REDACTED
Docket No. UE 433
Exhibit PAC/900
Witness: Thomas R. Burns

BEFORE THE PUBLIC UTILITY COMMISSION

OF OREGON

PACIFICORP

REDACTED

Direct Testimony of Thomas R. Burns

February 2024

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ATTACHED EXHIBITS

I. INTRODUCTION AND QUALIFICATIONS

Q. Please state your name, business address, and current position with PacifiCorp d/b/a Pacific Power (PacifiCorp or Company).

A. My name is Thomas R. Burns, my business address is 825 NE Multnomah Street, Suite LCT 600, Portland, Oregon 97232. I am currently employed as Vice President of Resource Planning and Acquisitions for PacifiCorp.

Q. Please describe your education and professional experience.

A. I graduated from Illinois State University with a Bachelor of Science degree in Economics. I joined PacifiCorp in 2007 and assumed the responsibilities of my current position in September 2022. Over this period, I held several operational, analytical and leadership positions within the Company. My previous role with PacifiCorp was Director of Energy Supply Management, Operations, and Reliability. In that role I was instrumental in the design and implementation of the Western Energy Imbalance Market.

Q. Briefly describe the responsibilities of your current position.

A. I am responsible for aspects of PacifiCorp's resource planning and procurement functions, which include the integrated resource plan (IRP), structured commercial business and valuation activities, and long-term load forecasts. Most relevant to this general rate case, I oversee the planning, analysis, and outreach processes that are used to develop PacifiCorp's IRP, and the economic analysis that helps guide the Company's resource acquisitions.

II. PURPOSE OF TESTIMONY

Q. What is the purpose of your testimony in this case?

A. I provide economic analysis that supports PacifiCorp's decisions to:

- Convert Jim Bridger Units 1 and 2 to natural gas operations;
- Acquire the 190-megawatt (MW) Rock Creek I wind facility; and
- Acquire and repower the 49 MW Rock River I wind facility in Wyoming.

I also summarize PacifiCorp's assessment of the projects from the 2021 IRP and IRP Update, and discuss customer benefits that result from these projects.

Q. Please provide an overview of your testimony on Jim Bridger Units 1 and 2.

A. My economic analyses indicate that converting Jim Bridger Units 1 and 2 to natural gas is in the public interest and will generate benefits for Oregon customers. Compared to early retirement of Jim Bridger Units 1 and 2, natural gas conversion has a present-value revenue requirement differential (PVRR(d)) customer benefit ranging from $271.68 million to $656.41 million. The range of benefits depends on the timing and magnitude of early coal unit retirement assumptions.

These substantial customer benefits are expected because the conversion is anticipated to cost approximately $34.6 million on a total-Company basis, and $9.3 million Oregon-allocated. While the assumed operational life of a new gas peaking asset is longer than the assumed life of Jim Bridger Units 1 and 2 once converted to gas-fueled generating units, the upfront capital required to convert to natural gas is significantly less than installing a new gas-fired generating unit. The Jim Bridger gas conversions are a significant opportunity to maintain much needed system capacity at a very low cost, during a period when there are growing resource adequacy concerns throughout the region.

Q. Please provide an overview of your testimony for Rock Creek I.

A. My economic analyses indicate that the project is in the public interest and will generate benefits for Oregon customers, and that Rock Creek I is expected to provide customer benefits in all scenarios. Analysis prepared before the Inflation Reduction Act (IRA) showed $15 million of customer benefits, which increased to $20 million of benefits on a risk-adjusted basis under a medium natural gas prices paired with medium carbon dioxide (CO_2) prices (MM) price-policy scenario. The post-IRA analysis of both Rock Creek I and Rock Creek II, a co-located sister facility not included in this proceeding due to its later in-service date, yields customer benefits totaling $298 million, that rise to $318 million on a risk-adjusted basis under an MM price-policy scenario. Conservatively, these benefits do not assign any value to the renewable energy certificates (RECs) that will be generated by Rock Creek I, which can provide additional customer benefits if sold, transferred, or used to comply with relevant state requirements.

Q. Please provide an overview of your testimony for Rock River I.

A. My economic analyses indicate that the project is in the public interest and will generate benefits for Oregon customers. Customer benefits for Rock River I range from $30.15 million when using medium natural gas and medium CO_2 assumptions to $67.76 million for high natural gas and high CO_2 assumptions before adjusting for the IRA. When factoring in the IRA, these benefits increased to $54.09 million when using medium natural gas and medium CO_2 assumptions and $91.69 million for high natural gas and high CO_2 assumptions. Conservatively, these benefits do not assign any value to the RECs that will be generated by Rock River I, which can provide additional customer benefits if sold, transferred, or used to comply with relevant state requirements.

III. JIM BRIDGER UNITS 1 AND 2 NATURAL GAS CONVERSION

Q. Please describe the conversion of Jim Bridger Units 1 and 2 to natural gas.

A. As described in the testimony of Company witness Brad D. Richards, Exhibit PAC/1300, PacifiCorp is converting the Company's coal-fired Jim Bridger Units 1 and 2, located near Point of Rocks, Wyoming, to run on natural gas. The units were offline by January 2024, and are expected to be converted to natural gas and in service April 2024.

A. <u>Need</u>

Q. Please provide an overview of the Company's IRP process.

A. PacifiCorp's IRP process uses thorough analysis and modeling that measures cost and risk to develop the Company's plans to provide reliable and reasonably priced service for its customers. The primary objective of the IRP is to identify the least-cost, least--risk portfolio of resources to serve customers in the future. This "preferred portfolio" is the portfolio that can be delivered through specific action items at a reasonable cost and with manageable risks.

The Company completes an IRP cycle every two years (odd-numbered years), which includes preparing a full IRP every two years and an update to the full IRP in the off years (even-numbered years). The Company submits both its IRP and IRP Update to each of the six regulatory commissions in the states where the Company provides retail service. Each IRP is developed through an open and public process, with input from an active and diverse group of stakeholders, including state regulatory commissions, state consumer-advocacy departments, customer-sponsored advocacy groups, environmental-advocacy groups, resource-advocacy groups, independent-power producers, project developers, other utilities, and customers. During the public-input process, which typically spans at least a full year before the release of a full IRP, PacifiCorp holds regular meetings with stakeholders to solicit feedback on the Company's planning assumptions, methodologies, and model results.

Q. Did the Company's 2021 IRP identify a need for additional resources to serve PacifiCorp's customers?

A. Yes. The primary focus of any IRP is to forecast the need for resources and evaluate different strategies to meet that need over time. The Company's 2021 IRP shows that PacifiCorp has a capacity deficit in all years of the planning horizon—starting at 1,071 MW in 2021 and increasing to over 6,600 MW by 2040. In 2025, the resource need in the 2021 IRP is 1,627 MW. As described further below, this need has increased since the 2021 IRP was finalized.

Q. How does the 2021 IRP preferred portfolio address the need for new resources?

A. The 2021 IRP preferred portfolio represents PacifiCorp's least-cost, least-risk plan to reliably meet customer demand over a 20-year planning period. Using a range of cost and risk metrics to evaluate numerous resource portfolios, PacifiCorp selected a preferred portfolio that reflects a cost-conscious plan that includes near-term investments in renewable resources that can capture tax credits before they expire or decrease and new transmission infrastructure to facilitate the interconnection and delivery of these resources. These new resources and transmission investments are lower cost than other resource and transmission alternatives and are necessary to reliably serve our customers.

Q. Can you describe the methodology that PacifiCorp used in the 2021 IRP to analyze the economics of its coal units and derive the preferred portfolio?

A. Yes. PacifiCorp incorporated a new and more advanced optimization modeling system called PLEXOS. The PLEXOS modeling system provides three platforms (referred to as Long-term (LT), Medium-term (MT) and Short-term (ST)), which work on an integrated basis to inform the optimal combination of resources by type, timing, size, and location over PacifiCorp's 20-year planning horizon. Please refer to Company witness Rick T. Link's testimony for additional detail regarding PLEXOS and the LT, MT, and ST platforms.

Q. Has the Company prepared an update to the 2021 IRP?

A. Yes. On March 31, 2022, the Company issued its 2021 IRP Update.[1]

Q. What is the purpose of the 2021 IRP Update?

A. The IRP update is a checkpoint on the 2021 IRP action plan, and ensures that changes in the planning environment are considered between the two-year IRP planning cycle. The 2021 IRP Update assessed whether evolving trends and events impact customers and required changes to the action plan to deliver resources and transmission investments. Relevant here, the 2021 IRP Update reflects resource planning and procurement activities that occurred since the 2021 IRP, and present an updated load-and-resource balance and an updated resource portfolio.

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[1] PacifiCorp 2021 Integrated Resource Plan Update (Mar. 31, 2022) (https://www.pacificorp.com/energy/integrated-resource-plan.html).

Q. Did the 2021 IRP Update continue to show a need for additional generation resources?

A. Yes. As discussed in Company witness Link's testimony, the need increased due to an increase in forecast load. The 2021 IRP Update shows a resource need in all years of the planning horizon—starting at 1,584 MW in 2022 and increasing to 6,755 MW in 2040. In 2025, the resource need is 1,867 MW, an increase of 240 MW, or approximately 15 percent, relative to the resource need identified in the 2021 IRP. The higher load reflected in the 2021 IRP Update approaches the level analyzed in the high-load sensitivity conducted in the 2021 IRP. The most recent load forecast is even higher than that assumed in the 2021 IRP Update.

Moreover, now that the 2020 All-Source Request for Proposals (2020AS RFP) has ended, PacifiCorp was unable to execute firm contracts with all projects on the final shortlist. Due to national tariff policies, global supply-chain issues, and inflationary pressures, some projects on the 2020AS RFP final shortlist were unable to move forward. Consequently, PacifiCorp's procurement was reduced by 902 MW of solar resources and 497 MW of battery storage resources. This under-procurement adds to our need for new resources.

Q. Did PacifiCorp's preferred portfolio of resources in the Company's 2021 IRP include the Jim Bridger conversion?

A. Yes. In the 2021 IRP, the Company evaluated a number of scenarios specific to the valuation of Jim Bridger Units 1 and 2 that excluded and included the conversion of these units to natural gas fueled operation. The Company concluded that the portfolio that eliminated gas conversion of Jim Bridger Units 1 and 2 was significantly higher cost than the portfolio that included its inclusion across each of the price-policy scenarios,[2] and included the resources as part of the least-cost, least-risk 2021 IRP preferred portfolio.[3]

Q. Please describe key factors for including the Jim Bridger conversion in the 2021 IRP preferred portfolio.

A. The Company evaluated several alternatives, including the addition of new renewable generation resources, alternative coal unit retirement timing, regional haze compliance operating limits, and gas conversions or installation of carbon capture, utilization and storage. On a risk-adjusted basis, the portfolio without natural gas conversion of Jim Bridger Units 1 and 2 results in approximately $469 million higher costs than the preferred portfolio.

Q. Did the Commission acknowledge the Jim Bridger conversion in the 2021 IRP?

A. Yes.[4]

Q. Was the Jim Bridger conversion included in the 2021 IRP Update?

A. Yes. The conversion of Jim Bridger Units 1 and 2 were included in the preferred portfolio identified in the 2021 IRP Update.[5] This is consistent with the substantial and increased need for additional generation resources first identified in the 2021 IRP, and then confirmed in the 2021 IRP Update.

[2] PacifiCorp 2021 IRP, Vol. 1, at 270 (Sept. 1, 2021) (https://www.pacificorp.com/content/dam/pcorp/documents/en/pacificorp/energy/integrated-resource-plan/2021-irp/Volume%20I%20-%209.15.2021%20Final.pdf).
[3] *Id.* at Ch. 1 Action Plan, Action Item 1c, at 24.
[4] Order No. 22-178, at 7 (May 23, 2022).
[5] PacifiCorp 2021 IRP Update, Ch. 7 Action Plan Status update, Action Item 1c, at 98 (https://www.pacificorp.com/content/dam/pcorp/documents/en/pacificorp/energy/integrated-resource-plan/2021_IRP_Update.pdf).

B. Modeling Assumptions

Q. Please summarize the natural gas and CO_2 price assumptions used in the economic analysis for Jim Bridger.

A. The economic analysis of Jim Bridger included five different price policy-scenarios—medium natural gas prices paired with medium CO_2 prices (MM); low natural gas prices without a CO_2 price (LN); medium natural gas prices without a CO_2 price (MN); high natural gas prices paired with high CO_2 prices (HH); and under medium gas prices and the social cost of greenhouse gases (SCGHG). While the MM price-policy scenario represents the Company's "expected case" describing likely future conditions, the additional scenarios provide additional helpful analyses.

These assumptions can influence the value of system energy, the dispatch of system resources, and PacifiCorp's resource mix. Consequently, wholesale-power prices and CO_2 policy assumptions affect net-power cost (NPC) benefits, non-NPC variable-cost benefits, and system fixed-cost benefits associated with the natural-gas conversion. Because wholesale power prices and CO_2 policy outcomes are both uncertain and important drivers to the economic analysis, it is important to evaluate a range of assumptions for these variables. The natural gas and CO_2 price assumptions are summarized in Table 1.

Table 1. Jim Bridger Price-Policy Assumptions

Price-Policy Scenario	Henry Hub Natural Gas Price (Levelized $/MMBtu)*	CO_2 Price Description
MM	$4.44	$9.93/ton starting in 2025 rising to $57.94/ton in 2040
LN	$2.94	None
MN	$4.44	None
HH	$5.64	$22.57/ton starting in 2025 rising to $102.48/ton in 2040
SCGHG	$4.44	$74.10/ton starting 2021 rising to $150.38/ton in 2040
*Nominal levelized Henry Hub natural gas price from 2025 through 2040.		

