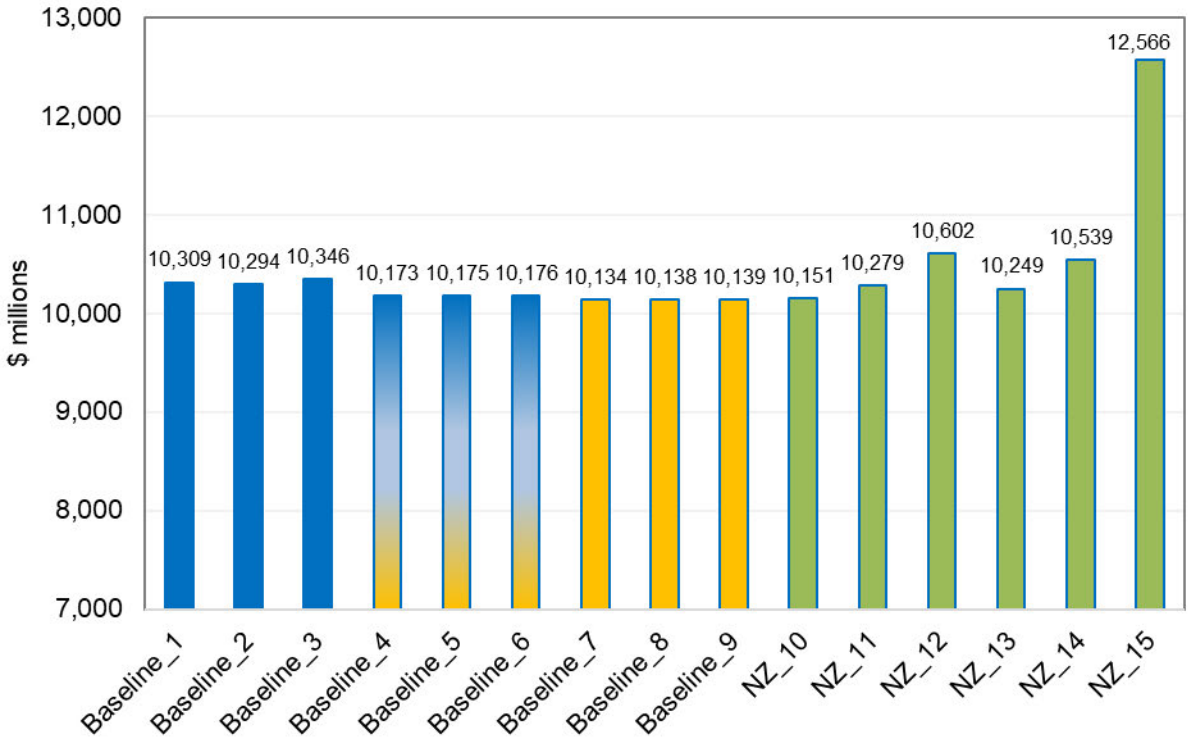
Figure 7-4 – 30-Year PVRR for All Plans (2022-2051) ($ millions)



As shown in Figure 7-**3**, on a 20-year PVRR basis, Plan 8 is the lowest-cost alternative plan among the baseline retirement plans (Plans 1 through 9), although PVRRs are very close across Plans 7 through 12 due to the addition of similar technology types in those portfolios through 2041. Given only minor differences in near-term portfolio changes within similar portfolio technology concept themes (i.e., within Plans 1-3 – natural gas options only, within Plans 4-6 – natural gas and renewables mix, and within Plans 7-9 – renewable options only), the PVRRs within these themes were found to be very similar to each other. Plans 10 through 12, representing "Net Zero by 2050" plans that retire Liberty-Empire's two existing natural gas combined cycle ("CC") units by 2050, are slightly lower-cost than Plans 7 through 9 during the 20-year study period but are higher cost on a 30-year basis once the CCs are replaced.

Of the alternative plans that assume age-based or baseline retirements (Plans 1 through 9), Plan 8 was the lowest cost. While Plan 10 (Net Zero 2050 with renewable and advanced storage replacements) is marginally lower-cost than Plan 8 on a 20-year PVRR basis, it becomes slightly

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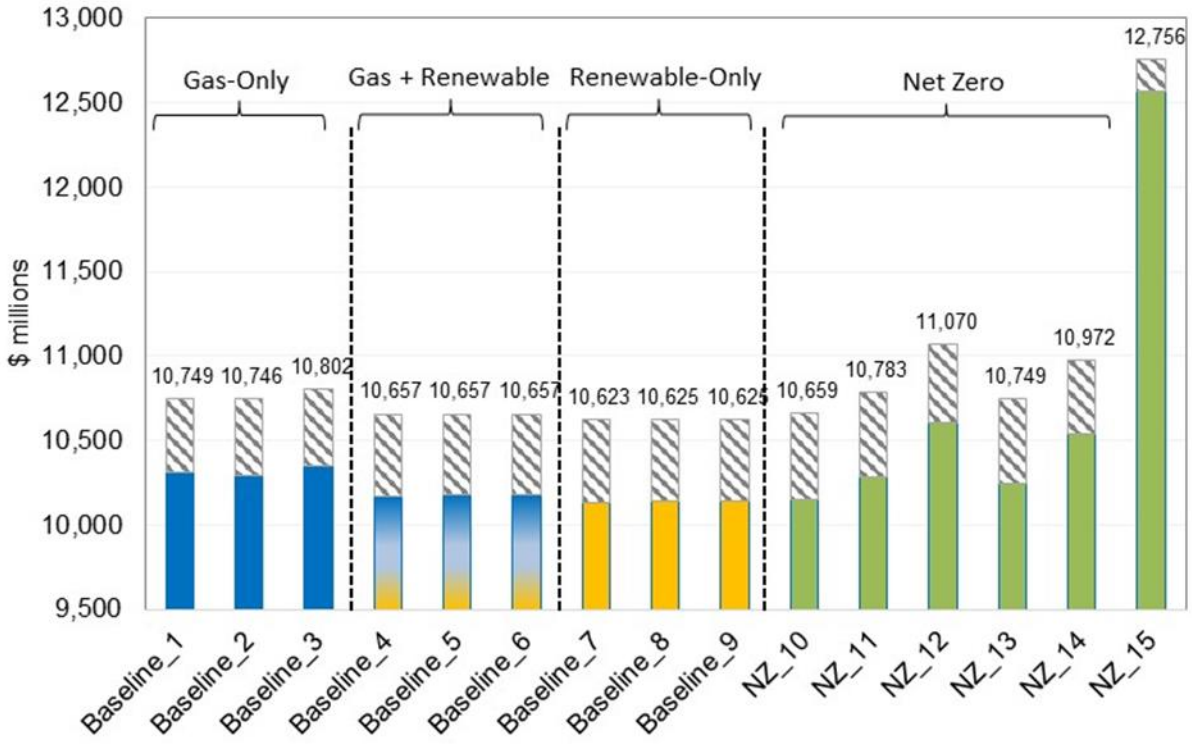
higher-cost on a 30-year PVRR basis. Due to the long-term nature of the net zero decision, Plan 10 does not differ significantly from Plan 8 in technology buildout during the 20-year IRP study period. Put another way, Plan 8 keeps the portfolio on a viable path toward Plan 10's long term net zero position assuming the necessary steps are taken in the 2041-2051 period.

Through the risk analysis, Liberty-Empire also determined the expected value or weighted average of PVRRs across the 81 endpoints, with subjective probabilities assigned to each endpoint by the utility decision-makers. The risk analysis is described further in Volume 6. From a risk mitigation perspective, Liberty-Empire found that Plans 7 through 9 performed best on an expected value basis for both 20-year and 30-year PVRRs, with Plan 8 remaining the lowest cost and preserving flexibility to pivot to the resource acquisition strategy under Plan 10 in the longer term. The expected value PVRRs for all plans are shown in Figure 7-5, with the shaded component of the bar being incremental to the Base Case PVRRs.

Figure 7-5 - PVRR with Risk Value for All Plans (2022-2041) – ($ millions)



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Compared to alternative plans that included only new renewable resources (i.e., Plans 7 through 9), the alternative plans that included thermal resources (i.e., Plans 1 through 3 and to a more limited extent, Plans 4 through 6) slightly lowered the range between higher-cost PVRR outcomes (defined as the 95th percentile of PVRRs when evaluated across the 81 endpoints) and the median PVRR outcome (defined as the 50th percentile of PVRRs when evaluated across the 81 endpoints). This metric indicated that portfolios that included more thermal capacity were better able to "tighten" or narrow the band of risk in potential PVRR outcomes. Although the CUF analysis includes uncertainty in natural gas prices and environmental costs, which also increases thermal resource cost risk, the new thermal capacity added in the alternative plans consists of natural gas-fired peaking technologies, which are expected to operate at relatively low capacity factors and primarily in hours with high power prices.

An illustration of the slightly tighter "band" of outcomes in Plan 1 relative to Plans 7, 10, and 13 can be seen in the cumulative probability distribution graphic or "risk profile" in Figure 7-6. The risk profile plots the PVRR for selected plans for each of the 81 endpoints. For illustrative purposes, only a subset of alternative plans representing different replacement technology "portfolio concepts" (e.g., natural gas-only, natural gas/renewable mix, renewable only, net zero 2035 with renewables, and net zero 2050 with renewables) are shown.

While Plan 8 did not perform best on this metric, the utility decision-makers determined that the difference in performance between the natural gas-only plans and Plan 8 were not material enough to overwhelm Plan 8's advantage in PVRR, which was the primary selection criterion for Preferred Plan selection. Similarly, although Portfolio 8 does not perform best on the dispatchable capacity metric, the difference did not overwhelm Plan 8's advantage in PVRR.

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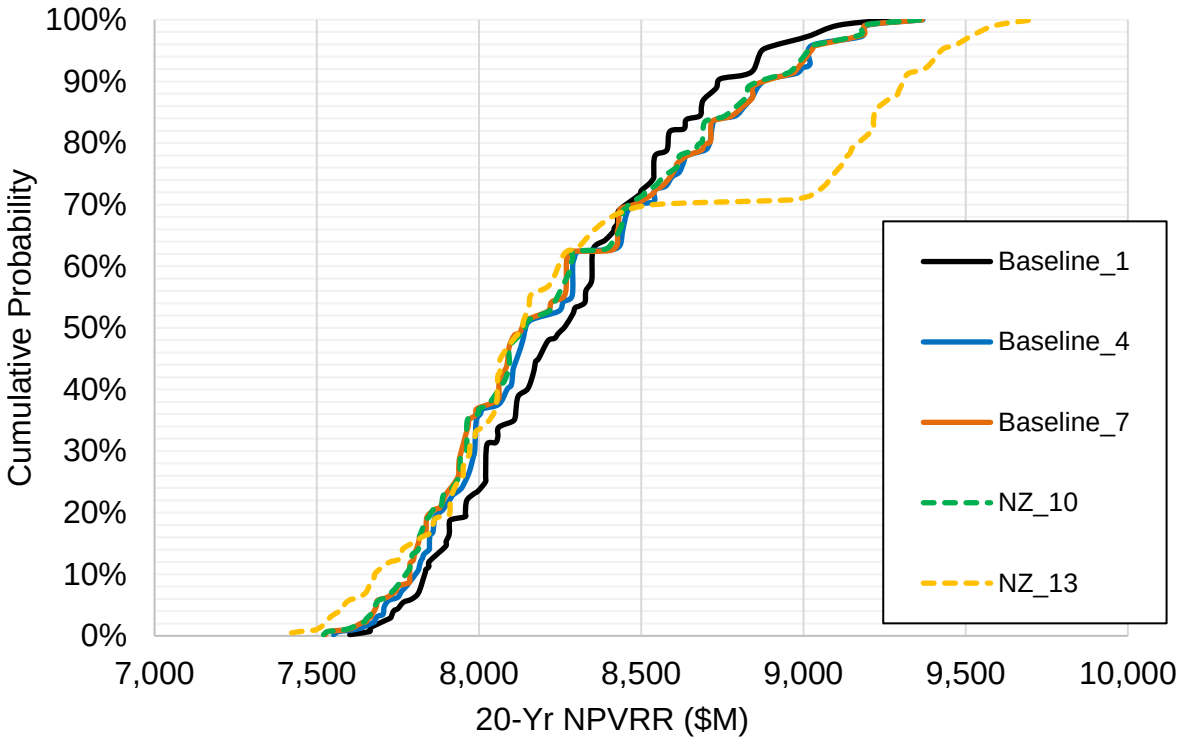
Figure 7-6 - Risk Profiles of Select Plans ($ millions)



Finally, Liberty-Empire found that plans that added new carbon-free resources performed better than plans that added new natural gas-fired resources on the Environmental Sustainability metric, measured by the amount of scope 1 and 2 CO2 emissions from the generation portfolio in 2041. Plans 1 through 6, which added new thermal resources prior to 2041, performed the weakest on this metric. Plans that retired Liberty-Empire's existing natural gas CCs prior to 2041 performed best on this metric.

Finally, Liberty-Empire determined that Plan 8 benefits from having more optionality in technology type, since it allows for the selection of new utility-scale and distributed renewable resources while other very similar plans, such as Plan 7, allow only for the selection of utility-scale renewable resources. As discussed in Volume 4.5 and Volume 4, distributed resources have the benefit of enabling the deferral of needed distribution system upgrades and may provide further benefits such as compliance with FERC Order 2222 implementation. Liberty-Empire believes there is value in investing in some level of distributed resources from an energy security

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and reliability perspective: distributed resources can help improve local reliability, prevent blackouts and outages, avoid distribution system investment, and improve energy security in the event of large-scale disruptions at the transmission level.

After carefully considering alternative plan performance across the Preferred Plan selection criteria described in Section 1.1, Liberty-Empire ultimately selected Plan 8 as the Preferred Plan.

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1.4 Preferred Plan Description

Liberty-Empire's decision-makers selected Plan 8 as the Preferred Plan. Plan 8 includes the near-term retirement of Riverton 10 and 11 replaced directly at the site by 30 MW of dual-fuel **[redacted]** reciprocating internal combustion engine ("RICE") units, the retirement of Energy Center 1 and 2 in 2035 with the addition of solar and storage resources co-located at the site, the low-cost bundle of realistically achievable potential ("RAP") demand-side management ("DSM"), and a mix of utility-scale and distributed solar and solar + storage resources added over the study period.

1.4.1 Supply-Side Resources in the Preferred Plan

The Preferred Plan includes the following assumed resource retirements and PPA expirations of the existing resources:

- Retirement of Riverton 10 and 11 in 2025;
- Expiration of the Elk River Wind PPA in 2025;
- Expiration of the MJMEUC Capacity Sale PPA in 2025;
- Expiration of the Meridian Way Wind PPA in 2028;
- Retirement of Energy Center 1 and 2 in 2035;
- Retirement of Iatan 1 in 2039;
- Expiration of the Plum Point PPA in 2040.

All other existing Liberty-Empire generating units were assumed to continue operations throughout the planning horizon, and Liberty-Empire did not plan to extend any PPAs for IRP analysis purposes.

The Preferred Plan will satisfy future capacity needs with a broad mix of solar, paired solar + storage, standalone storage, and natural gas resources at both the utility and distributed scale. The 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-

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scale 2:1 solar + storage, 50 MW of flow battery, and 132 MW of distributed solar and/or storage. The plan also adds the low-cost bundle of RAP DSM. As in all alternative plans, the Preferred Plan assumes dual-fuel RICE units replace the retirements at Riverton 10 and 11 in 2025. The Preferred Plan additions are further illustrated in Table 7-2. The capacity values (presented in MW) represent the summer operating capacity.

Table 7-2 - Preferred Plan Supply Side Resource Retirements and Additions

Year	Supply-Side Retirements and PPA Expirations	Supply-Side Additions
2022		RAP DSM (Low-Cost Bundle)
2023		
2024		
2025	Elk River Contract Expires (150 MW) Riverton 10-11 Retires (27 MW)	RICE utilizing existing IC (30 MW)
2026		
2027		Utility-Scale 2:1 S+S utilizing existing IC (105 MW) Dist. Solar (5 MW)
2028	Meridian Way Contract Expires (105 MW)	
2029		
2030		Utility-Scale Solar utilizing existing IC (70 MW)
2031		Dist. Solar (10 MW) Dist. 2:1 S+S (3 MW)
2032		Dist. Solar (10 MW) Dist. 2:1 S+S (6 MW)
2033		Utility-Scale Solar (100 MW) Dist. Solar (10 MW)
2034		Dist. Solar (10 MW)
2035	Energy Center 1 and 2 Expires (160 MW)	Dist. Solar (10 MW)
2036		Dist. Solar (10 MW)
2037		Dist. Solar (10 MW)
2038		Utility-Scale Solar (50 MW) Dist. Solar (10 MW)
2039	Iatan 1 Retires (84 MW)	Utility-Scale 2:1 S+S (480 MW) Dist. Solar (10 MW)
2040	Plum Point PPA Expires (50 MW)	Dist. Storage (4 MW) Dist. Solar (10 MW)
2041		Utility-Scale Solar (50 MW) Utility-Scale 2:1 S+S (120 MW) Dist. Storage (1 MW) Dist. 2:1 S+S (3 MW) Dist. Solar (10 MW) Flow Battery (50 MW)

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1.4.2 Advanced Transmission and Distribution Technologies in the Preferred Plan

(B) Invest in advanced transmission and distribution technologies unless, in the judgment of the utility decision-makers, investing in those technologies to upgrade transmission and/or distribution networks is not in the public interest;

The advanced transmission and distribution planning elements are discussed in Volume 4.5. Liberty-Empire makes every effort to incorporate advanced technologies in presently budgeted or recently substantially completed projects. As demonstrated by its recent investments in Advanced Metering Infrastructure ("AMI"), Advanced Distribution Management Systems ("ADMS"), and distribution automation, Liberty-Empire is taking significant action to incorporate advanced technologies into its distribution and transmission network and is modernizing its grid to better set the stage for future advanced grid technologies. However, the implementation of advanced grid technologies did not influence the current selection of the near-term resource acquisition strategy.

Organization-wide, Liberty is working to establish a platform of capabilities involving AMI, ADMS and other capabilities that are important for the safe, compliant, and cost-effective operation of the distribution grid. For example, the Company has a comprehensive corporate-wide initiative known as the Customer First program. Customer First includes AMI and an initiative called Network & Design Operations. This will implement a uniform Geospatial Information System ("GIS") technology across Liberty, for consistency of asset data management and analytics to support many other business and operational objectives, including the implementation of ADMS that will improve the integration and utilization of smart devices, sensors, automation, and operational optimization across its grid infrastructure. Over time, Liberty-Empire will continue to better understand the extent of implementation of these programs, determining Liberty-Empire's specific requirements in relation to load and customer needs.

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1.4.3 Demand-Side Programs in the Preferred Plan

(C) Utilize demand-side resources to the maximum amount that comply with legal mandates and, in the judgment of the utility decision-makers, are consistent with the public interest and achieve state energy policies; and

Liberty-Empire analyzed demand-side resources and supply-side resources on an equivalent basis as options for meeting load requirements. The demand-side resource inputs were developed by Applied Energy Group ("AEG"). AEG developed load shapes for each DSM program to be included as resource options for the portfolio modeling. The DSM programs were split into various bundles by cost for IRP analysis purposes, representing low, mid, and high-cost ranges. At least the low-cost bundle of RAP or maximum achievable potential ("MAP") DSM was found to be cost-effective in all plans. The demand-side resource analysis is discussed in Volume 5.