Q. Please describe the natural-gas price assumptions used in the price-policy scenarios.

A. The medium natural gas price assumptions are from PacifiCorp's official forward price curve (OFPC) dated March 31, 2021, which was the most current OFPC available when the modeling inputs were developed. The first 36 months of the OFPC reflect market forwards at the close of a given trading day, April 2021 is the prompt month in this analysis. As such, these 36 months are market forwards as of May 2021. The blending period (months 37 through 48) is calculated by averaging the month-on-month market forwards from the prior year with the month-on-month fundamentals-based price from the subsequent year. The fundamentals portion of the natural gas OFPC reflects Aurora-forecast prices.

Q. Please describe the CO_2 price assumptions used in the price-policy scenarios.

A. PacifiCorp used four different CO_2 price scenarios—zero, medium, high, and a price forecast that aligns with the SCGHG. The medium and high scenarios are derived from a survey of third-party industry experts, including IHS CERA, and Wood

Mackenzie and the Energy Information Administration as well as CO_2 price assumptions used by peer utilities. Both scenarios apply a CO_2 price as a tax beginning 2025. PacifiCorp incorporated the SCGHG that is assumed to start in 2021, and the SCGHG price is reflected in market prices and dispatch costs for the purposes of developing each portfolio (i.e., incorporated into capacity expansion optimization modeling).

Q. How did PacifiCorp pair the natural gas and CO_2 price assumptions for purposes of its analysis of Jim Bridger?

A. Scenarios pairing medium gas prices with alternative CO_2 price assumptions reflect OFPC forwards through April 2024 before transitioning to a fundamentals forecast. Scenarios using high or low gas prices, regardless of CO_2 price assumptions, do not incorporate any market forwards because these scenarios are designed to reflect an alternative view to that of the market. As such, the low and high natural gas price scenarios are purely fundamental forecasts. Low and high natural gas price scenarios are also derived from expert third-party, multi-client "off-the-shelf" subscription services.

Q. Does including potential future CO_2 costs reflect prudent utility planning?

A. Yes. The Company's price-policy scenarios include varying levels of assumed CO_2 costs to reflect the fact it is more likely than not that some policy will exist that will drive reduced emissions over the life of Jim Bridger. When determining CO_2 costs used for planning purposes, the Company strives to ensure that it is not an outlier as discussed above, and the medium price is within a reasonable range used by the industry to assess risk and conduct prudent resource planning. The most recent example of this trend is the Environmental Protection Agency's (EPA) proposed Ozone Transport Rule (OTR) restricting nitrogen oxide (NO_X) emissions from power plants and other industrial sources. At the time the Company conducted its economic analyses for the, this rule would have imposed new environmental compliance obligations beginning in 2023 and 2024 on coal units in Utah and Wyoming, respectively, with more severe limitations applicable in both states by 2026.[6]

Q. Are the modeled CO_2 costs intended to represent a literal carbon tax?

A. No. The modeled CO_2 costs are not intended to explicitly account for a future tax on CO_2 emissions. Rather, these costs capture the effect of policies incentivizing reduced emissions through benefits or imposing costs through penalties or other costs resulting from market dynamics driving the need for zero-emission resources or customer preferences.

Q. How were these portfolios examined for economic viability?

A. The Company's five price-policy scenarios were analyzed to provide a deterministic PVRR(d), a risk-adjusted PVRR(d), and the levelized benefits or costs of Jim Bridger Units 1 and 2 on a dollar-per-megawatt-hour ($/MWh) basis. These price-policy scenarios are discussed below.

C. <u>Price-Policy Scenario Results</u>

Q. Please summarize the PVRR(d) and levelized results for Jim Bridger Units 1 and 2.

A. Table 2 summarizes the PVRR(d) between cases, with and without Jim Bridger Units

[6] While these requirements are now subject to further federal litigation and subsequent agency review (s*ee, e.g., Wyoming, et al., v. United States Environmental Protection Agency, et al.,* 78 F4th 1171 (10th Cir. 2023) (OTR vacated and remanded in part); *Utah, et al., v. United States Environmental Protection Agency, et al.,* No. 23-9509 (Jul. 27, 2023) (staying OTR until final resolution for Utah)), the Company's economic analyses reflects then-current assumptions that the OTR would be in effect.

1 and 2.[7]

Table 2. Jim Bridger Units 1 and 2 (Benefits)/Costs

Price-Policy Scenario	PVRR(d) Net (Benefit)/Cost	Net Benefit ($/MWh)
MM	($515.20)	$321.79
MN	($595.67)	$609.59
LN	($656.41)	$174.87
HH	($378.79)	$237.21
MM-SCGHG	($271.68)	$17.57

Converting Jim Bridger Units 1 and 2 to operate on natural gas is expected to deliver $515.20 million in present-value net customer benefits in the MM scenario, $378.79 million in the HH scenario, and $271.68 million in the MM-SCGHG scenario. Under the MM, HH and MM-SCGHG scenarios, nominal levelized net benefits are $321.79/MWh, $237.21/MWh, and $17.57/MWh, respectively. Company forecasting and the relative magnitude of benefits over costs across these scenarios, as well as near-term resource need and the ability of the project to reduce the Company's reliance, strongly support the conversion of Jim Bridger Units 1 and 2.

IV. ROCK CREEK I

Q. Please describe the acquisition of Rock Creek I.

A. As described in the testimony of Company witness Jeffrey M. Wagner, Confidential Exhibit PAC/1200, PacifiCorp is acquiring 190 MW Rock Creek I facility. This project will be built by Invenergy under a build-transfer agreement (BTA) and will be transferred to the Company on completion of the project. My testimony below provides the economic justification for the Company's decision to acquire the project.

[7] Exhibit PAC/901 Jim Bridger Analysis.

A. Need

Q. Does PacifiCorp have a need for Rock Creek I?

A. Yes. As discussed above, PacifiCorp's 2021 IRP identifies a significant need for new resources over the near term. This need grew when the Company prepared its 2021 IRP Update. And this need has grown further due to an updated load forecast, and due to an under procurement of new solar and battery resources from the 2020AS RFP.

Q. Is Rock Creek I part of the 2021 preferred portfolio?

A. Yes. As discussed above, the 2021 IRP preferred portfolio includes 1,792 MW of new wind generation resulting from the 2020AS RFP, which includes 190 MW from Rock Creek I.[8]

Q. Please describe key factors that support including Rock Creek I in PacifiCorp's 2021 IRP preferred portfolio.

A. Rock Creek I is expected to meet the Company's near-term resource need and provide significant customer benefits by providing zero-fuel cost generation and substantial production tax credit (PTC) benefits, while mitigating risks associated with future regulation of carbon-emitting resources.

Q. Please describe the reliability benefits of projects like Rock Creek I.

A. Acquiring Rock Creek I reduces the Company's exposure to price and volume volatility by reducing the need for market purchases. Increased reliance on the market exposes customers to price volatility and price spikes that occur when the region experiences severe weather events or system disruptions. Such events increase net

[8] *Id.* at Vol. I, Ch. 9.

power costs, and the magnitude of increase is directly proportional to the volume of purchases needed. In short, there is no guarantee that there will be a seller when PacifiCorp needs to make a short-term purchase to serve its load. This risk also exists for firm forward market purchases, where the seller could cut scheduled deliveries and accept liquidated damages if they do not have sufficient supply to meet their contractual obligations of the sale. As discussed in Company witness Link's testimony, Western Electricity Coordinating Counsel and North American Electric Reliability Corporation (NERC) reliability studies highlight the risks of resource shortfalls across the region in the coming years.

Q. How do these studies relate to Rock Creek I?

A. Each of these studies confirm the generally accepted understanding that the west is facing increasing resource adequacy risks in the near term. More recently, NERC further confirmed these findings and warned in its 2022 Summer Reliability Assessment that several regions in North America were at high or elevated risk of power outages this past summer due to above-normal temperatures and drought conditions, particularly in the western half of Canada and the United States.[9]

Rock Creek I will help mitigate the risk that there may be inadequate supply to support market purchases and reduce exposure to price spikes in periods where demand threatens to exceed supply for market purchases.

Q. Was Rock Creek I selected in the 2020AS RFP?

A. Yes. As discussed in Company witness Link's testimony, the 2020AS RFP final shortlist included six final shortlist bids representing over 1,600 MW of wind

[9] 2022 Summer Reliability Assessment, North American Electric Reliability Corporation (May 2022) (https://www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/NERC_SRA_2022.pdf).

generation that seek to interconnect to PacifiCorp's transmission system. These bids include Rock Creek I, which together with Rock Creek II, were the only two bids that were not power purchase agreements.

Q. Following their selection to the 2020AS RFP final shortlist, did the Company begin negotiating BTAs for the Rock Creek Projects?

A. Yes. Both Rock Creek I and Rock Creek II were proposed by the same developer (Invenergy) and, as discussed by Company witness Wagner, the Company engaged in BTA negotiations with Invenergy for Rock Creek I. Because Rock Creek I and II have the same counterparty and are being developed simultaneously subject to materially identical BTAs, the Company's economic analysis has largely analyzed the projects together.

Q. Were negotiations impacted by current economic conditions?

A. Yes. Bidder development efforts were challenged by importation restrictions related to China, COVID-19 international impacts, and hostilities in Ukraine that created significant logistics and supply chain challenges associated with solar panels, wind turbines, lithium batteries, transformers, and many balance-of-plant materials. As a result, many developers have been forced to abandon established supply chains and revert to new suppliers (if available), which has materially impacted overall renewable power plant pricing and commitments toward project in-service dates.

Given PacifiCorp's need for generation resources, PacifiCorp allowed pricing adjustments from all final shortlist projects from the 2020AS RFP, as well as limited extensions to commercial operations dates. Despite this additional flexibility, some of the bids from the final shortlist were unable to provide firm prices and were not available for selection. As noted earlier, this contributed to an under procurement of 902 MW of solar capacity and 497 MW of battery capacity.

Q. Have current economic conditions impacted costs for Rock Creek I relative to the costs offered in the initial bid that was used to establish the final shortlist?

A. Yes. Given the market dynamics discussed above, the overall costs for Rock Creek I has increased from the bid in the 2020AS RFP. The economic analysis below is based on updated project costs.

Q. Were there any additional benefits associated with Rock Creek I that offset the increased costs?

A. Yes. PacifiCorp's original economic analysis in the 2020AS RFP assumed that Rock Creek I qualified for a 60 percent PTC through the first 10 years of operation. As a result of the IRA, the economic analysis in this case reflects the value of the 110 percent PTC, in addition to the updated project costs. These updates cause a significant and positive change in the economic benefits of Rock Creek I.

Q. Have current economic drivers also impacted the Company's resource needs?

A. Yes. While the costs of 2020AS RFP bids have increased, the Company's resource needs have also increased. It is also important to consider the broader regional capacity need that aligns with the Company's need, and expected in-service date for Rock Creek I. The 2020AS RFP included virtually every potential non-market resource in the region capable of achieving commercial operation by 2025. Meeting this near-term need with physical assets that will provide incremental generation capacity effectively limits the Company's options to bidders in the 2020AS RFP.

Therefore, the 2020AS RFP bids and Rock Creek I remain necessary to reliably serve customers, including customers in Wyoming, and Rock Creek I's selection in the RFP confirms it is part of the least-cost, least-risk resources available to meet the Company's need.

Q. Was Rock Creek I included in the Company's 2021 IRP Update preferred portfolio?

A. Yes.[10]

Q. Where there any important modeling updates in the 2021 IRP Update?

A. As discussed in Chapter 5 of the 2021 IRP Update, key updates in addition to the load-and-resource balance include the resource changes due to 2020AS RFP activity, which is discussed further below. Importantly, the EPA's pre-publication version of the OTR, released on March 11, 2022, was not modeled in the 2021 IRP Update.

Q. Does the 2021 IRP Update consider the reliability issues related to reliance on market purchases?

A. Yes. Given near-term concerns over resource adequacy, and because of the acquisition of additional resources including Rock Creek I, the 2021 IRP Update's preferred portfolio shows generally lower market purchases in the first five years relative to the 2021 IRP preferred portfolio.[11]

B. <u>Modeling Assumptions and Methods</u>

Q. Did the Company analyze Rock Creek I and Rock Creek II together?

A. Yes, for the most part. As stated above, there were two BTA wind facilities in the Company's final shortlist of projects: Rock Creek I and Rock Creek II. The second

[10] PacifiCorp 2021 IRP Update, Ch. 7, Action Item 2e, at 103 (Mar. 31, 2022).
[11] *Id.* at Figure 1.11.

facility is a much larger wind facility, at 400 MW compared to Rock Creek I at 190 MW. In previous regulatory proceedings, the Company analyzed the wind projects together to determine whether acquiring the projects would provide net benefits to customers. This was reasonable, because the projects are co-located with each other and share the same modeling assumptions.

That is contrasted with this proceeding, where the Company is only requesting rate recovery of Rock Creek I, because Rock Creek II has an in-service date that falls outside the test period of this rate case. Nonetheless, several of the analyses below include combined results from both wind projects, as well as Rock Creek I specific analyses. This allows the Commission to examine both the additive benefits that will occur when wind projects are interconnected to PacifiCorp's system, but also the Rock Creek I specific customer benefits that inform the Company's revenue requirement in this proceeding.