1.4.4 Resources in the Preferred Plan

Table 7-3 and Table 7-4 present the forecasted capacity balance for the Preferred Plan and provide more detail about the timing of the resources planned to meet Liberty-Empire's load while complying with current legal mandates. Table 7-3 shows the capacity balance for the summer season, utilizing summer peaks and summer unit ratings. Table 7-4 shows the capacity balance for the winter season, utilizing winter peaks and winter unit ratings.

Table 7-3 – Plan 8 Preferred Plan – Summer Peak

[redacted]

Table 7-4 - Plan 8 Preferred Plan – Winter Peak

[redacted]

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1.4.5 Extreme Weather Capability

(D) In the judgment of the utility decision-makers, the Preferred Plan, in conjunction with the deployment of emergency demand response measures and access to short-term and emergency power supplies, has sufficient resources to serve load forecasted under extreme weather conditions pursuant to 4CSR 240-22.030(8)(B) for the implementation period. If the utility cannot affirm the sufficiency of resources, it shall consider an alternative resource plan or modifications to its preferred resource plan that can meet extreme weather conditions.

Liberty-Empire examined the adequacy of the Preferred Plan to serve the load forecasted under extreme weather conditions pursuant to 20 CSR 4240-22.030(8)(B). As a member of the Southwest Power Pool ("SPP") balancing authority and energy market, Liberty-Empire's ability to serve load in extreme weather scenarios relies primarily on the fact that the utility meets the SPP required reserve margin. Although SPP is a summer-planning system, Liberty-Empire also ensured that all portfolios meet winter reserve margin requirements.

All Liberty-Empire resource plans also include replacement of the existing Riverton units 10 and 11 with significantly more reliable dual-fuel **[redacted]** RICE units, as well as the life extension of Energy Center units 1 and 2 until 2035 to maintain and improve the ability to provide reliable services during potential emergency events. Energy Center 1 and 2 provided significant value to customers and helped stabilize the system during the events of Storm Uri due to their ability to operate on fuel oil in addition to natural gas. Liberty-Empire believes maintaining Energy Center 1 and 2 through 2035 will significantly help to hedge market risks at a relatively low cost of investment. As analyzed in Volume 6, Section 3.2, Liberty-Empire found a very small cost difference between retiring Energy Center 1 and 2 in 2026 relative to in 2035 (representing less than 0.1% of total portfolio costs over a 30-year period). In addition, maintaining Energy Center 1 and 2 will provide other foreseeable benefits to address reliability-related discussions occurring within SPP and several SPP Working Groups, including the potential for increasing reserve margins and decremented capacity for existing thermal resources.

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1.5 Utility Decision Makers

The list of utility decision-makers for the 2022 IRP included Liberty-Empire executives and directors. Other managers, analysts and specialists were also involved in the IRP development. The names, titles, and roles of the Liberty-Empire IRP team, including the utility decision-makers are provided in Table 7-5. This local team was also supported by an IRP Review Board.

Table 7-5 – Liberty-Empire 2022 IRP Team (Central Region)

Name	Title	Primary IRP Function
Kevin Noblet	President, Central Region	Executive Staff - Utility Decision Maker
Tim Wilson	Vice President, Electric Operations	Executive Staff - Utility Decision Maker
Tisha Sanderson	Vice President, Finance and Administration	Executive Staff - Utility Decision Maker
Aaron Doll	Senior Director, Energy Strategy	Director in charge of IRP, Transmission, SPP Market – Utility Decision Maker
Drew Landoll	Director, Strategic Projects	Strategic Projects, Environmental, Renewable Energy – Utility Decision Maker
Charlotte Emery	Director, Rates and Regulatory Affairs	Regulatory, Rates – Utility Decision Maker
Diana Carter	Director, Legal Services	Legal
Brian Mushimba	Senior Director, Generation Operations – Central Region	Existing Supply-Side Fleet
Todd Tarter	Senior Manager, Strategic Planning	IRP Project Manager
Shaen Rooney	Senior Manager, Strategic Projects	Supply-Side, Environmental, Renewable Energy
Josh Tupper	Manager, Energy Market Operations	Energy Supply, Energy Trading, SPP Next Day Market
David Busse	Lead, Planning and Fuel	Supply-Side, Commodity Pricing, Load Forecasting, Resource Adequacy
Christopher Green	Analyst III, Planning	Congestion Hedging Management, Transmission
Nate Hackney	Analyst III, Reporting and Systems	Demand-Side
Robin McAlester	Senior Manager, Transportation Electrification	Transportation Electrification

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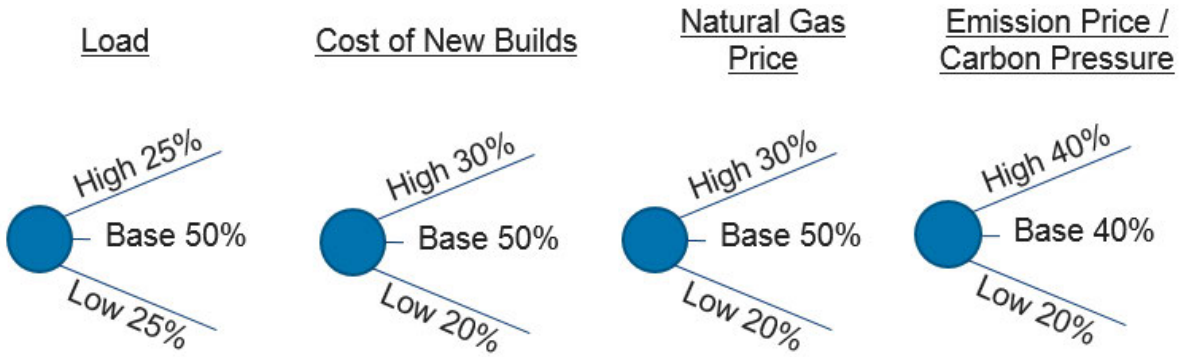
SECTION 2 RANGES OF CRITICAL UNCERTAIN FACTORS

(2) The utility shall 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. The utility shall also describe and document its assessment of whether, and under what circumstances, other uncertain factors associated with the preferred resource plan could materially affect the performance of the preferred resource plan relative to alternative resource plans.

2.1 Critical Uncertain Factors

A CUF is any uncertain factor that is likely to materially affect the outcome of the resource planning decision. As discussed in Volume 6, Liberty-Empire identified the following critical uncertain factors: load growth, carbon prices, natural gas fuel prices, and a grouping of factors related to the cost of new builds.[1] These critical uncertain factors and their ranges form the nodes and the branches of the uncertainty tree in Figure 7-7. Volume 6 documents the rationale underlying the subjective probabilities of each scenario assigned by the utility decision-makers.

Figure 7-7 - Critical Uncertain Factors Tree



[1] As discussed in Volume 6, the cost of new builds CUF itself includes high, base, and low scenarios of component factors including capital costs, interconnection costs, interest rates, tax credit provisions (if relevant), and renewable capacity factors (if relevant).

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2.2 Ranges of Critical Uncertain Factors

Planning for future resources in the electric utility industry involves the consideration and evaluation of many uncertainties. For this IRP, Liberty-Empire developed 15 alternative plans. As discussed in Volume 6, these plans were developed to examine a variety of long-term options for Liberty-Empire's portfolio, including future preferred technology type, levels of distributed versus utility-scale resources, levels of DSM, and retirement dates of existing Liberty-Empire units.

Plan 8, which was selected as the Preferred Plan, includes a long-term future resource buildout dominated by utility-scale and distributed solar and storage resources. An analysis of the range of probable outcomes for the Preferred Plan under the critical uncertain factors was performed to evaluate the performance of the Preferred Plan relative to the other alternative plans under a wide range of external market conditions. The 20-year PVRRs for all alternative plans under each of the 81 endpoints was calculated to determine which portfolio was the lowest-cost under each scenario.

Of the baseline plans (Plans 1-9), Liberty-Empire found that the renewable-only portfolios (Plans 7-9) performed best in scenarios that had base or low cost of new build trajectories, regardless of the paired natural gas price, emissions price, and load scenario. The gas-only portfolios (Plans 1-3) performed best under scenarios that had high cost of new build trajectories. Under the high cost of new build scenarios, Plans 7-9 were higher cost due to higher assumed solar and storage capital costs, less favorable future federal tax credit policy, higher interconnection costs, lower solar capacity factors, and higher interest rates. However, the high cost of new builds endpoint represents a "worst case scenario" for all component variables, and Liberty-Empire believes it is unlikely that all of the factors within the high cost of new build critical uncertain factor would happen simultaneously for a sustained period time.

No combination of natural gas price, emissions price, and load growth was found to change the positioning of the renewable-only portfolios as the best-performing plan. In other words, Liberty-

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Empire found that a renewables-only Preferred Plan strategy is expected to perform better than any of the alternative strategies regardless of how natural gas prices, emissions prices, and load growth are reasonably expected to evolve.

When further evaluating the performance of the renewable-only plans (Plans 7-9) under the critical uncertain factor scenarios, Liberty-Empire determined that Plan 9 (Renewables with MAP DSM) was never lower cost than Plan 7 or 8. In scenarios where Plan 7 was lower cost than Plan 8, Liberty-Empire found that the magnitude of the difference in 20-year PVRR between Plans 7 and 8 was negligible, representing only about 0.01% to 0.25% of the total 20-year PVRR (between $0.5 and 21 million in NPV over the 20-year period). In addition to negligible PVRR differences in these scenarios, Liberty-Empire believes that Plan 8 has benefits relative to Plan 7 through the inclusion of distributed energy resources. As discussed in Volume 4.5 and Volume 4, distributed resources have the benefit of enabling the deferral of needed distribution system upgrades and may provide further benefits such as compliance with FERC Order 2222 implementation. Moreover, Liberty-Empire believes there is value in investing in some level of distributed resources from an energy security and reliability perspective: distributed resources can help improve local reliability, prevent blackouts and outages, avoid distribution system investment, and improve energy security in the event of large-scale disruptions at the transmission level.

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SECTION 3 BETTER INFORMATION

(3) The utility shall describe and document its quantification of the expected value of better information concerning at least the critical uncertain factors that affect the performance of the preferred resource plan, as measured by the present value of utility revenue requirements. The utility shall provide a tabulation of the key quantitative results of that analysis and a discussion of how those findings will be incorporated in ongoing research activities.

3.1 Expected Value of Better Information

To determine the maximum possible value that Liberty-Empire should be willing to pay for better information about future market conditions, Liberty-Empire assumed it was possible to obtain perfect information about the future trajectory of the critical uncertain factors; that is, Liberty-Empire could determine with certainty which state of the world will occur. The expected value of perfect information ("EVPI") represents the delta between the expected value of the best decisions under every scenario with perfect information regarding market uncertainties and the expected value of the best decision without perfect information regarding market uncertainties.[2] Liberty-Empire developed two measures of EVPI: (1) the EVPI assuming perfect information regarding *all four* critical uncertain factors, representing the value that Liberty-Empire would pay to have perfect information regarding all critical uncertainties; and (2) the *conditional* EVPIs assuming perfect information regarding each of the four critical uncertain factors individually, given that the remaining three factors were at their "Base" values.

The first measure illustrates the maximum amount Liberty-Empire should be willing to pay to have better information about all four critical uncertain factors together and does not assume any prior knowledge about the critical uncertain factors other than the subjective probability distributions. To determine the EVPI assuming perfect information regarding all four critical uncertain factors, Liberty-Empire first determined the alternative plan that had the lowest cost under each of the 81 scenarios, then weighted the PVRR of each portfolio by the subjective

[2] The EVPI represents the delta between the scenario-specific probability-weighted average of the values of the best decisions under given scenarios.

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probability of the given scenario. The sum of the probability-weighted PVRRs results in the expected value of the best decisions made with perfect information regarding all of the market uncertainties. By calculating the delta between this value and the expected value of the Preferred Plan (Plan 8) across the 81 scenarios, Liberty-Empire determined the EVPI. EVPI represents the theoretical maximum amount of money Liberty-Empire should be willing to spend to obtain perfect information about the future state of the world. The results of the EVPI analysis are summarized in Table 7-6. Because the net zero by 2050 plans (Plans 10-12) do not involve any near-term decisions that differ from Plan 8 during the 20-year IRP study period, these plans were excluded from this analysis.

Table 7-6 – Summary of the Expected Values of Perfect Information ("EVPI")

Expected Value of Perfect Information	**$ millions**
Expected Value Plan 8 (20-Year PVRR):	8,262
Expected Value with Perfect Information (20-Year PVRR):	8,167
Expected Value of Perfect Information:	**95**

The second measure described above, i.e., the *conditional* EVPI for a single critical uncertain factor, is the maximum amount Liberty-Empire should be willing to pay for better information about that critical uncertain factor assuming that the other three critical uncertain factors are at their "Base" values. To individually obtain the conditional EVPI for each of the four critical uncertain variables, it was assumed that all other variables were known to be at the Base Case value. For example, to test the value of perfect information for load growth, Liberty-Empire kept natural gas prices, CO2 prices, and the cost of new builds at their Base Case values, while load growth was varied between base, high and low. Under this example, the EVPI represents the EVPI assuming perfect information regarding load growth, conditional on the fact that the remaining three factors were at their "Base" values.

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Table 7-7 – EVPI Load

Load			
Load	**Base**	**High**	**Low**
Natural Gas	Base	Base	Base
CO2	Base	Base	Base
Cost of New Builds	Base	Base	Base
Endpoint:	1	4	7
Subjective Probability:	5%	3%	3%
Baseline_1	8,025	8,121	7,898
Baseline_2	8,011	8,112	7,885
Baseline_3	8,041	8,140	7,914
Baseline_4	7,992	8,088	7,865
Baseline_5	7,991	8,087	7,864
Baseline_6	7,992	8,088	7,865
Baseline_7	7,967	8,063	7,840
Baseline_8	7,965	8,062	7,838
Baseline_9	7,965	8,063	7,839
NZ_13	8,058	8,154	7,931
NZ_14	8,259	8,355	8,133
NZ_15	9,368	9,466	9,241
Lowest Cost Plan:	Baseline_8	Baseline_8	Baseline_8
Lowest Cost Plan ($M):	7,965	8,062	7,838
Expected Value Plan 8 ($M):	7,957		
Expected Value Using Perfect Information ($M):	7,957		
Expected Value of Perfect Information ($M):	-		

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Table 7-8 – EVPI Natural Gas Prices

Natural Gas			
Load	Base	Base	Base
Natural Gas	**Base**	**High**	**Low**
CO2	Base	Base	Base
Cost of New Builds	Base	Base	Base
Endpoint:	1	28	55
Subjective Probability:	5%	3%	2%
Baseline_1	8,025	8,213	7,909
Baseline_2	8,011	8,197	7,892
Baseline_3	8,041	8,234	7,915
Baseline_4	7,992	8,129	7,915
Baseline_5	7,991	8,129	7,914
Baseline_6	7,992	8,129	7,916
Baseline_7	7,967	8,093	7,897
Baseline_8	7,965	8,094	7,890
Baseline_9	7,965	8,094	7,892
NZ_13	8,058	8,103	8,065
NZ_14	8,259	8,250	8,322
NZ_15	9,368	9,354	9,403
Lowest Cost Plan:	Baseline_8	Baseline_7	Baseline_8
Lowest Cost Plan ($M):	7,965	8,093	7,890
Expected Value Plan 8 ($M):	7,989		
Expected Value Using Perfect Information ($M):	7,988		
Expected Value of Perfect Information ($M):	0.5		

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Table 7-9 – EVPI Environmental Costs

CO2			
Load	Base	Base	Base
Natural Gas	Base	Base	Base
CO2	**Base**	**High**	**Low**
Cost of New Builds	Base	Base	Base
Endpoint:	1	10	19
Subjective Probability:	5%	5%	3%
Baseline_1	8,025	8,352	7,829
Baseline_2	8,011	8,364	7,810
Baseline_3	8,041	8,395	7,836
Baseline_4	7,992	8,289	7,812
Baseline_5	7,991	8,291	7,811
Baseline_6	7,992	8,290	7,812
Baseline_7	7,967	8,269	7,787
Baseline_8	7,965	8,280	7,782
Baseline_9	7,965	8,279	7,783
NZ_13	8,058	8,263	7,912
NZ_14	8,259	8,283	8,157
NZ_15	9,368	9,358	9,247
Lowest Cost Plan:	Baseline_8	NZ_13	Baseline_8
Lowest Cost Plan ($M):	7,965	8,263	7,782
Expected Value Plan 8 ($M):	8,054		
Expected Value Using Perfect Information ($M):	8,047		
Expected Value of Perfect Information ($M):	7.1		

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Table 7-10 – EVPI Cost of New Builds

Cost of New Builds			
Load	Base	Base	Base
Natural Gas	Base	Base	Base
CO2	Base	Base	Base
Cost of New Builds	**Base**	**High**	**Low**
Endpoint:	1	2	3
Subjective Probability:	5%	3%	2%
Baseline_1	8,025	8,543	7,962
Baseline_2	8,011	8,523	7,954
Baseline_3	8,041	8,561	7,979
Baseline_4	7,992	8,722	7,849
Baseline_5	7,991	8,715	7,847
Baseline_6	7,992	8,716	7,847
Baseline_7	7,967	8,717	7,814
Baseline_8	7,965	8,689	7,819
Baseline_9	7,965	8,690	7,819
NZ_13	8,058	9,214	7,668
NZ_14	8,259	9,488	7,913
NZ_15	9,368	10,091	9,225
Lowest Cost Plan:	Baseline_8	Baseline_2	NZ_13
Lowest Cost Plan ($M):	7,965	8,523	7,668
Expected Value Plan 8 ($M):	8,153		
Expected Value Using Perfect Information ($M):	8,073		
Expected Value of Perfect Information ($M):	80.0		

Based on the results, Liberty-Empire determined that better information around the cost of new builds would be most valuable for further analysis of resource strategy. While Liberty-Empire will never have perfect information regarding these variables, it will continue to monitor trends in the costs of new builds, interconnection costs, and federal tax policy, particularly those associated with solar and storage resources, when implementing the Preferred Plan.

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3.2 Contingency Resource Plans

(4) The utility shall describe and document its contingency resource plans in preparation for the possibility that the preferred resource plan should cease to be appropriate, whether due to the limits identified pursuant to 4 CSR 240-22.070(2) being exceeded or for any other reason.

(A) The utility shall identify as contingency resource plans those alternative resource plans that become preferred if the critical uncertain factors exceed the limits developed pursuant to section (2).

The 15 alternative resource plans are described in detail in Volume 6. For reference, Table 7-11 provides a summary of each.