Q. Please summarize the natural gas and CO_2 price assumptions used in the economic analysis of Rock Creek I.

A. The economic analysis of Rock Creek I included three price-policy scenarios—the MM, MN, and LN price-policy scenarios.[12] These assumptions can influence the value of system energy, the dispatch of system resources, and PacifiCorp's resource mix. Consequently, wholesale-power prices and CO_2 policy assumptions affect NPC benefits, non-NPC variable-cost benefits, and system fixed-cost benefits associated

[12] The Company did not include a high gas price/no CO_2, high gas/medium CO_2, or medium gas/SCGHG price policy as these analyses would be less insightful. All scenarios have either higher avoided natural gas fuel costs or carbon prices, that each result in procuring more alternative resources, and greater savings and customer benefits from Rock Creek. This is intuitive, because higher natural gas costs or carbon prices decrease the demand for natural gas, but alternative emitting resources would still have a higher cost than Rock Creek, resulting in more incremental savings from resources like Rock Creek that have no variable fuel costs.

with Rock Creek I. Because wholesale power prices and CO_2 policy outcomes are both uncertain and important drivers to the economic analysis, it is important to evaluate a range of assumptions for these variables. Table 3 summarizes the price-policy scenarios used to analyze Rock Creek I.

Table 3. Price-Policy Scenario Assumption Overview

Price-Policy Scenario	Henry Hub Natural Gas Price (Levelized $/MMBtu)*	CO_2 Price Description
MM	$4.52	$12.10/ton starting 2025 rising to $51.40/ton in 2040
MN	$4.52	None
LN	$2.92	None
*Nominal levelized Henry Hub natural gas price from 2025 through 2040.		

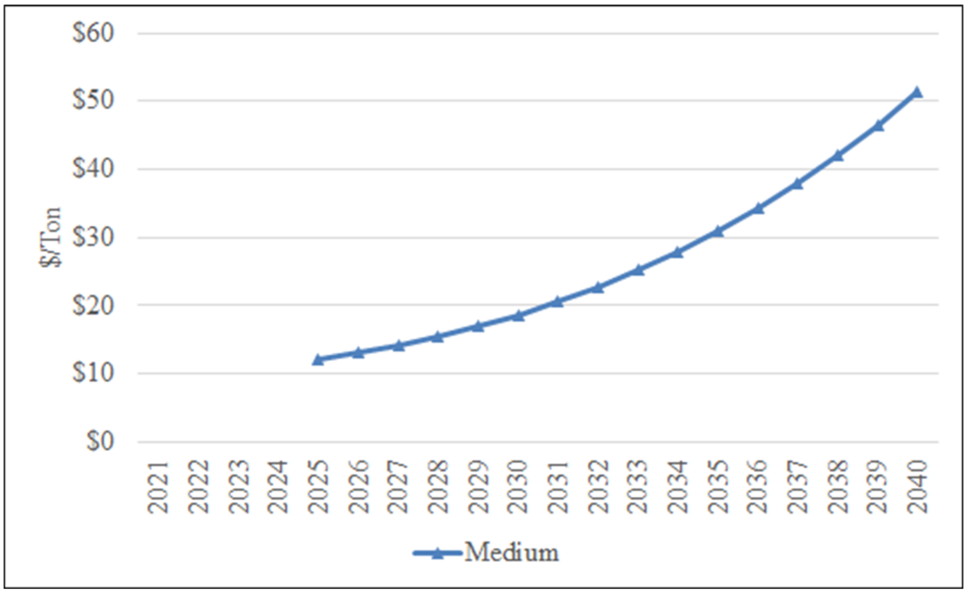
Q. Please describe the natural-gas price assumptions used in the price-policy scenarios.

A. The medium natural gas price assumptions are from PacifiCorp's OFPC dated June 30, 2022, which was the most current OFPC available when PacifiCorp prepared its modeling inputs for the 2020AS RFP. The first 36 months of the OFPC reflect market forwards at the close of a given trading day (June 30, 2022, in this case). As such, these 36 months are market forwards as of June 2022. The blending period (months 37 through 48) is calculated by averaging the month-on-month market forwards from the prior year with the month-on-month fundamentals-based price from the subsequent year. The fundamentals portion of the natural gas OFPC reflects Aurora-forecast prices.

Q. Please describe the CO_2 price assumptions used in the price-policy scenarios.

A. PacifiCorp used two different CO_2 price scenarios—zero and medium. The medium scenario is derived from a survey of third-party industry experts, including IHS CERA, and Wood Mackenzie and the Energy Information Administration as well as CO_2 price assumptions used by peer utilities. The resulting CO_2 price is applied as a tax beginning in 2025, as shown in Figure 1.

Figure 1. CO2 Price Assumptions



Q. Did PacifiCorp update its load forecast in its analysis of Rock Creek I?

A. Yes. The Company used a sales and load forecast that was completed in May 2022.

Q. How does the May 2022 forecast compare to the load forecast used in the 2021 IRP?

A. Figures 2 and 3 show PacifiCorp's May 2022 load and peak forecast relative to the 2021 IRP before incremental energy efficiency savings. A higher load forecast is being driven by new industrial and commercial customer growth, increased air conditioning saturations and miscellaneous devices and electric vehicle adoption expectations. The updated load forecast also accounts for updates to weather, temperature, and line losses to account for the progression of historical data since the load forecast that informed the 2021 IRP.

On average, over the 2023 through 2040 timeframe, forecast system load is up 13.6 percent per year and forecast coincident system peak is up 14.1 percent per year when compared to the 2021 IRP. Over that same timeframe, the average annual growth rate for the May 2022 forecast, before accounting for incremental energy efficiency improvements, is 2.04 percent for load and 1.66 percent for peak.

Figure 2. Forecast Annual System Load

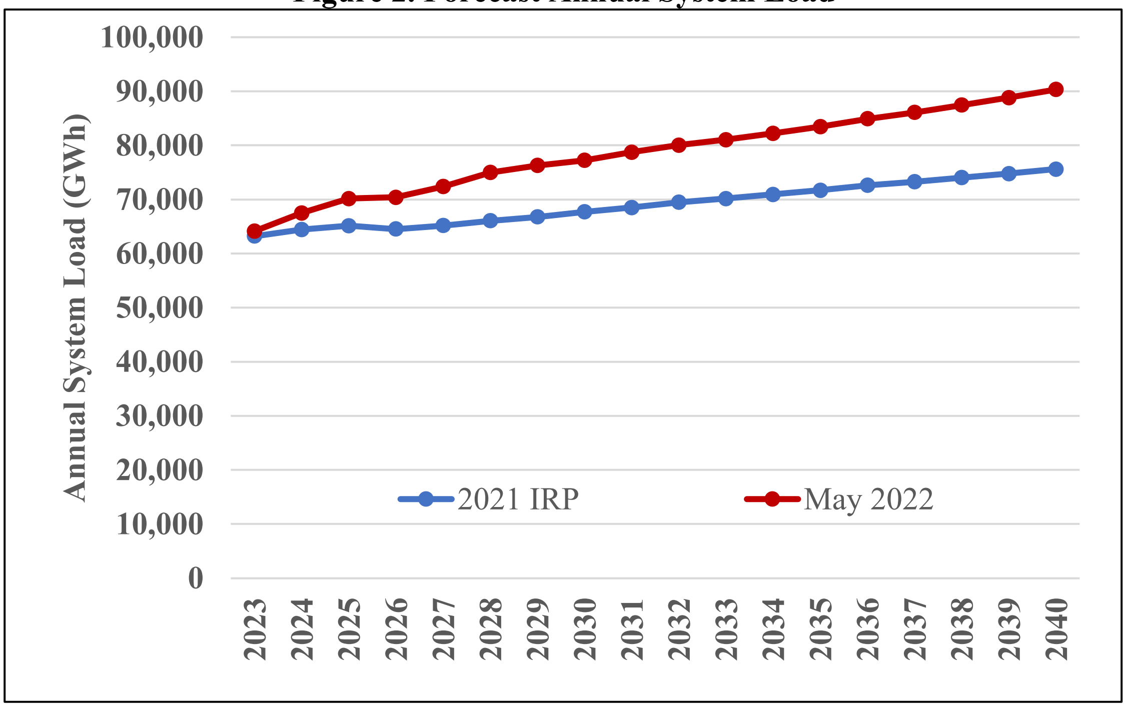
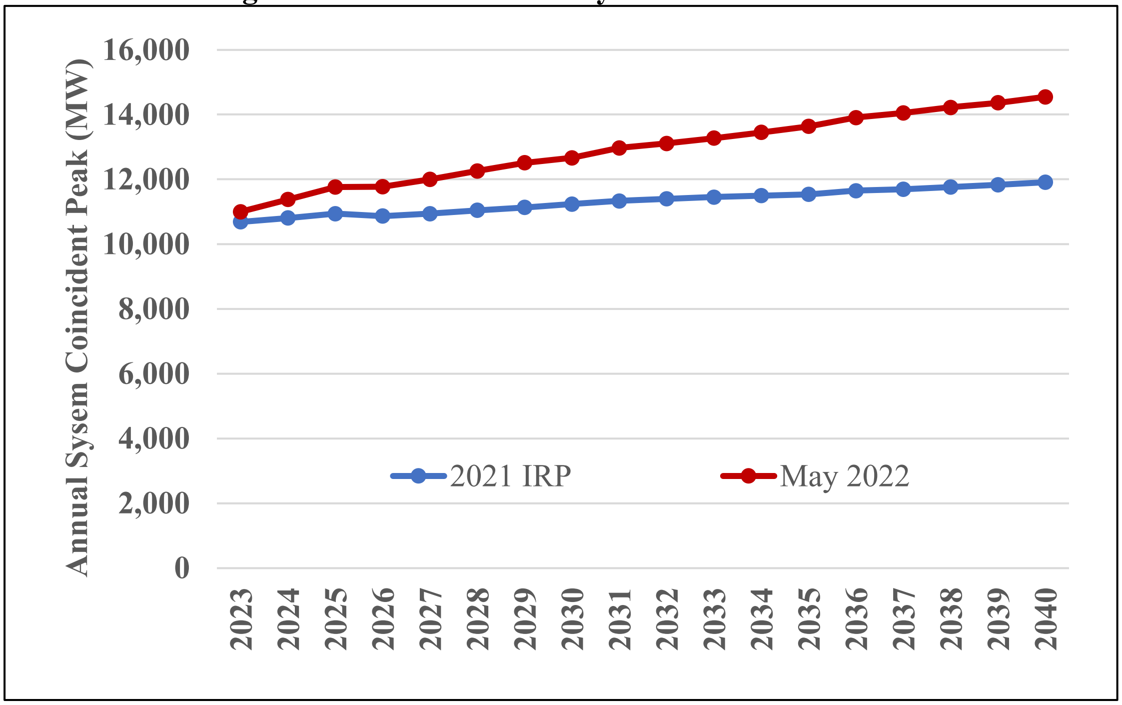


Figure 3. Forecast Annual System Coincident Peak



Q. Has PacifiCorp incorporated the EPA's proposed OTR in its analysis of Rock Creek I?

A. Yes. PacifiCorp modeled two primary components to reflect the OTR: NO_X allowance requirements for each of its units including penalties for units with high emissions rates, and a dispatch target or shadow price for NO_X allowances, which is used to avoid producing NO_X emissions during periods when the economic benefits are relatively low. After running the model, PacifiCorp compared the results to forecasts of its annual allocation of NO_X allowances for Utah and Wyoming.

Q. Please describe how the annual allocation of NO_X allowances would work under the proposed rule.

A. The proposed rule calls for dynamic budgeting of NO_X allowances in 2025 and beyond, with available allowances allocated among resources within a state based on the recent historical heat input and emissions rates of each resource. Under the EPA's proposed rule, the forecast allocation of NO_X allowances drops significantly in 2026, as the EPA assumed that selective catalytic reduction (SCR) installations at eligible facilities would significantly reduce emissions by that year. PacifiCorp's thermal facilities in Utah would be covered by the rule beginning 2023 and thermal facilities in Wyoming could be covered by the rule beginning 2024.

While trading of NO_X allowances among participating states is allowed, the proposed OTR includes significant penalties if a state's emissions exceed 121 percent of its annual allocation. Limited banking of NO_X allowances is also allowed, but emissions met via banked allowances may also be subject to penalties if a state's emissions exceed 121 percent of its annual allocation. To avoid such penalties, PacifiCorp's NO_X emissions during the ozone season (May-September) in each state cannot exceed 121 percent of PacifiCorp's forecast allocation of NO_X allowances for that state.

Q. Please describe how PacifiCorp developed NO_X allowance requirements for each of its units.

A. In general, an allowance for one ton of NO_X emissions would allow the holder of the allowance to emit one ton of NO_X. However, starting in 2027,[13] the proposed OTR also imposes a daily NO_X emissions rate limit of 0.14 pounds-per-million British thermal units (lb/MMBtu) for each coal-fired facility, and requires emitters to provide an equivalent of triple allowances for any emissions that exceed that rate. For example, a resource with an emissions rate of 0.20 lb/MMBtu would have an

[13] Coal units that currently have SCR installed must meet the daily backstop limit in 2024. Coal units that do not currently have SCR installed must meet the daily backstop limit in 2027.

effective allowance requirement of 0.32 lb/MMBtu.[14] To calculate PacifiCorp's NO_X allowance requirements under the OTR, starting in 2027 the modeled emission rates for coal resources whose emissions exceed 0.14 lb/MMBTU were grossed up to account for the additional surrender of allowances.