Table 7-11 – Alternative Resource Plans

Plan	Plan Description	Replacement Tech.	Scale	Key Retirements*	DSM Bun-dle
1	Gas Only – Utility-Scale	Natural Gas	Utility		RAP
2	Gas Only – Utility-Scale + Distributed	Natural Gas	Utility/Distributed		RAP
3	Gas Only – Utility-Scale + Distributed	Natural Gas	Utility		MAP
4	Gas/Renew Mix – Utility-Scale	Natural Gas + Renew.	Utility		RAP
5	Gas/Renew Mix – Utility-Scale + Distributed	Natural Gas + Renew.	Utility/Distributed		RAP
6	Gas/Renew Mix – Utility-Scale + Distributed	Natural Gas + Renew.	Utility/Distributed		MAP
7	Renewable – Utility-Scale	Renewable	Utility		RAP
8	Renewable – Utility-Scale + Distributed	Renewable	Utility/Distributed		RAP
9	Renewable – Utility-Scale + Distributed	Renewable	Utility/Distributed		MAP
10	Net Zero 2050 – Renewable + Storage	Renewable	Utility/Distributed	Riverton CC 2045 Stateline CC 2050	RAP
11	Net Zero 2050 – Nuclear SMR	Nuclear + Renew.	Utility/Distributed	Riverton CC 2045 Stateline CC 2050	RAP
12	Net Zero 2050 – Hydrogen	Hydrogen + Renew.	Utility/Distributed	Riverton CC 2045 Stateline CC 2050	RAP
13	Net Zero 2035 – Renewable / Storage	Renewable	Utility/Distributed	Riverton CC 2035 Stateline CC 2035	RAP
14	Net Zero 2035 – Nuclear SMR	Nuclear + Renew.	Utility/Distributed	Riverton CC 2035 Stateline CC 2035	RAP
15	Net Zero 2035 – Hydrogen	Hydrogen + Renew.	Utility/Distributed	Riverton CC 2035 Stateline CC 2035	RAP

DSM = "Demand-Side Management"
RAP = "Realistic Achievable Potential"

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MAP = "Maximum Achievable Potential"
Renewable options include storage. Advanced storage options are allowed only in the net zero portfolios.

* Key Retirements are incremental to retirements and PPA expirations that are common across all plans:
- Retirement of Riverton 10 and 11 in 2025
- Expiration of the Elk River Wind PPA in 2025
- Expiration of the MJMEUC Capacity Sale PPA in 2025
- Expiration of the Meridian Way Wind PPA in 2028
- Retirement of Energy Center 1 and 2 by 2035
- Retirement of Iatan 1 in 2039
- Expiration of the Plum Point PPA in 2040

Liberty-Empire considers Plans 1, 2, 7, and 10 to be contingency plans to the Preferred Plan. While Plans 7 and 10 both constitute renewable-only resource acquisition strategies similar to Plan 8, Liberty-Empire found that these plans perform best across differing futures for load growth, fuel prices, and environmental costs. Plan 7 represents a contingency plan if distributed solar and storage resources were found to be difficult to develop or site. Plan 10 does not differ significantly from Plan 8 in buildout through the 20-year IRP study period but keeps the Company on the pathway to achieving Net Zero by 2050 through the retirement of the existing CC units in 2045 and 2050. While Plans 1 and 2 perform best in market conditions with a sustained high cost of new builds and thus serve as contingency plans under such a state-of-the-world, Liberty-Empire believes it is unlikely (though possible) that such a "worst case" scenario representing a combination of high capital costs, high interconnection costs, low renewable capacity factors, high interest rates could continue through the long term.

Given Liberty-Empire's existing generation fleet and market position, the Company is well-positioned to develop contingency plans if the critical uncertain factors change enough to compel a different course of action. For example, should a sustained high cost of new builds scenario materialize, Liberty-Empire could adjust its planning to a course similar to Plan 2. Should distributed solar and storage resources be found difficult to develop or site, Liberty-Empire could adjust its planning to a course similar to Plan 7. In addition, Liberty-Empire will continue to monitor all uncertain factors, file annual updates, and file triennial IRPs to update its plan on a regular basis.

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(B) The utility shall develop a process to pick among alternative resource plans, or to revise the alternative resource plans as necessary, to help ensure reliable and low cost service should the preferred resource plan no longer be appropriate for any reason. The utility may also use this process to confirm the viability of contingency resource plans identified pursuant to subsection (4)(A).

Liberty-Empire is continually monitoring factors that could impact the Preferred Plan. This may involve additional analyses. Liberty-Empire updates its Missouri stakeholder group periodically through the filing of triennial IRPs and annual updates required under rule 20 CSR 4240-22.080. Liberty-Empire's modeling and the effects of these factors on Liberty-Empire's plans are researched, reanalyzed, documented, and presented to the Commission every year. Additionally, if Liberty-Empire's Preferred Plan changed significantly, Liberty-Empire would notify the Commission as required by 20 CSR 4240-22.080(12). Because of its ongoing planning requirements, Liberty-Empire is always focused on regulatory and industry developments, and both the Commission and stakeholders are continually apprised of how these developments may affect Liberty-Empire's performance and plans.

(C) Each contingency resource plan shall satisfy the fundamental objective in 4 CSR 240-22.010(2) and the specific requirements pursuant to 4 CSR 240-22.070(1).

All alternative resource plans minimally comply with legal mandates. The contingency plans satisfy the fundamental objectives in 20 CSR 4240-22.010(2).

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SECTION 4 LOAD BUILDING PROGRAMS

(5) Analysis of Load-Building Programs. If the utility intends to continue existing load-building programs or implement new ones, it shall analyze these programs in the context of one (1) or more of the alternative resource plans developed pursuant to 4 CSR 240-22.060(3) of this rule, including the preferred resource plan selected pursuant to 4 CSR 240-22.070(1). This analysis shall use the same modeling procedure and assumptions described in 4 CSR 240-22.060(4). The utility shall describe and document-

(A) Its analysis of load building programs, including the following elements:

1. Estimation of the impact of load-building programs on the electric utility's summer and winter peak demands and energy usage;

2. A comparison of annual average rates in each year of the planning horizon for the resource plan(s) with and without the load-building program;

3. A comparison of the probable environmental costs of the resource plan(s) in each year of the planning horizon with and without the proposed load-building program;

4. A calculation of the performance measures and risk by year; and

5. An assessment of any other aspects of the proposed load-building programs that affect the public interest; and

(B) All current and proposed load-building programs, a discussion of why these programs are judged to be in the public interest, and, for all resource plans that include these programs, plots of the following over the planning horizon:

1. Annual average rates with and without the load-building programs; and

2. Annual utility costs and probable environmental costs with and without the load-building programs.

Liberty-Empire does not have any load building programs in place at this time and does not contemplate adding load building programs during the 20-year planning horizon.

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SECTION 5 IMPLEMENTATION PLAN

(6) The utility shall develop an implementation plan that specifies the major tasks, schedules, and milestones necessary to implement the preferred resource plan over the implementation period. The utility shall describe and document its implementation plan, which shall contain-

5.1 Implementation Plan

The implementation plan contains the descriptions and schedules for the major tasks necessary to implement the Preferred Plan over the implementation period, i.e., the time between the triennial compliance filings. The next triennial IRP filing is scheduled for 2025. Therefore, the implementation period is the period 2022-2025.

5.1.1 Planned Research Activities for Load Forecasting

(A) A schedule and description of ongoing and planned research activities to update and improve the quality of data used in load analysis and forecasting;

Liberty-Empire recently conducted a Residential and Non-Residential market research study. This study involved primary data collection surveys with Liberty-Empire customers in Missouri to give planners insight into the equipment and appliances that customers use in their homes and businesses. Liberty-Empire plans to utilize this data to produce its class-level load forecast for the next triennial filing.

5.1.2 Demand-Side Implementation Plan

(B) A schedule and description of ongoing and planned demand-side programs and demand-side rates, evaluations, and research activities to improve the quality of demand-side resources;

For purposes of the 2022 IRP, demand-side programs were bundled based on their performance and cost characteristics, then evaluated on an equivalent basis with supply-side options. Based on this analysis, Liberty-Empire selected the low-cost bundle of RAP DSM for

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inclusion in the Preferred Plan. The selected bundle is shown on both a peak and energy basis in Figure 7-8 and Figure 7-9, respectively.