Q. Please describe how PacifiCorp developed a dispatch target to manage its NO_X allowance requirements.

A. While trading is allowed under the EPA's proposed OTR, the restrictions on inter-state transfers limit the number of potential counterparties. PacifiCorp's generation fleet is an appreciable portion of the electric generating units in both Utah and Wyoming, so the potential counterparties that could have allowances available for sale within those states is quite limited. With that in mind, PacifiCorp's current planning assumes that it will comply with the OTR using only its own combined allocation of NO_X allowances, and is meant to ensure that its annual allowance requirements do not exceed 100 percent of the sum of its Utah and Wyoming allowance allocations. When combined with state-specific limits previously described, while either PacifiCorp's Utah or Wyoming NO_X allowance requirements could be up to 121 percent of that state's allocation, any increase in one state would have to be accompanied by a reduction in emissions allowance requirements from PacifiCorp resources in the other state.

PacifiCorp's primary production cost analysis relies upon PLEXOS ST modeling that identifies system costs for a single deterministic set of expected or normal input conditions. In reality, and in stochastic modeling the Company performs

[14] Effective allowance requirement for resource with emissions rate of 0.20 lb/MMBTU: 100% * 0.20 lb/MMBtu + 200% * (0.20 – 0.14) lb/MMBtu = 100% *0.20 + 200% * 0.06 = 0.32 lb/MMBtu.

using the PLEXOS MT model, significant variations in inputs such as load, hydro generation, and thermal availability are a normal course of operations. Each of these inputs can unexpectedly increase PacifiCorp's need for NO_X emission allowances. Because banking and trading are limited under the OTR, variations in NO_X emissions that might otherwise average out over time must comply in every year and under every set of conditions. As a result, the NO_X allowances used under "normal" input conditions will likely need to be somewhat below the forecast limit to ensure sufficient allowances are available to meet unexpected input conditions.

PacifiCorp's analysis indicated that using a NO_X allowance dispatch target of [redacted] in the ST model would result in NO_X allowance requirements that were under PacifiCorp's forecast allocation and would leave sufficient allowances to meet a range of potential "above-normal" conditions. Whenever the incremental value of using a high NO_X emitting resources exceeds the dispatch target price, the model will deploy the high NO_X resource, rather than lower NO_X alternatives, which are typically gas-fired resources or market transactions. For a coal-fired resource with a NO_X emissions rate of 0.20 lb/MMBtu, the NO_X dispatch target price means that the resource would not be dispatched unless it provides at least [redacted] in incremental value relative to no NO_X alternatives, or a proportional amount of incremental value relative to lower NO_X alternatives.[15]

The dispatch target price is used to direct the model to avoid emissions, and is not a direct cost, as the Company would receive its allowance allocation free of

[15] A 0.20 lb/MMBTU coal-fired resource would have a NO_X credit requirement of 0.32 lb/MMBTU in 2027 and beyond, as detailed in footnote 22. A typical average heat rate for a coal-fired resource is 11 MMBtu/MWh. [redacted] ÷ 2,000 lb/ton * 0.32 lb/MMBtu * 11 MMBtu/MWh = [redacted].

charge under the proposed rule. While the Company could potentially sell allowances, there is little indication what market prices may prevail, and market prices may be below this target. As a result, no direct costs or revenues for allowances are included in the analysis. The allowance requirements resulting from this dispatch target price vary over time as the OTR requirements take full effect and as the Company's portfolio evolves. The Company's load forecast and other modeling inputs also play a role in the resulting volumes. A comparison of the allowance requirements for the scenarios relative and forecast allowance allocations is discussed in the Price-Policy Scenario Results section later in my testimony.

Q. Please describe the modeling methodology PacifiCorp used in its analysis of Rock Creek I.

A. Consistent with IRP modeling practices, the Company calculated a system PVRR by identifying least-cost resource portfolios and dispatching system resources through 2040, which aligns with the 20-year forecast period used in the 2021 IRP and 2021 IRP Update. Net customer benefits are calculated as the PVRR(d) between different simulations of PacifiCorp's system. One simulation includes both Rock Creek I and Rock Creek II, and the other simulation excludes them. The simulation that includes both projects includes transmission interconnection costs. When the two simulations are compared, changes to system costs are attributable to both projects. These also include simulations before passage of the IRA, and after to reflect the value of increased PTCs.

PacifiCorp also calculated a PVRR(d) based on one simulation that includes only Rock Creek I and compares it to a simulation that excludes both Rock Creek projects and one simulation that includes only Rock Creek II and compares it to a simulation that excludes both Rock Creek projects. In all studies, the Gateway West and Gateway South transmission projects discussed in Company witness Link's testimony were assumed to be in-service, and beyond 2025 proxy resource options from the 2021 IRP are available to meet system needs.

Customers are expected to realize benefits when the system present-value revenue requirement (PVRR) from the simulation with the projects is lower than the system PVRR without. Conversely, customers would experience increased costs if the system PVRR with the projects is higher than the system PVRR without.

Q. What portfolios did you analyze using the PLEXOS model in this case?

A. Portfolios were analyzed with and without both projects, with and without Rock Creek I, and with and without Rock Creek II, including certain results pre-IRA and post-IRA.

Q. Did PacifiCorp analyze how other assumptions affect its economic analysis of the wind projects?

A. Yes. PacifiCorp analyzed sensitivities that quantify how changes in capital costs and PTC values influence projected customer benefits.

C. <u>Price-Policy Scenario Results</u>

Q. Please summarize the pre-IRA results for the simulations that focused on each Rock Creek project individually.

A. Tables 4 and 5 summarize the PVRR(d) results for each price-policy scenario for the scenarios that examined each of the Rock Creek projects prior to passage of the IRA.

Table 4. Pre-IRA (Benefit)/Cost of Rock Creek I ($ million)

Price-Policy Scenario	PVRR(d)	Risk-Adjusted PVRR(d)
MM	(15)	(20)
MN	(9)	(15)
LN	3	(2)

Table 5. Pre-IRA (Benefit)/Cost of Rock Creek II ($ million)

Price-Policy Scenario	PVRR(d)	Risk-Adjusted PVRR(d)
MM	(24)	(33)
MN	(14)	(24)
LN	8	(3)

Rock Creek II generally provides a larger benefit, because it is approximately twice the size of Rock Creek I. All the same, under the MM price-policy scenario, Rock Creek I lowers total-system costs by $15 million, and adjusted for risk these benefits increase to a $20 million reduction in system costs. System benefits generally mirror the results seen in Table 5 when both projects were considered together, with a slight cost for Rock Creek I and Rock Creek II in the LN scenario prior to adjusting for risk and benefits in each of the other scenarios. Both projects, when evaluated individually, yield benefits on a risk-adjusted basis among all three price-policy scenarios.

Q. Why did PacifiCorp decide to update its economic analysis after passage of the IRA?

A. Based on existing law, PacifiCorp's economic analysis assumed that Rock Creek I qualified for 60 percent of available PTCs through the first 10 years of operation. After passage of the IRA, the Company understands that both Rock Creek projects qualify for 110 percent of available PTCs. This provides a significant increase to the economic benefits from the projects, and the Company's updated analysis reflects those benefits. The Company also updated its analysis to reflect current project costs.

Q. Please summarize the PVRR(d) results post-IRA.

A. Table 6 summarizes the PVRR(d) results for each price-policy scenario from the combined projects after passage of the IRA.[16]

Table 6. Post-IRA (Benefit)/Cost of Both Wind Projects ($ million)

	(a)	(b)	(c)	(d)	(e) = (c) + (d)	(f) = (a) + (e)	(g) = (b) + (e)
Price-Policy Scenario	**PVRR(d)**	**Risk-Adjusted PVRR(d)**	**110% PTC Update**	**Project Cost Update**	**Total Update**	**Updated PVRR(d)**	**Updated Risk-Adjusted PVRR(d)**
MM	(143)	(163)	(197)	42	(155)	(298)	(318)
MN	(33)	(51)	(194)	42	(151)	(185)	(202)
LN	16	2	(195)	42	(153)	(137)	(151)

Before adjusting for risk (Column (g)), system costs are lower when the wind projects are included in the portfolio in all scenarios: ranging from a $137 million customer benefit under the LN scenario to $298 million in the MM scenario. When adjusting for risk (Column (g)), the benefits from the wind projects increase: ranging from $151 million in the LN scenario to $318 million in the MM scenario. The increase in customer benefits from the 110 percent PTC is substantial, even when accounting for the increase in project costs. This updated analysis supports the necessity of the wind projects, and indicates they will produce robust customer benefits. As discussed earlier, these benefits only increase under a high gas or a high CO_2 price-policy scenario.

[16] Confidential Exhibit PAC/902 Rock Creek Analysis.

Q. How do system costs change post-IRA with and without both projects?

A. Figure 6 summarizes changes in system costs, based on ST model results using MM price-policy assumptions, when both projects are eliminated from the portfolio. The graph on the left shows annual changes in cost by category and the graph on right shows annual net changes in total costs (the solid black line) and the cumulative PVRR(d) of changes to net system costs over time (the dashed black line). Through 2040, the PVRR(d) shows that the portfolio that includes both projects is $298 million lower cost than the portfolio without both.

Figure 6. Increase/(Decrease) in System Costs when both Projects are Removed from the Portfolio ($ millions) Medium Gas/Medium CO2

Q. How do the risk-adjusted PVRR(d) results compare to the stochastic-mean PVRR(d) results?

A. For both projects, the risk-adjusted medium gas medium CO_2 PVRR(d) results show a benefit of $318 million, which is higher than the reported ST-model PVRR(d) results of $298 million prior to the risk adjustment. This indicates that the wind projects provide stochastic risk benefits by making the system less susceptible to low-probability combinations of load, market price, hydro generation, and thermal outage volatility that can increase system costs.

Q. How do the modeled OTR allowance requirements compare to PacifiCorp's forecast allowance allocation?

A. The annual allowance requirements in the ST-model results are generally slightly below a high estimate of PacifiCorp's allowance allocation. Based on the allocation methodology identified in the proposed rule, this high allowance allocation would likely require installation of SCR equipment at most of PacifiCorp's coal-fired generating units that are not equipped with that technology. In the absence of additional emission control equipment, PacifiCorp's allocation would be significantly lower, and well below the allowance requirements from the ST-model results. The high and low allocation forecasts and the ST-model results for the MM and MN price-policy scenarios are shown in Confidential Figure 7. As shown, allowance allocations could be significantly lower than what is assumed to be available in the current ST-model results, which would further increase the value of generation from resources without emissions, such as Rock Creek I.

[redacted]

[redacted]

Q. Would Rock Creek I provide customer benefits even if construction costs are higher than expected?

A. Yes. For both projects, a one percent increase in the initial capital costs would reduce PVRR benefits through 2040 by $9.1 million. To negate the $318 million in risk-adjusted, post-IRA benefits under the MM price-policy scenario, project costs would need to increase by 35 percent. To negate the $202 million in risk-adjusted, post-IRA benefits under the MN price-policy scenario, project costs would need to increase by 22 percent.

Q. Are the Company's economic analyses of the expected customer benefits from Rock Creek I conservative?

A. Yes. The PVRR(d) results for Rock Creek I do not reflect the potential value of RECs generated by the incremental energy output from the renewable project. Customer benefits for all price-policy scenarios would improve by approximately $14 million for every dollar assigned to the incremental RECs that will be generated through 2040.

Similarly, the Company's analyses understate forecast coal costs for certain system resources, including the Dave Johnston plant. If corrected to include the full costs of fuel supply for all plants, the Company's economic analysis would demonstrate even higher benefits for Rock Creek I. Additionally, the natural gas and electricity prices in the Company's September 2022 OFPC are higher than the values assumed in the June 2022 OFPC used in the Company's analysis, which would similarly result in higher benefits for Rock Creek I.

V. ROCK RIVER I

Q. Please describe the acquisition and repowering of the Rock River I wind facility.

A. As described in the testimony of Company witness Timothy J. Hemstreet, Confidential Exhibit PAC/1100, PacifiCorp is acquiring and repowering the 49 MW Rock River I wind facility. This involves installing approximately 19 wind turbine generators at the facility. These new turbines will increase the power generation from the previous capability, and extend the service life of the facility, and allow customers to benefit from this favorable wind site. My testimony below provides the economic justification for the Company's decision to acquire and repower Rock River I.

A. <u>Need</u>

Q. Did PacifiCorp's preferred portfolio of resources developed in the Company's 2021 IRP include Rock River I?

A. Yes.[17]

Q. Please describe the key factors for including Rock River I in the 2021 IRP preferred portfolio.

A. The project is anticipated to be fully online and serving customers by 2024. This timing enables the project to deliver needed energy and capacity for customers before the availability of either new proxy resources, or final shortlist project generation expected to be enabled by the Gateway South transmission line, as identified in the Company's 2020AS RFP. Without this project, the risk of shortfalls is increased as is the Company's reliance on energy markets. In its current state, the existing Rock River I facility is not operating as turbines have been removed pending the repowering of the sites. Repowering will allow the facility to once again provide energy and capacity to serve load and reduce market reliance, while allowing the newly installed turbines to qualify for substantial federal PTCs.