Figure 7-8 – Low-Cost RAP DSM Peak Savings

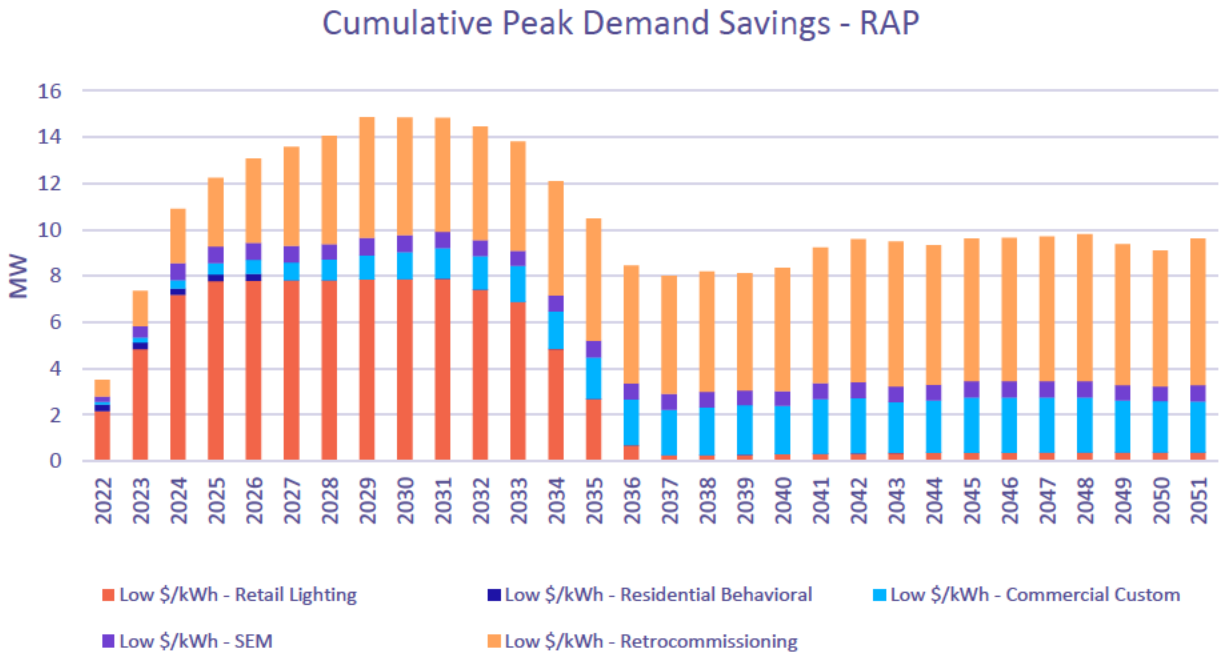
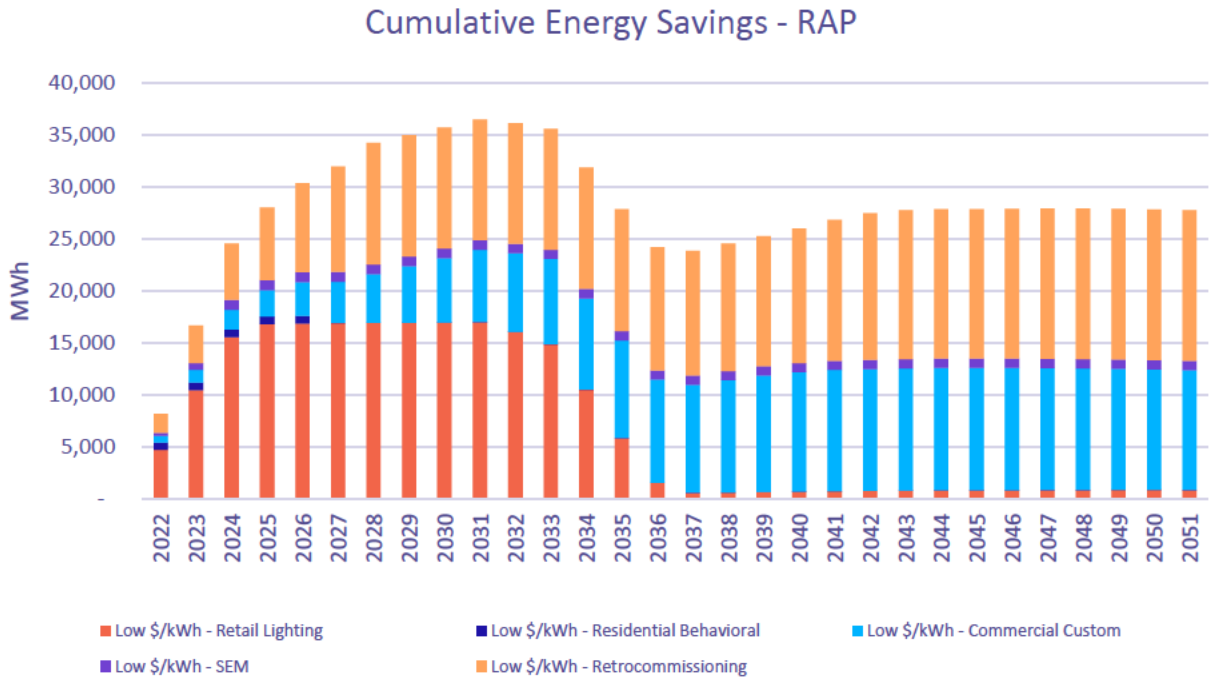


Figure 7-9 – Low-Cost RAP DSM Energy Savings



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The low-cost bundle of RAP DSM includes programs with a three-year average $/kWh saved below $0.18/kWh. The bundle includes retail lighting, residential behavioral, commercial custom, SEM, and retrocommissioning DSM programs.

Liberty-Empire filed an application to implement robust and mutually beneficial energy efficiency offerings under the framework prescribed by the Missouri Energy Efficiency Investment Act ("MEEIA") in September 2021 in Commission File No. EO-2022-0078. The Commission approved the application on December 15, 2021, and the tariffs for these programs are approved through December 31, 2022. This 2022 MEEIA portfolio (known as MEEIA Cycle 1) continues and expands on popular programs from previous energy efficiency offerings and introduces four new customer programs. As part of the implementation plan from this IRP, the Company plans to prioritize the implementation of low-cost energy efficiency programs for MEEIA Cycle 2 as appropriate.

5.1.3 Supply-Side Implementation Plan

(C) A schedule and description of all supply-side resource research, engineering, retirement, acquisition, and construction activities, including research to meet expected environmental regulations;
(D) Identification of critical paths and major milestones for implementation of each demand-side resource and each supply-side resource, including decision points for committing to major expenditures;

Liberty-Empire's Preferred Plan includes the retirement of Riverton 10 and 11 and the addition of 30 MW of new RICE capacity in 2025. As discussed in Volume 6, Riverton 10 and 11 were selected for near-term retirement and replacement due to the age of the facility. To comply with SPP notice requirements and shutdown procedures, Liberty-Empire must provide six months' notice of a planned retirement to SPP. **[redacted]

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[redacted]** Although this means that a definitive retirement date cannot be identified at this time, based on available information, a retirement in 2025 appears feasible. Over the next couple of years, Liberty-Empire will work with an independent engineering firm to assess the demolition costs of Riverton 10 and 11.

5.2 RICE Resource Additions

Liberty-Empire expects to add a total of 30 MW of new RICE at the Riverton site during the implementation period. Liberty-Empire plans to perform feasibility and environmental studies, begin permitting as required, and issue a request for proposal ("RFP") in preparation of acquiring 30 MW of RICE to directly replace the retirements of Riverton 10 and 11 in 2025.

5.3 Preferred Plan Considerations Beyond the Short-Term Implementation Period

While the short-term implementation period is defined as the period 2022 to 2025, Liberty-Empire identified three Preferred Plan considerations beyond this period: **[redacted]** (2) the impact of a slightly shorter extension of the federal investment tax credit ("ITC") than was assumed in the 2022 IRP Base Case, and (3) a plan to site solar and storage resources at existing interconnection sites, co-located with existing plants to take advantage of surplus interconnection capabilities.

[redacted]

**[redacted]

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[redacted]

[redacted]

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Tax Credit Extensions

In December 2020, Congress passed an extension of the ITC, which provides 26% tax credit eligibility for systems commencing construction in 2020-2022, 22% for systems commencing construction in 2023, and 10% for systems commencing construction in 2024 or later. Any system placed in service by the end of 2025 can receive the 26% and 22% tax credit,[3] while those entering into service after 2025, regardless of when they commenced construction, can receive a maximum tax credit of only 10%. Given uncertainty around federal tax policy at the time of the assumptions development for the 2022 IRP, relative to the tax provisions currently in law, Liberty-Empire's 2022 IRP Base Case tax credit assumptions include a two-year extension to the ITC, in line with recent historical Congressional action. Other tax credit provision scenarios (e.g., no extension to current law and a longer extension scenario similar to the one that passed the House of Representatives in 2021) were also evaluated within the critical uncertain factor analysis.

The Preferred Plan contains some solar and storage additions in 2027. Because Liberty-Empire's Base Case includes a short-term extension to the ITC, these 2027 additions were assumed to be 26% ITC-eligible. However, because Liberty-Empire modeling assumed that new resources begin operations at the beginning of the year (e.g., January 1, 2027), even if a shorter extension were to be realized (e.g., only to mid or late 2026), the cost impact would be minor.

To help quantify this impact, Liberty-Empire assumed the January 1, 2027 solar and storage additions selected in the Preferred Plan were accelerated one full year to January 1, 2026 (effectively December 31, 2025) to take advantage of expiring tax credits under current law. Figure 7-11 shows that the NPV of total cost of the Preferred Plan would increase *very slightly* due to the nearer-term solar and storage resources being added at slightly higher capital and fixed costs. These increases in fixed costs would likely be offset by an additional year's worth of energy revenue from the renewable resources.

[3] Note that because 26% and 22% ITC-qualified resources must enter into service by 2025, Liberty-Empire has assumed that all pre-2026 solar projects will be able to take advantage of the 26% ITC.

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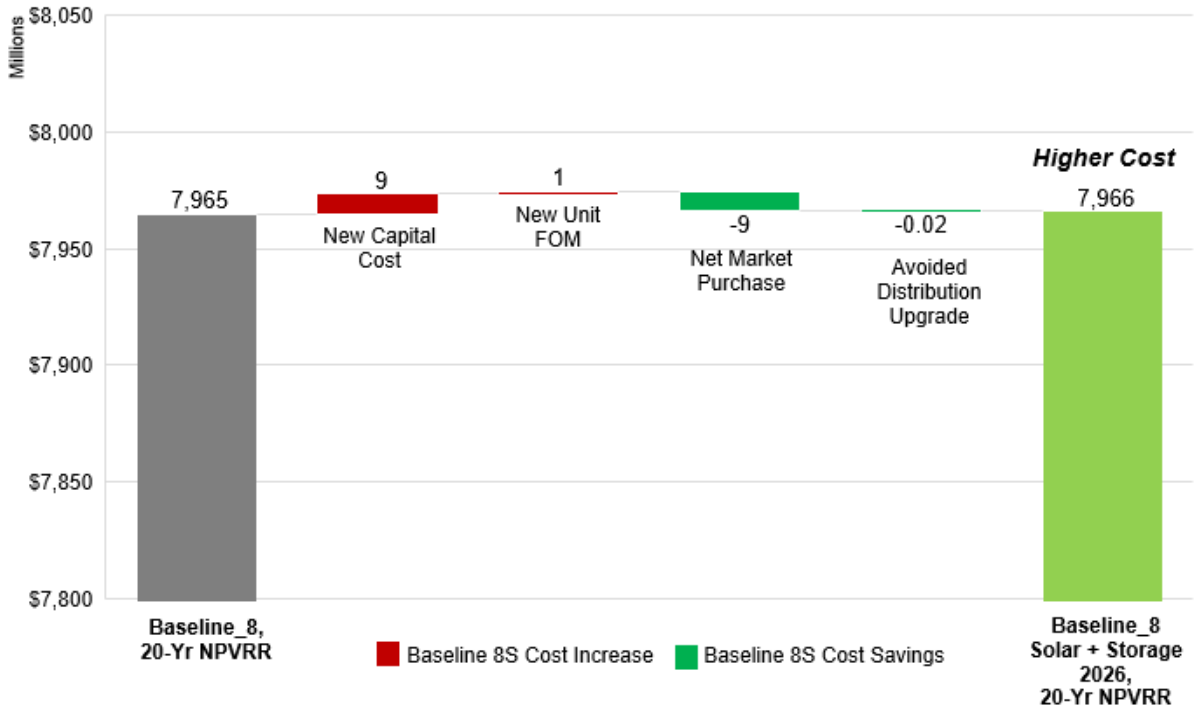
Figure 7-11 – 20-Year PVRR Impact of 2026 Solar and Storage Resources