Q. Did the Commission acknowledge Rock River I as part of the 2021 IRP?

A. Yes.[18]

Q. Was Rock River I included in the Company's 2021 IRP Update?

A. Yes.[19]

[17] *Id.* at Ch. 1 Action Plan, Action Item 2b, at 25.
[18] Order No. 22-178, at 6 (approving PacifiCorp's Action Plan generally).
[19] PacifiCorp 2021 IRP Update (Mar. 31, 2022).

B. Assumptions and Results

Q. Has the Company performed updated analyses of Rock River I after filing the 2021 IRP?

A. Yes. The Company performed a 30-year analysis of the project's economics through end-of-life using its PLEXOS modeling system, the same modeling system used for the 2021 IRP.

Q. Please summarize the natural gas and CO_2 price assumptions used in the economic analyses for Rock River I.

A. The economic analysis for each of the projects included four price-policy scenarios—representing low, medium, and high natural gas prices, and zero, medium, high, and the SCGHG CO_2 prices. The price-policy scenario that pairs medium natural gas prices with medium CO_2 prices is referred to as the "MM" scenario, the price-policy scenario that pairs low natural gas prices with a zero CO_2 price is referred to as the "LN" scenario, the price-policy scenario that pairs high natural gas prices with a high CO_2 price is referred to as the "HH" scenario, and the scenario that pairs medium natural gas prices with the SCGHG is referred to as the MM-SCGHG scenario. While the MM price-policy scenario represents the Company's "expected case" describing likely future conditions, the LN, HH, and MM-SCGHG scenarios provide informative analytical bookends scenarios.

Similar to the Company's Jim Bridger analyses, these assumptions can influence the value of system energy, the dispatch of system resources, and PacifiCorp's resource mix. Consequently, wholesale-power prices and CO_2 policy assumptions affect NPC, non-NPC variable-cost benefits, and system fixed-cost benefits associated with Rock River I. Because wholesale power prices and CO_2 policy outcomes are both uncertain and important drivers to the economic analysis, it is important to evaluate a range of assumptions for these variables. The natural gas and CO_2 price assumptions are summarized in Table 7.

Table 7. Price-Policy Assumptions

Price-Policy Scenario	Henry Hub Natural Gas Price (Levelized $/MMBtu)*	CO_2 Price Description
HH	$5.64	22.57/ton starting 2025 rising to 102.48/ton in 2040
MM	$4.44	$9.93/ton starting in 2025
LN	$2.94	None
MM-SCGHG	$4.44	$74.10/ton starting 2021 rising to $150.38/ton in 2040
*Nominal levelized Henry Hub natural gas price from 2025 through 2040.		

Q. Please describe the natural-gas price assumptions used in the price-policy scenarios.

A. The medium natural gas price assumptions are from PacifiCorp's OFPC dated March 31, 2021, which was the most recent OFPC available when the modeling inputs were developed. The first 36 months of the OFPC reflect market forwards at the close of a given trading day, May 2021 is the prompt month in this case. As such, these 36 months are market forwards as of May 2021. The blending period (months 37 through 48) is calculated by averaging the month-on-month market forwards from the prior year with the month-on-month fundamentals-based price from the subsequent year. The fundamentals portion of the natural gas OFPC reflects Aurora-forecast prices.

Q. Please describe the CO_2 price assumptions used in the price-policy scenarios.

A. PacifiCorp used four different CO_2 price scenarios—zero, medium, high, and the SCGHG. The medium scenario is derived from a survey of third-party industry experts, including IHS CERA, and Wood Mackenzie and the Energy Information Administration as well as CO_2 price assumptions used by peer utilities. Both the medium and high scenarios apply a CO_2 price as a tax beginning 2025. PacifiCorp also incorporated the SCGHG that is assumed to start in 2021 for Washington, and is applied such that the SCGHG is reflected in market prices and dispatch costs for the purposes of developing each portfolio (i.e., incorporated into capacity expansion optimization modeling).

Q. How did PacifiCorp pair the natural gas and CO_2 price assumptions for purposes of analyzing Rock River I?

A. Scenarios pairing medium gas prices with alternative CO_2 price assumptions reflect OFPC forwards through April 2024 before transitioning to a fundamentals forecast. Scenarios using high or low gas prices, regardless of CO_2 price assumptions, do not incorporate any market forwards because these scenarios are designed to reflect an alternative view to that of the market. As such, the low and high natural gas price scenarios are purely fundamental forecasts. Low and high natural gas price scenarios are also derived from expert third-party, multi-client, “off-the-shelf” subscription services.

Q. Please explain how you conducted your analyses.

A. The methodologies are consistent with the approach used to perform the economic analysis of portfolios in the 2021 IRP. The system value of incremental wind energy

Rock River I is calculated from two PLEXOS ST model simulations for a given price-policy scenario—one simulation with incremental wind energy and one simulation without incremental wind energy. The system value of incremental wind energy is then converted to a dollar-per-$/ MWh value by dividing the change in annual system cost by the change in incremental wind energy for both price-policy scenarios through 2040. The value of wind energy is extended out through 2050 by extrapolating the system values calculated from modeled data over the 2038-2040 timeframe. The assumed system value, expressed in dollars per$/ MWh, is applied to the incremental energy output associated with each of the wind repowering projects.

Q. Were your initial economic analyses of Rock River I conducted before passage of the IRA?

A. Yes.

Q. How does the IRA impact your analyses of Rock River I?

A. Based on existing law, PacifiCorp's initial economic analyses assumed that Rock River I qualified for 60 percent of available PTCs. After passage of the IRA, the Company understands that Rock River I now qualify for 110 percent of available PTCs.

Q. Has the Company updated its analysis of Rock River I after filing the 2021 IRP?

A. Yes. The Company updated its economic analysis in 2022 to support the Company's decision to acquire and repower Rock River I, and these results are reflected below. Table 8 summarizes the PVRR(d) between cases, with and without Rock River I acquisition and repowering, for customer benefits before and after passage of the IRA. This table also presents the same information on a levelized $/MWh basis.[20]

Table 8. Rock River I (Benefits)/Costs

Price-Policy Scenario	Pre-IRA PVRR(d) ($ million)	Pre-IRA Net Benefit ($/MWh)	Post-IRA PVRR(d) ($ million)	Post-IRA Net Benefit ($/MWh)
HH	($67.76)	($31/MWh)	($91.69)	($43/MWh)
MM	($30.15)	($14/MWh)	($54.09)	($25/MWh)
LN	$23.12	$11/MWh	($15.12)	($7/MWh)
MM-SCGHG	($143.42)	($67/MWh)	($167.35)	($78/MWh)

Before passage of the IRA, Rock River I was expected to deliver $30.15 million in present-value net customer benefits in the MM scenario, $67.76 million in the HH scenario, and $143.42 million in the MM-SCGHG scenario. This is contrasted with $23.12 million cost in the LN scenario. Under the MM-SCGHG, MM and HH scenarios, nominal levelized net benefits are $67/MWh, $14/MWh and $31/MWh, respectively. Under the LN scenario there is a nominal levelized net cost of $11/MWh. Company forecasting and the relative magnitude of benefits over costs across these scenarios, as well as near-term resource need and the ability of the project to reduce the Company's reliance on market purchases, all support acquiring and repowering Rock River I.

After passage of the IRA, customer benefits increased substantially: Rock River I will now deliver $54.09 million in present-value net customer benefits in the MM scenario and $91.69 million in the HH scenario. Importantly, the only scenario where Rock River I was expected to generate customer costs before passage of the

[20] Exhibit PAC/903 Rock River Analysis.

IRA—the LN scenario ($23.12 million)—has transformed to a $15.12 million customer benefit. These benefits only increase under a high gas or a high CO_2 price-policy scenario.

Q. Are the Company's economic analyses of the expected customer benefits from Rock River I conservative?

A. Yes. The PVRR(d) results for Rock River I do not reflect the potential value of RECs generated by the incremental energy output from the renewable project. Customer benefits for all price-policy scenarios would improve significantly for every dollar assigned to the incremental RECs that will be generated through 2040, and these RECs can also be sold to reduce the revenue requirement impact of this resource.

VI. CONCLUSION

Q. Please summarize the conclusions of your testimony.

A. PacifiCorp's analysis shows that the conversion of Jim Bridger Units 1 and 2 to natural gas, the acquisition of Rock Creek I, and the acquisition and repowering of Rock River I are necessary and will provide substantial customer benefits compared to anticipated project costs.

Q. What is your recommendation?

A. As supported by PacifiCorp's economic analysis, I recommend that the Commission determine that the Company's decisions to convert Jim Bridger 1 and 2, acquire Rock Creek I, and acquire and repower Rock River I are prudent.

Q. Does this conclude your direct testimony?

A. Yes.

Docket No. UE 433
Exhibit PAC/901
Witness: Thomas R. Burns

BEFORE THE PUBLIC UTILITY COMMISSION

OF OREGON

PACIFICORP

Exhibit Accompanying Direct Testimony of Thomas R. Burns

Jim Bridger Analysis

February 2024

Table 2 Jim Bridger 1&2 Gas Conversion

	PVRR(d) Net (Benefit)/Cost ($million)	Nom. Lev. Net Benefit ($/MWh of Incremental Energy)
Medium Natural Gas, Medium CO2	($515.20)	$321.79
Medium Natural Gas, No CO2	($595.67)	$609.59
Low Natural Gas, No CO2	($656.41)	$174.87
High Natural Gas, High CO2	($378.79)	$237.21
Medium Natural Gas, SCGHG	($271.68)	$17.57

Line No.	Nominal Discount Rate	6.88%																			
	Jim Bridger 1&2 Gas Conversion	**Formula**	**PVRR(d)**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**
	Project Costs ($ millions)																				
	JB1 GC Capital Rev. Req.		$8.07	$0.00	$0.00	$0.00	$1.42	$1.36	$1.30	$1.25	$1.19	$1.14	$1.08	$1.03	$0.98	$0.93	$0.87	$0.82	$0.77	$0.71	$0.00
	JB1 GC Property Taxes		$0.40	$0.00	$0.00	$0.00	$0.00	$0.10	$0.09	$0.08	$0.08	$0.07	$0.06	$0.06	$0.05	$0.04	$0.04	$0.03	$0.02	$0.01	$0.00
	JB2 GC Capital Rev. Req.		$8.07	$0.00	$0.00	$0.00	$1.42	$1.36	$1.30	$1.25	$1.19	$1.14	$1.08	$1.03	$0.98	$0.93	$0.87	$0.82	$0.77	$0.71	$0.00
	JB2 GC Property Taxes		$0.40	$0.00	$0.00	$0.00	$0.00	$0.10	$0.09	$0.08	$0.08	$0.07	$0.06	$0.06	$0.05	$0.04	$0.04	$0.03	$0.02	$0.01	$0.00
(1)	**Project Costs ($ million)**		$16.94	$0.00	$0.00	$0.00	$2.83	$2.92	$2.79	$2.66	$2.54	$2.41	$2.29	$2.17	$2.05	$1.94	$1.82	$1.70	$1.58	$1.45	$0.00

	Medium Natural Gas, Medium CO_2	**PVRR**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**
	Total System Cost With JB 1&2 Gas Conversion ($ million)																			
(2)	TSC With JB 1&2 Gas Conversion	$21,723.3	$1,300.1	$1,342.1	$1,366.3	$1,413.9	$1,770.9	$2,001.6	$1,887.5	$2,092.5	$2,143.4	$2,360.3	$2,898.2	$3,084.6	$3,383.9	$3,563.2	$3,713.6	$3,917.3	$4,282.2	$0.0
(3)	Plus: Nominal Project Costs	$16.9	$0.0	$0.0	$0.0	$2.8	$2.9	$2.8	$2.7	$2.5	$2.4	$2.3	$2.2	$2.1	$1.9	$1.8	$1.7	$1.6	$1.5	$0.0
(4)	Less: Real Levelized Project Costs	($13.3)	$0.0	$0.0	$0.0	($1.6)	($1.7)	($1.7)	($1.7)	($1.8)	($1.8)	($1.9)	($1.9)	($1.9)	($2.0)	($2.0)	($2.1)	($2.1)	($2.2)	$0.0
(5)	TSC With JB 1&2 Gas Conversion	$21,727.0	$1,300.1	$1,342.1	$1,366.3	$1,415.1	$1,772.1	$2,002.7	$1,888.4	$2,093.2	$2,144.0	$2,360.8	$2,898.5	$3,084.7	$3,383.8	$3,563.0	$3,713.2	$3,916.8	$4,281.5	$0.0
(6)	**Total System Cost Without JB 1&2 Gas Conversion ($ million)**	$22,242.2	$1,296.9	$1,330.0	$1,357.9	$1,547.4	$1,844.6	$2,083.8	$1,966.6	$2,162.1	$2,212.3	$2,431.3	$2,939.5	$3,123.8	$3,455.9	$3,634.4	$3,784.0	$3,981.0	$4,345.9	$0.0
(7)	**Total System Cost / (Benefit) of JB 1&2 Gas Conversion ($ million)**	($515.2)	$3.2	$12.1	$8.5	($132.2)	($72.5)	($81.0)	($78.1)	($68.9)	($68.3)	($70.5)	($40.9)	($39.0)	($72.1)	($71.4)	($70.8)	($64.3)	($64.4)	$0.0