Co-located Resources at Existing Sites

Liberty-Empire's portfolio includes several thermal plants with existing generator interconnection rights into SPP. Given the relatively low capacity factors of several of these plants, the interconnection rights at these sites are rarely utilized to their full capability. By co-locating complementary renewable resources such as solar and paired storage at these existing sites and taking advantage of "surplus" interconnection capabilities, Liberty-Empire could avoid paying additional generator interconnection costs and waiting in the SPP Generator Interconnection ("GI") Queue process to interconnect greenfield facilities.

Liberty-Empire identified Energy Center 1 and 2 as strong candidate sites for co-locating solar and storage resources. While co-located resources would likely not be able to provide additional capacity value for the portfolio until after the retirement of the existing thermal plant, the IRP analysis demonstrated that the avoided interconnection costs and market energy revenue justified pursuing such a strategy. Preliminary and internal studies within the Company have also supported the prudence of taking advantage of these capabilities, and Liberty-Empire has recently received viable proposals for co-located renewable resources at these sites. In addition

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to surplus interconnection capabilities at Energy Center 1 and 2, Liberty-Empire also has approximately 30 MW of interconnection availability at the site of Asbury.

(E) A description of adequate competitive procurement policies to be used in the acquisition and development of supply-side resources;

5.4 Competitive Procurement Policies

Prior to issuing requests for proposals, Liberty-Empire pre-screens potential bidders' qualifications and experiences to confirm that those who are allowed to propose on projects are capable of completing the work safely and adequately. Liberty-Empire utilizes the competitive bidding process and performs rigorous evaluations of the proposals submitted to secure the best evaluated goods and services for implementing the development of its supply-side resources. As of December 2017, Liberty-Empire adopted the "Responsible Contractor Policy for Large Construction and Maintenance Projects." Solicitation and Procurement of new generation, and all large projects will abide by this policy.

5.5 Monitoring Critical Uncertain Factors

(F) A process for monitoring the critical uncertain factors on a continuous basis and reporting significant changes in a timely fashion to those managers or officers who have the authority to direct the implementation of contingency resource plans when the specified limits for uncertain factors are exceeded; and

5.5.1 Monitoring Environmental Costs

Liberty-Empire personnel monitor environmental regulations and requirements to determine what actions need to be undertaken to ensure compliance and to determine the costs associated with that compliance. Liberty-Empire is currently tracking issues related to ozone; sulfur dioxide ("SO_2"); nitrogen dioxide ("NO_2"); the Clean Air Interstate Rule ("CAIR") and/or the Cross State Air Pollution Rule ("CSAPR"); water; particulate matter; the Coal Combustion Residuals ("CCR")

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rule relating to ash; mercury and hazardous air pollutants ("Hg/HAPS"); and carbon dioxide ("CO_2"). The information gathered is shared through discussions with senior management.

Environmental issues are monitored by the Strategic Projects department. The Strategic Projects department works with various other departments and management to monitor environmental costs and issues at Liberty-Empire's generation facilities. Energy Supply Services provides management with the Annual NO_x Allocation Projection, the SO_2 Allowance Management Policy ("SAMP"), and the Greenhouse Gas Projections and Emissions Inventory, as well as a quarterly Environmental Key Issues Summary. Personnel from the Environmental staff are in regular contact with local, state and federal environmental agencies and attend various environmental events. Liberty-Empire is an active member of the EEI, the Regulatory Environmental Group for Missouri ("REGFORM"), the Missouri Electric Utilities Environmental committee ("MEUEC"), and various other state committees and organizations.

5.5.2 Monitoring Market and Fuel Prices

Power prices and fuel prices are regularly monitored by operational personnel. Both operational personnel and senior management are kept up to date of the processes and procedures being implemented in SPP that directly impact the availability and pricing of power. SPP market prices are monitored on an ongoing basis. The Energy Supply Services department produces a daily Market Results report that reports, among other things, the hourly Day-Ahead market price for each of the Company's load and resource nodes. Additionally, the price of natural gas is closely monitored as well. As documented in Volume 4, Liberty-Empire implemented a natural gas risk management policy that has an objective of minimizing the impact of natural gas price volatility. The risk management policy includes monitoring of natural gas prices. The natural gas risk management policy is overseen and positions taken are approved annually by senior management.

Liberty-Empire purchases fuel and power on a continuous basis. Each month, fuel and energy accountants prepare reports for management, such as the Summary of Fuel and Purchased

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Power Report, the Electric Fuel Report, and the Power Report. The Summary of Fuel and Purchased Power Report compares generation, fuel costs, market revenue, and purchase costs, actual to budget on a monthly, year-to-date, and twelve-months-ended basis. The Electric Fuel Report contains detailed fuel usage and cost information by generating unit, plant, and system on a monthly, year-to-date, and twelve-months-ended basis. The Power Report is a detailed list of power purchases and sales for the month. Explanations for variances from budget are also reported to management in the monthly and quarterly Fuel Variance Report that is prepared by the Energy Supply Services department. Liberty-Empire's Electric Gas Position Report is supplied to management on a monthly basis. It reports detailed natural gas price and natural gas hedged volume information. This report contains a natural gas position summary, trading detail, market detail, and other information. It tracks both hedged and spot market natural gas activity. The market detail section lists current natural gas market futures prices and basis adjustment estimates for the next several years.

5.5.3 Monitoring Load Growth

Liberty-Empire's load forecast is revised annually, and close attention is paid to the levels of peak demand during the summer and winter months. Scheduled reviews on the load forecast are held with senior management. Each month, Liberty-Empire prepares variance reports related to the demand, energy, and sales forecasts and the actual results.

The Financial Planning and Analysis Department ("FP&A") prepares a monthly Sales and Revenue Variance Report for management. This report compares actual electric sales and revenue versus the forecast of each. Additionally, the FP&A group also produces a monthly report that compares net system input ("NSI") compared to the forecast and an explanation of the variance. This comparison and variance reporting is done at both the revenue class and total system level on a monthly, quarterly, and year-to-date basis. Each month, a Customer Report is prepared by the Energy Support Services department and distributed to management. The Customer Report exhibits the number of customers and the change in customer growth by Commercial Operation Area. In addition, a Weather Report is prepared by the Rates and Regulatory Affairs department

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and distributed to management. Since weather is a key factor for the monthly peak, NSI, sales, and revenue, the Weather Report shows how the current month's heating and cooling degree days compared to history and National Oceanic and Atmospheric Administration ("NOAA") 30-year normals. When the load forecasts are developed, input is provided from several areas of Liberty-Empire including management, Industrial and Commercial Services, and the Commercial Operations areas.

5.5.4 Monitoring Construction/Transmission/Interest Rates

The capital costs associated with generation and transmission projects are monitored by Liberty-Empire in a variety of ways. A project development team is formed for each major generation project with direct line reporting to a member of senior management. Finance personnel monitor the markets daily to track interest rates, are in frequent contact with the rating agencies, and are kept well-informed of planned budgets for new projects. These efforts are coordinated with members of senior management.

Liberty-Empire monitors the state of current estimates of construction costs for supply-side resources via industry periodicals such as Platt's and the EIA Annual Energy Outlook. In the past, Liberty-Empire has contracted with engineering firms for construction cost estimates on an as-needed basis. Liberty-Empire has recent experience with several new generation construction projects with various technologies including combined-cycle, simple cycle combustion turbines, aeroderivative combustion turbines, community solar, and wind turbines. These types of construction projects are monitored by Project Managers. Reports are provided to management on a periodic basis. Additionally, Liberty-Empire actively participates in SPP RTO's transmission planning studies. SPP conducts several studies directly associated with transmission planning: the Balanced Portfolio Study, the Priority Projects Study, Aggregate Facilities Studies, the SPP Transmission Expansion Plan ("STEP"), and Integrated Transmission Plans (Near Term, 10-Year, and 20-Year Plans). A copy of these studies is provided in the appendices to Volume 4.5 – Transmission Distribution Analysis in response to rule 22.045(6). In addition to the aforementioned and attached studies, Liberty-Empire, through its representation on various

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working groups, participates in any applicable High Priority and special case studies as deemed necessary by the respective overseeing working groups.

5.6 Monitoring Preferred Resource Plan

(G) A process for monitoring the progress made implementing the preferred resource plan in accordance with the schedules and milestones set out in the implementation plan and for reporting significant deviations in a timely fashion to those managers or officers who have the authority to initiate corrective actions to ensure the resources are implemented as scheduled.

Liberty-Empire's 2022 IRP implementation period is 2022-2025. During this period, the near-term resource acquisition strategy involves the retirement of Riverton 10 and 11, replacement by approximately 30 MW RICE, and pursuit of low-cost RAP DSM programs.