	Medium Natural Gas, No CO_2	**PVRR**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**
	Total System Cost With JB 1&2 Gas Conversion ($ million)																			
(8)	TSC With JB 1&2 Gas Conversion	$18,754.5	$1,139.5	$1,206.4	$1,274.6	$1,335.8	$1,439.2	$1,677.8	$1,518.8	$1,760.8	$1,782.5	$1,983.4	$2,537.8	$2,688.7	$2,981.3	$3,110.0	$3,186.9	$3,295.9	$3,713.5	$0.0
(9)	Plus: Nominal Project Costs	$16.9	$0.0	$0.0	$0.0	$2.8	$2.9	$2.8	$2.7	$2.5	$2.4	$2.3	$2.2	$2.1	$1.9	$1.8	$1.7	$1.6	$1.5	$0.0
(10)	Less: Real Levelized Project Costs	($13.3)	$0.0	$0.0	$0.0	($1.6)	($1.7)	($1.7)	($1.7)	($1.8)	($1.8)	($1.9)	($1.9)	($1.9)	($2.0)	($2.0)	($2.1)	($2.1)	($2.2)	$0.0
(11)	TSC With JB 1&2 Gas Conversion	$18,758.1	$1,139.5	$1,206.4	$1,274.6	$1,337.0	$1,440.4	$1,678.9	$1,519.7	$1,761.5	$1,783.1	$1,983.9	$2,538.1	$2,688.8	$2,981.3	$3,109.8	$3,186.6	$3,295.4	$3,712.8	$0.0
(12)	**Total System Cost Without JB 1&2 Gas Conversion ($ million)**	$19,353.8	$1,135.3	$1,193.4	$1,266.0	$1,472.0	$1,527.9	$1,771.3	$1,612.6	$1,847.2	$1,874.1	$2,078.3	$2,587.6	$2,742.2	$3,055.3	$3,185.5	$3,262.8	$3,370.6	$3,774.5	$0.0
(13)	**Total System Cost / (Benefit) of JB 1&2 Gas Conversion ($ million)**	($595.7)	$4.2	$12.9	$8.6	($135.0)	($87.5)	($92.3)	($92.8)	($85.7)	($90.9)	($94.4)	($49.6)	($53.3)	($74.0)	($75.7)	($76.3)	($75.3)	($61.7)	$0.0

	Low Natural Gas, No CO_2	**PVRR**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**
	Total System Cost With JB 1&2 Gas Conversion ($ million)																			
(14)	TSC With JB 1&2 Gas Conversion	$18,948.0	$1,239.8	$1,238.7	$1,284.2	$1,312.4	$1,412.6	$1,680.5	$1,532.7	$1,756.7	$1,783.3	$2,009.4	$2,571.7	$2,723.9	$3,012.1	$3,132.6	$3,225.6	$3,338.8	$3,699.6	$0.0
(15)	Plus: Nominal Project Costs	$16.9	$0.0	$0.0	$0.0	$2.8	$2.9	$2.8	$2.7	$2.5	$2.4	$2.3	$2.2	$2.1	$1.9	$1.8	$1.7	$1.6	$1.5	$0.0
(16)	Less: Real Levelized Project Costs	($13.3)	$0.0	$0.0	$0.0	($1.6)	($1.7)	($1.7)	($1.7)	($1.8)	($1.8)	($1.9)	($1.9)	($1.9)	($2.0)	($2.0)	($2.1)	($2.1)	($2.2)	$0.0
(17)	TSC With JB 1&2 Gas Conversion	$18,951.7	$1,239.8	$1,238.7	$1,284.2	$1,313.6	$1,413.9	$1,681.6	$1,533.6	$1,757.4	$1,783.9	$2,009.9	$2,571.9	$2,724.0	$3,012.1	$3,132.4	$3,225.2	$3,338.3	$3,698.9	$0.0
(18)	**Total System Cost Without JB 1&2 Gas Conversion ($ million)**	$19,608.1	$1,235.6	$1,225.6	$1,277.5	$1,452.9	$1,512.5	$1,788.3	$1,640.5	$1,860.0	$1,887.7	$2,112.5	$2,626.5	$2,778.6	$3,090.3	$3,212.0	$3,305.0	$3,415.6	$3,760.7	$0.0
(19)	**Total System Cost / (Benefit) of JB 1&2 Gas Conversion ($ million)**	($656.4)	$4.2	$13.2	$6.7	($139.3)	($98.7)	($106.7)	($106.9)	($102.6)	($103.7)	($102.6)	($54.6)	($54.6)	($78.3)	($79.7)	($79.8)	($77.3)	($61.8)	$0.0

	High Natural Gas, High CO_2	**PVRR**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**
	Total System Cost With JB 1&2 Gas Conversion ($ million)																			
(20)	TSC With JB 1&2 Gas Conversion	$24,384.6	$1,324.1	$1,394.4	$1,445.8	$1,462.3	$2,163.8	$2,358.7	$2,266.5	$2,442.6	$2,501.9	$2,698.5	$3,248.7	$3,446.5	$3,750.2	$3,980.1	$4,167.9	$4,415.8	$4,796.6	$0.0
(21)	Plus: Nominal Project Costs	$16.9	$0.0	$0.0	$0.0	$2.8	$2.9	$2.8	$2.7	$2.5	$2.4	$2.3	$2.2	$2.1	$1.9	$1.8	$1.7	$1.6	$1.5	$0.0
(22)	Less: Real Levelized Project Costs	($13.3)	$0.0	$0.0	$0.0	($1.6)	($1.7)	($1.7)	($1.7)	($1.8)	($1.8)	($1.9)	($1.9)	($1.9)	($2.0)	($2.0)	($2.1)	($2.1)	($2.2)	$0.0
(23)	TSC With JB 1&2 Gas Conversion	$24,388.3	$1,324.1	$1,394.4	$1,445.8	$1,463.5	$2,165.0	$2,359.8	$2,267.4	$2,443.4	$2,502.5	$2,698.9	$3,248.9	$3,446.6	$3,750.1	$3,979.9	$4,167.5	$4,415.3	$4,795.9	$0.0
(24)	**Total System Cost Without JB 1&2 Gas Conversion ($ million)**	$24,767.1	$1,320.6	$1,380.8	$1,437.1	$1,585.8	$2,211.1	$2,411.3	$2,317.6	$2,487.5	$2,539.5	$2,737.7	$3,282.4	$3,476.0	$3,806.6	$4,041.1	$4,230.4	$4,468.9	$4,868.0	$0.0

(25)	**Total System Cost / (Benefit) of JB 1&2 Gas Conversion ($ million)**	($378.8)	$3.5	$13.6	$8.7	($122.3)	($46.0)	($51.5)	($50.2)	($44.1)	($37.1)	($38.8)	($33.5)	($29.4)	($56.5)	($61.2)	($62.9)	($53.5)	($72.0)	$0.0

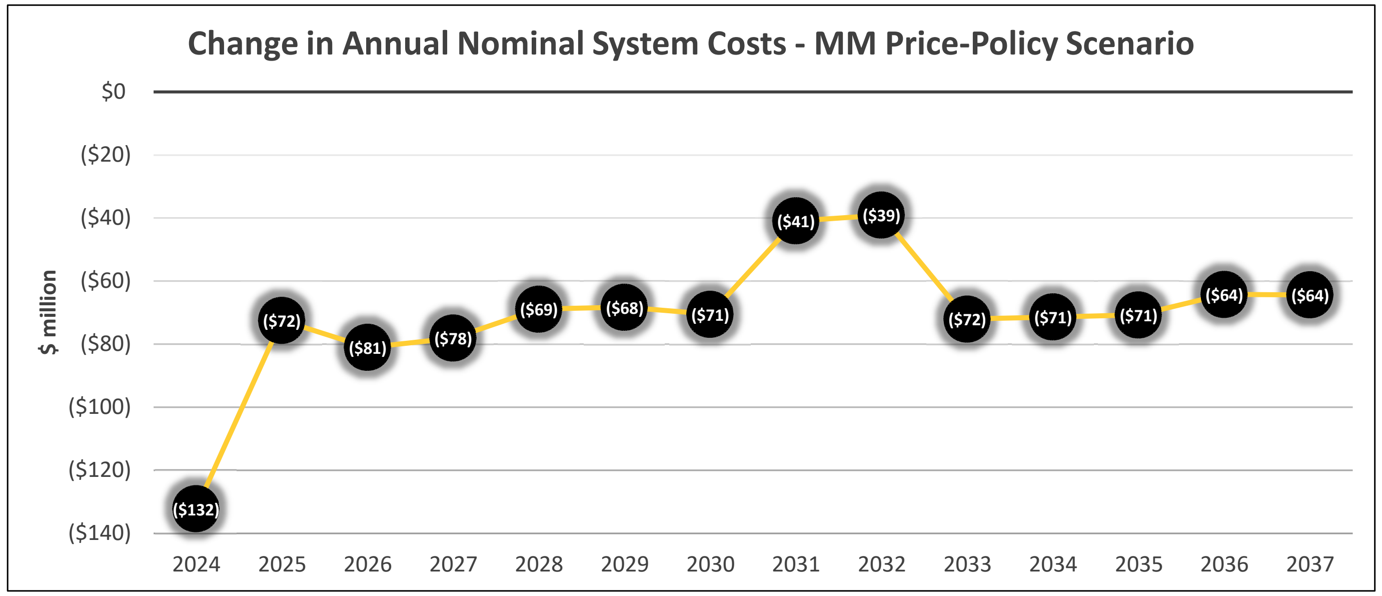
	Medium Natural Gas, SCGHG	**PVRR**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**
	Total System Cost With JB 1&2 Gas Conversion ($ million)																			
(26)	TSC With JB 1&2 Gas Conversion	$35,083.0	$3,374.4	$3,528.6	$3,581.5	$3,413.6	$3,186.5	$3,134.4	$3,076.2	$3,121.7	$3,143.1	$3,267.4	$3,718.3	$3,853.9	$4,040.0	$4,231.8	$4,393.3	$4,661.3	$4,993.5	$0.0
(27)	Plus: Nominal Project Costs	$16.9	$0.0	$0.0	$0.0	$2.8	$2.9	$2.8	$2.7	$2.5	$2.4	$2.3	$2.2	$2.1	$1.9	$1.8	$1.7	$1.6	$1.5	$0.0
(28)	Less: Real Levelized Project Costs	($13.3)	$0.0	$0.0	$0.0	($1.6)	($1.7)	($1.7)	($1.7)	($1.8)	($1.8)	($1.9)	($1.9)	($1.9)	($2.0)	($2.0)	($2.1)	($2.1)	($2.2)	$0.0
(29)	TSC With JB 1&2 Gas Conversion	$35,086.7	$3,374.4	$3,528.6	$3,581.5	$3,414.8	$3,187.8	$3,135.5	$3,077.1	$3,122.5	$3,143.7	$3,267.9	$3,718.6	$3,854.1	$4,039.9	$4,231.6	$4,392.9	$4,660.8	$4,992.8	$0.0
(30)	**Total System Cost Without JB 1&2 Gas Conversion ($ million)**	$35,358.4	$3,370.9	$3,517.6	$3,588.0	$3,475.5	$3,204.1	$3,153.9	$3,091.7	$3,121.8	$3,145.4	$3,272.2	$3,760.4	$3,891.4	$4,096.5	$4,291.1	$4,454.4	$4,734.8	$5,192.8	$0.0
(31)	**Total System Cost / (Benefit) of JB 1&2 Gas Conversion ($ million)**	($271.7)	$3.5	$11.0	($6.4)	($60.7)	($16.3)	($18.4)	($14.6)	$0.7	($1.7)	($4.3)	($41.8)	($37.4)	($56.6)	($59.4)	($61.5)	($74.0)	($200.0)	$0.0

	Project Costs - Nominal 14 Yr																			
	JB1 GC Capital Rev. Req.	$8,065,516	$0	$0	$0	$1,415,136	$1,360,683	$1,303,321	$1,246,994	$1,191,625	$1,137,143	$1,083,481	$1,030,578	$978,097	$925,678	$873,258	$820,838	$768,419	$711,565	$0
	JB1 GC Property Taxes	$404,715	$0	$0	$0	$0	$99,500	$91,895	$84,431	$77,097	$69,885	$62,784	$55,787	$48,886	$42,000	$35,115	$28,229	$21,343	$14,458	$0
	JB2 GC Capital Rev. Req.	$8,065,516	$0	$0	$0	$1,415,136	$1,360,683	$1,303,321	$1,246,994	$1,191,625	$1,137,143	$1,083,481	$1,030,578	$978,097	$925,678	$873,258	$820,838	$768,419	$711,565	$0
	JB2 GC Property Taxes	$404,715	$0	$0	$0	$0	$99,500	$91,895	$84,431	$77,097	$69,885	$62,784	$55,787	$48,886	$42,000	$35,115	$28,229	$21,343	$14,458	$0
(32)	**Project Costs ($ million)**	$16,940,461	$0	$0	$0	$2,830,272	$2,920,366	$2,790,430	$2,662,849	$2,537,445	$2,414,056	$2,292,531	$2,172,729	$2,053,966	$1,935,355	$1,816,745	$1,698,134	$1,579,524	$1,452,044	$0

	Project Costs - Real Levelized 21 Yr																			
	JB1 GC Capital Rev. Req.	$6,232,923	$0	$0	$0	$766,653	$783,174	$800,052	$817,293	$834,905	$852,898	$871,278	$890,054	$909,234	$928,828	$948,845	$969,292	$990,180	$1,011,519	$0
	JB1 GC Property Taxes	$401,116	$0	$0	$0	$49,338	$50,401	$51,487	$52,596	$53,730	$54,888	$56,071	$57,279	$58,513	$59,774	$61,062	$62,378	$63,723	$65,096	$0
	JB2 GC Capital Rev. Req.	$6,232,923	$0	$0	$0	$766,653	$783,174	$800,052	$817,293	$834,905	$852,898	$871,278	$890,054	$909,234	$928,828	$948,845	$969,292	$990,180	$1,011,519	$0
	JB2 GC Property Taxes	$401,116	$0	$0	$0	$49,338	$50,401	$51,487	$52,596	$53,730	$54,888	$56,071	$57,279	$58,513	$59,774	$61,062	$62,378	$63,723	$65,096	$0
(33)	**Project Costs ($ million)**	$13,268,079	$0	$0	$0	$1,631,981	$1,667,150	$1,703,077	$1,739,779	$1,777,271	$1,815,571	$1,854,697	$1,894,665	$1,935,495	$1,977,205	$2,019,814	$2,063,341	$2,107,806	$2,153,229	$0

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
MM				($132)	($72)	($81)	($78)	($69)	($68)	($71)	($41)	($39)	($72)	($71)	($71)	($64)	($64)

Figure 2 **Total-System Change in Annual Revenue Requirement Due to the Jim Bridger Unit 1&2 Gas Conversion ($ million)**



Discount Rate
6.88%

P02-MMGR ST Split Run Cost Data LT 5230 ST 19667

Total	Is FOM	Sample:	Mean

$ millions	NPV	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
1 Coal VOM Costs																					
Retired Coal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EOL Coal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2 Coal Fixed Costs																					
Retired Coal FOM	426	77	94	79	67	63	30	30	32	13	13	13	13	14	13	13	14	17	0	0	0
Reclamation Costs	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Retirement Costs	243	0	0	0	0	0	124	0	41	12	37	0	0	0	0	0	0	63	259	0	43
EOL Coal FOM	2,489	211	246	246	272	264	269	264	225	208	237	232	247	238	255	247	251	174	136	128	106
Total	3,158	289	339	325	339	327	423	294	299	234	287	245	260	252	268	260	265	254	395	128	149
3 Coal Fuel Costs																					
Retired Coal	404	174	95	104	23	12	5	7	12	6	5	7	6	9	9	9	15	14	0	0	0
Retired Coal Start Fuel	23	4	4	4	3	2	1	2	3	1	1	1	1	1	2	1	2	2	0	0	0
EOL Coal	3,345	401	433	427	528	419	360	354	315	316	265	238	208	194	179	168	180	172	43	39	52
EOL Coal Start Fuel	116	13	15	14	16	15	14	14	11	9	9	7	8	7	7	6	8	6	3	4	3
Total	3,887	592	546	549	569	448	380	376	341	333	280	254	224	210	196	184	205	194	47	43	56
4 Emission Cost (CO2)																					
Retired Coal	18	0	0	0	0	4	1	2	3	2	1	2	2	3	3	4	7	7	0	0	0
EOL Coal	1,510	0	0	0	0	242	231	249	218	227	215	204	191	196	193	198	238	244	88	90	125
Total	1,529	0	0	0	0	246	232	250	221	229	216	206	194	199	196	202	245	252	88	90	125
5 Proxy Generation Costs																					
Solar VOM	23	(4)	(2)	4	4	4	4	4	4	4	4	4	4	4	4	4	4	1	1	0	0
Wind VOM	(3,443)	(309)	(311)	(332)	(335)	(481)	(535)	(555)	(546)	(573)	(586)	(211)	(219)	(206)	(203)	(51)	14	14	15	15	15
Gas VOM	152	10	12	14	13	13	13	13	14	14	14	14	16	14	16	17	18	19	18	19	19
Battery VOM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LT Contract VOM	871	108	109	129	127	110	100	99	98	95	64	36	36	35	35	35	34	29	28	28	28
QFs VOM	2,054	275	266	252	233	231	228	210	208	194	190	189	174	148	145	143	112	31	23	9	6
Other VOM	(44)	1	1	1	1	1	1	1	(36)	(35)	(35)	(35)	(36)	(35)	15	15	15	15	43	43	44
Fuel	3,472	248	278	290	282	281	265	292	307	326	334	343	381	352	390	416	430	422	414	445	461
Start Fuel	77	9	6	5	9	9	8	9	10	8	7	6	7	6	7	7	7	5	4	5	5
Energy not Served	16	1	0	8	0	0	2	2	0	1	2	2	2	1	0	1	4	0	0	0	0
Dumped Energy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Deficiency Cost	102	50	35	24	6	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Emissions Costs	843	0	0	0	0	52	54	65	71	78	86	97	119	117	143	169	191	203	209	241	263
Total	4,123	389	393	395	340	220	140	140	132	109	79	445	484	436	552	755	828	739	755	804	841
VOM Integration, Wind + Solar																					
6 Proxy Generation Resource Fixed Costs																					
Generator Fixed / Build Costs	5,089	8	8	8	15	15	218	218	352	352	537	704	765	1,035	1,035	1,035	1,035	1,237	1,601	1,601	1,849
Battery Fixed / Build Costs	453	0	0	0	0	0	0	0	0	74	74	74	74	74	74	74	74	162	162	162	162
Solar FOM	1,593	0	0	0	63	100	125	128	139	140	181	220	225	280	285	289	295	344	344	350	368
Wind FOM	4,893	160	163	191	198	467	523	539	559	572	604	620	678	679	613	603	616	623	638	646	656
Gas FOM	438	36	38	38	40	41	42	43	46	49	52	54	55	33	34	34	35	36	37	37	37
Battery FOM	62	0	0	0	1	(1)	(1)	(2)	(0)	12	10	10	9	9	9	9	9	23	18	30	31
Other FOM	667	12	5	5	6	5	7	7	85	86	80	81	83	85	86	88	90	92	280	286	336
Use of Service	(6)	0	0	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(2)	(2)	(2)	(2)
Total	13,189	215	213	241	322	628	915	933	1,181	1,284	1,538	1,763	1,889	2,193	2,135	2,132	2,153	2,515	3,078	3,110	3,436
Remove Portfolio Credits																					
7 DSM Costs																					
DR VOM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DR FOM	610	0	6	19	29	34	38	42	46	51	55	60	63	86	90	105	117	138	157	166	230
EE VOM	1,085	9	21	30	40	50	60	74	88	103	121	138	153	167	181	195	205	221	240	260	276
EE FOM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	1,695	9	27	49	70	84	98	115	134	154	176	198	216	253	271	300	322	359	397	427	506
8 Market Costs																					
System Market Sales	(4,142)	(273)	(247)	(267)	(302)	(336)	(376)	(417)	(426)	(426)	(449)	(478)	(476)	(470)	(458)	(476)	(479)	(484)	(477)	(457)	(597)
System Market Purchases	1,230	80	70	74	76	84	67	74	83	99	103	117	124	127	149	172	194	227	256	276	318
Total	(2,912)	(193)	(177)	(193)	(225)	(252)	(309)	(344)	(342)	(327)	(346)	(360)	(352)	(343)	(310)	(304)	(285)	(257)	(221)	(181)	(279)
9 Transmission Costs																					
Transmission Build / Reinforcement Costs	1,341	0	0	0	1	99	151	151	157	157	159	177	199	214	214	214	214	256	256	256	296
Total	1,341	0	0	0	1	99	151	151	157	157	159	177	199	214	214	214	214	256	256	256	296

11	Total System Cost	25,822	1,300	1,342	1,366	1,414	1,771	2,002	1,888	2,092	2,143	2,360	2,898	3,085	3,384	3,563	3,714	3,917	4,282	4,764	4,647	5,098
	Fixed	18,298	503	558	585	691	1,089	1,526	1,420	1,683	1,725	2,039	2,246	2,411	2,744	2,707	2,711	2,749	3,164	3,886	3,661	4,110
	Variable	7,711	797	784	781	723	711	504	496	439	447	351	682	703	670	815	1,033	1,198	1,148	908	1,016	1,018
	Adjustments	(187)	0	(0)	(0)	(0)	(29)	(29)	(29)	(29)	(29)	(29)	(29)	(30)	(30)	41	(30)	(30)	(30)	(30)	(30)	(30)
12	Risk Adjusted PVRR	26,179		358																		
	Generation (GWH)																					
	Retired Coal	20,157	7,440	4,813	4,428	707	365	134	189	303	154	111	177	152	194	196	195	309	288	-	-	-
	EOL Coal	252,466	23,923	25,027	24,205	27,814	21,516	18,372	17,616	14,405	13,525	11,382	9,632	8,029	7,294	6,343	5,791	6,193	5,697	1,879	1,717	2,107
	DSM	147,142	2,431	2,919	3,424	3,991	4,488	4,947	5,516	6,127	6,731	7,359	7,909	8,411	8,828	9,290	9,733	9,986	10,423	11,033	11,570	12,027
	LT Contracts	32,363	1,441	1,685	2,597	3,063	2,434	2,264	2,229	2,213	2,149	1,656	1,204	1,185	1,172	1,160	1,145	1,132	925	914	904	891
	QFs	73,171	5,736	5,611	5,384	5,067	5,024	4,970	4,719	4,682	4,460	4,410	4,384	4,172	3,667	3,371	3,330	2,627	655	552	256	94
	Gas	225,862	10,129	11,701	13,173	11,326	11,369	10,702	11,328	11,178	11,119	11,034	11,088	11,976	10,567	11,480	12,000	12,129	11,574	10,582	10,869	10,536
	Solar	188,705	1,223	1,271	1,467	3,802	5,007	6,608	6,591	6,867	6,932	8,267	10,554	10,530	13,603	13,583	13,561	13,535	16,289	16,264	16,239	16,513
	Wind	362,823	9,172	9,225	9,695	10,006	15,849	18,275	18,282	18,392	18,345	20,175	20,181	21,718	21,616	21,637	21,646	21,752	21,662	21,660	21,661	21,874
	Other System	114,544	3,761	3,779	3,311	3,120	2,963	2,977	2,997	5,806	5,795	5,760	5,725	5,760	5,768	5,719	5,724	5,722	5,746	11,059	11,082	11,968
	Total	1,417,233	65,255	66,031	67,683	68,897	69,015	69,249	69,467	69,974	69,211	70,152	70,854	71,933	72,710	72,779	73,125	73,385	73,259	73,944	74,298	76,011
	Generation (GWH)																					
	JB12 GC	1,601	0	0	0	429	222	134	189	303	154	111	177	152	194	196	195	309	288	0	0	0