Liberty-Empire reports updates and progress to the Company's decision-makers through regular meetings monitoring progress, issues, and deviations to ensure that plant retirements are completed on schedule, on budget, and in accordance with safety protocols.

Liberty is monitoring participation, savings, and program spending for DSM initiatives under its MEEIA portfolio. This information is being collected both internally through Liberty systems and externally through Liberty's implementation partners. On a quarterly basis, this information will be aggregated and shared with the DSM Advisory Group ("DSMAG"), which consists of Staff, DE, OPC, National Housing Trust ("NHT"), and Renew Missouri. The DSMAG will also review the revenue recovered through Demand-Side Investment Mechanism ("DSIM"), marketing efforts, research, and future program development. These meetings will serve as the forum to review and discuss any adjustments to the MEEIA portfolio needed to meet the portfolio goals.

Liberty-Empire also hosts an annual meeting at its headquarters in Joplin featuring local Community Action Agencies and the DSMAG, during which it discusses "Strengths, Weaknesses, Opportunities, and Threats to Empire's low-income population." These discussions have led to numerous improvements in Liberty-Empire's low-income weatherization and energy efficiency

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programs. Liberty-Empire committed to hosting no fewer than five of these annual meetings in the Stipulation and Agreement in Commission Case No. EM-2016-0213, and the Company hosted the fifth annual meeting on December 2, 2021. The Company committed in its most recent rate case to continue hosting these meetings in future years even though the commitment from EM-2016-0213 has been fulfilled.

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SECTION 6 RESOURCE ACQUISITION STRATEGY

(7) The utility shall develop, describe and document, officially adopt, and implement a resource acquisition strategy. This means that the utility's resource acquisition strategy shall be formally approved by an officer of the utility who has been duly delegated the authority to commit the utility to the course of action described in the resource acquisition strategy. The officially adopted resource acquisition strategy shall consist of the following components:

Liberty-Empire's resource acquisition strategy has been formally approved. A signed commitment to the Preferred Plan and the resource acquisition strategy was included with the Company's letter of transmittal, and it can be found attached to this volume as Appendix 7A.

6.1 Preferred Resource Plan

(A) A preferred resource plan selected pursuant to the requirements of section (1) of this rule;

The Preferred Plan was described and documented in Section 1 above in response to rule 22.070 (1).

6.2 Implementation Plan

(B) An implementation plan developed pursuant to the requirements of section (6) of this rule; and

The Preferred Plan's implementation plan was described and documented in Section 5 above in response to rule 22.070 (6).

Major areas of focus in the Implementation Plan are as follows:

- Make use of the recently completed Residential and Non-Residential Market Study to help develop primary data driven demand-side programs for the next MEEIA Cycle ("MEEIA Cycle 2");
- Perform feasibility and environmental studies, begin permitting as required, and issue a request for proposal ("RFP") in preparation of acquiring 30 MW of RICE to directly replace the retirements of Riverton 10 and 11 in 2025;

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- Prioritize the implementation of low-cost energy efficiency programs from MEEIA Cycle 2 as appropriate;
- **[redacted]** and
- Monitor federal tax credit policy, cost trends for solar and storage resources, and co-location opportunities at Liberty-Empire's existing generation resource sites to plan for anticipated solar and storage additions, as well as prepare to adapt the timing of medium-term co-located solar additions to 2026 or 2027 depending on the length of ITC extension that materializes (1-year or 2-year).

6.3 Contingency Resource Plans

(C) A set of contingency resource plans developed pursuant to the requirements of section (4) of this rule and identification of the point at which the critical uncertain factors would trigger the utility to move to each contingency resource plan as the preferred resource plan.

The contingency resource plans were described and their applicability was discussed in Section 3 above in response to rule 22.070 (4).

SECTION 7 EVALUATION OF DEMAND-SIDE PROGRAMS AND DEMAND-SIDE RATES

(8) Evaluation of Demand-Side Programs and Demand–Side Rates. The utility shall describe and document its evaluation plans for all demand-side programs and demand-side rates that are included in the preferred resource plan selected pursuant to 4 CSR 240-22.070(1). Evaluation plans required by this section are for planning purposes and are separate and distinct from the evaluation, measurement, and verification reports required by 4 CSR 240-3.163(7) and 4 CSR 240-20.093(7); nonetheless, the evaluation plan should, in addition to the requirements of this section, include the proposed evaluation schedule and the proposed approach to achieving the evaluation goals pursuant to 4 CSR 240-3.163(7) and 4 CSR 240-20.093(7). The evaluation plans for each program and rate shall be developed before the program or rate is implemented and shall be filed when the utility files for approval of demand-side programs or demand-side program plans with the tariff application for the program or rate as described in 4 CSR 240-20.094(3). The purpose of these evaluations shall be to develop the information necessary to evaluate the cost-effectiveness and improve the design of existing and future demand-side programs and demand-side rates, to improve the

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forecasts of customer energy consumption and responsiveness to demand-side programs and demand-side rates, and to gather data on the implementation costs and load impacts of demand-side programs and demand-side rates for use in future cost-effectiveness screening and integrated resource analysis.

(A) Process Evaluation. Each demand-side program and demand-side rate that is part of the utility's preferred resource plan shall be subjected to an ongoing evaluation process which addresses at least the following questions about program design.

1. What are the primary market imperfections that are common to the target market segment?

2. Is the target market segment appropriately defined, or should it be further subdivided or merged with other market segments?

3. Does the mix of end-use measures included in the program appropriately reflect the diversity of end-use energy service needs and existing end-use technologies within the target market segment?

4. Are the communication channels and delivery mechanisms appropriate for the target market segment?

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

(B) Impact Evaluation. The utility shall develop methods of estimating the actual load impacts of each demand-side program and demand-side rate included in the utility's preferred resource plan to a reasonable degree of accuracy.

1. Impact evaluation methods. At a minimum, comparisons of one (1) or both of the following types shall be used to measure program and rate impacts in a manner that is based on sound statistical principles:

A. Comparisons of pre-adoption and post-adoption loads of program or demand-side rate participants, corrected for the effects of weather and other intertemporal differences; and

B. Comparisons between program and demand-side rate participants' loads and those of an appropriate control group over the same time period.

2. The utility shall develop load-impact measurement protocols that are designed to make the most cost-effective use of the following types of measurements, either individually or in combination:

A. Monthly billing data, hourly load data, load research data, end-use load metered data, building and B. equipment simulation models, and survey responses; or

Audit and survey data on appliance and equipment type, size and efficiency levels, household or business characteristics, or energy-related building characteristics.

(C) The utility shall develop protocols to collect data regarding demand-side program and demand-side rate market potential, participation rates, utility costs, participant costs, and total costs.

Evaluation, measurement, and verification ("EM&V") is designed to support the need for public accountability, oversight and cost-effective bundle improvements and documentation of the effects of customer-funded efficiency bundles. Liberty-Empire will engage an EM&V contractor to conduct process and impact evaluations of the energy efficiency bundles.

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EM&V is recommended on a three-year rotating schedule. A process and impact evaluation should be conducted on each bundle once during the three-year bundle cycle. The EM&V budget is presented on an annual basis but may be spent at any point during the bundle cycle. The process and impact evaluations need not be conducted at the same time. Process evaluations are typically conducted earlier in the bundle cycle so that any issues can be addressed immediately, ensuring optimal bundle performance. Impact evaluations are typically conducted later in the bundle cycle when bundle results are accessible and apparent. The exact schedule will be determined with the evaluation contractor.

Process evaluations ensure that a bundle is operating as intended and provides information that can enable improvements in both the bundle design and implementation. Process evaluations assess customer understanding, attitudes about, and satisfaction with the bundle and other educational activities. The EM&V contractor assesses the effectiveness of the marketing and outreach, trade ally involvement, and whether implementation milestones are met adequately and on schedule. These evaluations use sales and promotion data maintained by the tracking system as well as customer survey data.

A good process evaluation:

- Assists bundle implementers and managers structure bundles to achieve cost-effective savings while maintaining high levels of customer satisfaction.
- Determines awareness levels to refine marketing strategies and reduce barriers to participation.
- Provides recommendations for changing the bundle's structure, management, administration, design, delivery, operations or targets.
- Determines if specific best practices should be incorporated.

Impact evaluations estimate gross and net demand, energy savings and the cost-effectiveness of installed systems. They are used to verify measure installations, identify key energy assumptions

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and provide the research necessary to calculate defensible and accurate savings attributable to the bundle. The selected EM&V contractor develops an evaluation plan that ensures the appropriate measurement of savings in compliance with industry protocols. The impact evaluation also includes an evaluation of net-to-gross components.

The Company will engage an EM&V contractor to the extent that is appropriate. The actual determination may be made in other filings.

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SECTION 8 APPENDIX 7A COMMITMENT TO THE PREFERRED PLAN SIGNED

THE EMPIRE DISTRICT ELECTRIC COMPANY d/b/a LIBERTY (LIBERTY-EMPIRE)

2022 INTEGRATED RESOURCE PLAN

COMMITMENT TO THE

APPROVED PREFERRED RESOURCE PLAN

FILE NO. EO-2021-0331

In accordance with Missouri Public Service Commission Rule 20 CSR 4240-22, The Empire District Electric Company d/b/a Liberty (Liberty-Empire) developed, described and documented, and now officially adopts for implementation, the preferred resource plan and resource acquisition strategy contained in this filing.

As required, the adopted resource acquisition strategy consists of a preferred resource plan; an implementation plan; and a set of contingency resource plans. I hereby further commit to provide the notice called for by Commission Rule 20 CSR 4240-22.080 (12), if Liberty-Empire should, between triennial compliance filings, decide to take actions materially inconsistent with the preferred resource plan.

Kevin Noblet

President, Central Region

3-28-22

Dated