Discount Rate
6.88%

P02a-MMGR-BDG-GC ST Split Run Cost Data LT 9076 ST 19877

Total	Is FOM	Sample:	Mean

$ millions	NPV	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
1 Coal VOM Costs																					
Retired Coal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EOL Coal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2 Coal Fixed Costs																					
Retired Coal FOM	300	74	77	72	51	49	16	16	16	0	0	0	0	0	0	0	0	0	0	0	0
Reclamation Costs	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Retirement Costs	243	0	0	0	52	0	124	0	41	12	37	0	0	0	0	0	0	63	128	0	43
EOL Coal FOM	2,489	211	246	246	272	264	269	264	225	208	237	232	247	238	255	247	251	174	136	128	106
Total	3,032	285	323	318	374	313	409	280	283	220	274	232	247	238	255	247	251	237	264	128	149
3 Coal Fuel Costs																					
Retired Coal	346	174	102	104	8	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Retired Coal Start Fuel	10	4	4	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EOL Coal	3,272	400	432	428	520	401	341	338	304	302	240	228	201	191	173	163	174	170	60	59	60
EOL Coal Start Fuel	115	13	15	14	16	14	13	14	11	8	8	7	7	7	7	6	8	7	4	5	4
Total	3,743	591	553	550	544	418	354	352	315	310	248	236	208	198	180	170	182	177	64	65	64
4 Emission Cost (CO2)																					
Retired Coal	1	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EOL Coal	1,472	0	0	0	0	231	218	235	209	216	194	197	185	191	186	192	230	242	122	132	146
Total	1,474	0	0	0	0	232	218	235	209	216	194	197	185	191	186	192	230	242	122	132	146
5 Proxy Generation Costs																					
Solar VOM	23	(4)	(2)	4	4	4	4	4	4	4	4	4	4	4	4	4	4	1	1	0	0
Wind VOM	(3,444)	(309)	(311)	(333)	(335)	(482)	(535)	(555)	(546)	(573)	(586)	(211)	(219)	(206)	(203)	(51)	14	14	15	15	15
Gas VOM	151	10	12	14	12	13	12	13	13	13	13	14	16	14	16	17	17	19	20	20	20
Battery VOM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LT Contract VOM	871	108	109	129	127	110	100	99	98	95	64	36	36	35	35	35	34	29	28	28	28
QFs VOM	2,054	275	266	252	233	231	228	210	208	194	190	189	174	148	145	143	112	31	23	9	6
Other VOM	(56)	1	1	1	1	1	1	1	(36)	(35)	(35)	(35)	(36)	(35)	15	15	15	15	29	28	32
Fuel	3,447	248	275	291	273	277	259	286	293	303	322	342	379	343	387	413	423	425	452	469	509
Start Fuel	72	9	6	5	7	7	7	8	9	6	6	6	8	6	7	7	6	5	4	5	5
Energy not Served	16	2	0	8	0	0	2	2	0	1	2	2	2	1	0	1	4	0	0	0	0
Dumped Energy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Deficiency Cost	103	50	39	23	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
Emissions Costs	844	0	0	0	0	51	53	63	68	72	83	96	118	114	140	165	188	203	226	258	284
Total	4,083	390	395	395	325	214	131	129	113	79	63	443	481	424	547	749	818	742	799	834	900
VOM Integration, Wind + Solar																					
6 Proxy Generation Resource Fixed Costs																					
Generator Fixed / Build Costs	5,788	8	8	8	140	140	343	343	477	477	662	771	831	1,125	1,125	1,125	1,125	1,311	1,506	1,506	1,754
Battery Fixed / Build Costs	453	0	0	0	0	0	0	0	0	74	74	74	74	74	74	74	74	162	162	162	162
Solar FOM	1,762	0	0	0	92	129	154	157	168	169	211	234	239	293	299	303	310	349	350	355	374
Wind FOM	4,893	160	163	191	198	467	523	539	559	572	604	620	678	679	613	603	616	623	638	646	656
Gas FOM	438	36	38	38	40	41	42	43	46	49	52	54	55	33	34	34	35	36	37	37	37
Battery FOM	62	0	0	0	1	(1)	(1)	(2)	(0)	12	10	10	9	9	9	9	9	23	18	30	31
Other FOM	586	12	5	5	6	5	7	7	85	86	80	81	83	85	86	88	90	92	187	190	239
Use of Service	(6)	0	0	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(2)	(2)	(2)	(2)
Total	13,976	215	213	241	476	782	1,069	1,087	1,335	1,438	1,693	1,843	1,969	2,297	2,239	2,237	2,258	2,594	2,896	2,926	3,250
Remove Portfolio Credits																					
7 DSM Costs																					
DR VOM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DR FOM	610	0	6	19	29	34	38	42	46	51	55	60	63	86	90	105	117	138	157	166	230
EE VOM	1,085	9	21	30	40	50	60	74	88	103	121	138	153	167	181	195	205	221	240	260	276
EE FOM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	1,695	9	27	49	70	84	98	115	134	154	176	198	216	253	271	300	322	359	397	427	506
8 Market Costs																					
System Market Sales	(4,107)	(273)	(249)	(268)	(311)	(345)	(380)	(424)	(432)	(431)	(450)	(475)	(474)	(459)	(450)	(467)	(465)	(466)	(442)	(420)	(525)
System Market Purchases	1,250	80	68	74	68	77	64	69	77	97	103	118	122	130	151	173	200	235	291	316	368
Total	(2,857)	(193)	(181)	(194)	(243)	(268)	(316)	(355)	(354)	(333)	(348)	(357)	(352)	(329)	(299)	(294)	(265)	(231)	(151)	(104)	(157)
9 Transmission Costs																					
Transmission Build / Reinforcement Costs	1,341	0	0	0	1	99	151	151	157	157	159	177	199	214	214	214	214	256	256	256	296
Total	1,341	0	0	0	1	99	151	151	157	157	159	177	199	214	214	214	214	256	256	256	296

11 Total System Cost	26,299	1,297	1,330	1,358	1,547	1,845	2,084	1,967	2,162	2,212	2,431	2,939	3,124	3,456	3,634	3,784	3,981	4,346	4,618	4,633	5,123
Fixed	19,202	500	542	578	932	1,228	1,790	1,561	1,863	1,879	2,218	2,312	2,478	2,834	2,798	2,802	2,841	3,288	3,701	3,477	3,967
Variable	7,527	797	788	780	667	645	447	435	370	375	279	656	675	651	795	1,012	1,170	1,151	1,075	1,186	1,229
Adjustments	(187)	0	(0)	(0)	(0)	(29)	(29)	(29)	(29)	(29)	(29)	(29)	(30)	(30)	41	(30)	(30)	(30)	(30)	(30)	(30)
12 Risk Adjusted PVRR	26,648		349																		
Generation (GWH)																					
Retired Coal	17,392	7,447	5,204	4,374	277	89	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
EOL Coal	246,913	23,909	24,980	24,223	27,288	20,550	17,309	16,683	13,832	12,888	10,295	9,274	7,733	7,101	6,110	5,604	5,965	5,621	2,594	2,492	2,461
DSM	147,019	2,430	2,918	3,429	3,976	4,465	4,918	5,483	6,103	6,731	7,359	7,908	8,410	8,829	9,289	9,733	9,986	10,423	11,033	11,570	12,027
LT Contracts	32,363	1,441	1,685	2,597	3,063	2,434	2,264	2,229	2,213	2,149	1,656	1,204	1,185	1,172	1,160	1,145	1,132	925	914	904	891
QFs	73,171	5,736	5,611	5,384	5,067	5,024	4,970	4,719	4,682	4,460	4,410	4,384	4,172	3,667	3,371	3,330	2,627	655	552	256	94
Gas	224,627	10,112	11,549	13,232	11,011	11,263	10,448	11,086	10,708	10,393	10,655	11,009	11,866	10,301	11,249	11,754	11,921	11,589	11,444	11,669	11,368
Solar	205,843	1,223	1,271	1,467	5,600	6,777	8,354	8,344	8,634	8,755	10,090	11,246	11,222	14,291	14,273	14,253	14,228	16,400	16,397	16,372	16,644
Wind	362,823	9,171	9,224	9,704	10,016	15,855	18,280	18,289	18,387	18,345	20,171	20,179	21,711	21,609	21,630	21,641	21,751	21,662	21,661	21,660	21,875
Other System	106,103	3,767	3,776	3,307	3,090	2,942	2,971	2,990	5,802	5,790	5,758	5,725	5,760	5,768	5,730	5,729	5,714	5,750	8,297	8,282	9,154
Total	1,416,253	65,235	66,219	67,717	69,388	69,400	69,515	69,821	70,361	69,510	70,394	70,931	72,059	72,738	72,813	73,188	73,323	73,025	72,894	73,206	74,514

Discount Rate
6.88%

P02-MMGR-MN ST Split Run Cost Data LT 5230 ST 20612

Total | Is FOM | Sample: | Mean

$ millions	NPV	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
1 Coal VOM Costs																					
Retired Coal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EOL Coal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2 Coal Fixed Costs																					
Retired Coal FOM	426	77	94	79	67	63	30	30	32	13	13	13	13	14	13	13	14	17	0	0	0
Reclamation Costs	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Retirement Costs	243	0	0	0	0	0	124	0	41	12	37	0	0	0	0	0	0	63	259	0	43
EOL Coal FOM	2,489	211	246	246	272	264	269	264	225	208	237	232	247	238	255	247	251	174	136	128	106
Total	3,158	289	339	325	339	327	423	294	299	234	287	245	260	252	268	260	265	254	395	128	149
3 Coal Fuel Costs																					
Retired Coal	374	173	96	101	24	18	4	5	10	2	1	0	0	0	0	0	0	5	0	0	0
Retired Coal Start Fuel	18	4	4	4	3	2	1	2	2	1	0	0	0	0	0	0	0	1	0	0	0
EOL Coal	4,570	403	420	421	514	510	475	484	439	458	426	433	437	424	438	443	463	371	208	213	184
EOL Coal Start Fuel	123	13	15	14	16	14	13	13	10	9	10	10	10	10	10	10	10	8	5	5	5
Total	5,085	593	534	540	557	544	494	504	461	470	436	443	447	434	448	453	474	385	213	218	188
4 Emission Cost (CO2)																					
Retired Coal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EOL Coal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 Proxy Generation Costs																					
Solar VOM	23	(4)	(2)	4	4	4	4	4	4	4	4	4	4	4	4	4	4	1	1	0	0
Wind VOM	(3,441)	(309)	(311)	(332)	(335)	(480)	(534)	(553)	(545)	(573)	(586)	(211)	(219)	(206)	(203)	(52)	14	14	15	15	15
Gas VOM	111	11	14	16	15	10	8	8	9	8	8	7	6	5	6	6	7	13	14	14	16
Battery VOM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LT Contract VOM	871	108	109	129	127	110	100	99	98	95	64	36	36	35	35	35	34	29	28	28	28
QFs VOM	2,054	275	266	252	233	231	228	210	208	194	190	189	174	148	145	143	112	31	23	9	6
Other VOM	(45)	1	1	1	1	1	1	1	(36)	(35)	(35)	(35)	(36)	(35)	15	15	15	15	42	42	44
Fuel	2,498	271	305	309	301	221	175	187	215	210	191	167	159	134	150	157	176	283	301	324	385
Start Fuel	67	9	5	5	8	9	9	10	11	7	6	4	4	3	3	4	4	4	3	4	4
Energy not Served	15	1	0	8	0	0	2	2	0	1	2	2	2	1	0	1	3	0	0	0	0
Dumped Energy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Deficiency Cost	103	50	35	26	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Emissions Costs	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	2,255	413	421	416	360	106	(7)	(34)	(36)	(90)	(157)	162	130	88	155	313	368	390	427	436	498
VOM Integration, Wind + Solar																					
6 Proxy Generation Resource Fixed Costs																					
Generator Fixed / Build Costs	5,089	8	8	8	15	15	218	218	352	352	537	704	765	1,035	1,035	1,035	1,035	1,237	1,601	1,601	1,849
Battery Fixed / Build Costs	453	0	0	0	0	0	0	0	0	74	74	74	74	74	74	74	74	162	162	162	162
Solar FOM	1,593	0	0	0	63	100	125	128	139	140	181	220	225	280	285	289	295	344	344	350	368
Wind FOM	4,893	160	163	191	198	467	523	539	559	572	604	620	678	679	613	603	616	623	638	646	656
Gas FOM	438	36	38	38	40	41	42	43	46	49	52	54	55	33	34	34	35	36	37	37	37
Battery FOM	62	0	0	0	1	(1)	(1)	(2)	(0)	12	10	10	9	9	9	9	9	23	18	30	31
Other FOM	667	12	5	5	6	5	7	7	85	86	80	81	83	85	86	88	90	92	280	286	336
Use of Service	(6)	0	0	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(2)	(2)	(2)	(2)
Total	13,189	215	213	241	322	628	915	933	1,181	1,284	1,538	1,763	1,889	2,193	2,135	2,132	2,153	2,515	3,078	3,110	3,436
Remove Portfolio Credits																					
7 DSM Costs																					
DR VOM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DR FOM	610	0	6	19	29	34	38	42	46	51	55	60	63	86	90	105	117	138	157	166	230
EE VOM	1,085	9	21	30	40	50	60	74	88	103	121	138	153	167	181	195	205	221	240	260	276
EE FOM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	1,695	9	27	49	70	84	98	115	134	154	176	198	216	253	271	300	322	359	397	427	506
8 Market Costs																					
System Market Sales	(4,807)	(466)	(410)	(380)	(386)	(373)	(399)	(454)	(455)	(450)	(481)	(477)	(477)	(475)	(478)	(512)	(534)	(509)	(522)	(510)	(579)
System Market Purchases	720	88	82	83	74	52	33	38	49	54	55	56	53	53	57	57	64	93	105	107	157
Total	(4,087)	(378)	(328)	(297)	(312)	(320)	(366)	(416)	(405)	(396)	(426)	(421)	(424)	(422)	(421)	(454)	(471)	(416)	(417)	(404)	(422)
9 Transmission Costs																					
Transmission Build / Reinforcement Costs	1,341	0	0	0	1	99	151	151	157	157	159	177	199	214	214	214	214	256	256	256	296
Total	1,341	0	0	0	1	99	151	151	157	157	159	177	199	214	214	214	214	256	256	256	296

11 Total System Cost	22,449	1,140	1,206	1,275	1,336	1,439	1,678	1,519	1,761	1,783	1,983	2,538	2,689	2,981	3,110	3,187	3,296	3,714	4,319	4,142	4,620
Fixed	18,298	503	558	585	691	1,089	1,526	1,420	1,683	1,725	2,039	2,246	2,411	2,744	2,707	2,711	2,749	3,164	3,886	3,661	4,110
Variable	4,339	636	648	689	645	380	181	127	107	86	(26)	322	307	267	362	506	577	580	463	510	540
Adjustments	(187)	0	(0)	(0)	(0)	(29)	(29)	(29)	(29)	(29)	(29)	(29)	(30)	(30)	41	(30)	(30)	(30)	(30)	(30)	(30)
12 Risk Adjusted PVRR	22,637		188																		
Generation (GWH)																					
Retired Coal	18,524	7,378	4,853	4,289	794	550	118	127	245	59	12	1	0	-	-	-	-	97	-	-	-
EOL Coal	383,064	24,043	24,239	23,774	27,179	26,640	24,844	24,749	20,624	20,396	19,070	18,728	18,505	17,514	17,567	17,886	18,385	14,065	8,786	8,848	7,219
DSM	147,207	2,446	2,942	3,447	3,994	4,479	4,955	5,524	6,127	6,731	7,358	7,907	8,411	8,827	9,289	9,733	9,986	10,423	11,033	11,570	12,026
LT Contracts	32,363	1,441	1,685	2,597	3,063	2,434	2,264	2,229	2,213	2,149	1,656	1,204	1,185	1,172	1,160	1,145	1,132	925	914	904	891
QFs	73,171	5,736	5,611	5,384	5,067	5,024	4,970	4,719	4,682	4,460	4,410	4,384	4,172	3,667	3,371	3,330	2,627	655	552	256	94
Gas	156,082	11,037	13,377	14,480	13,276	8,936	6,798	7,019	7,537	6,959	6,199	5,287	4,931	3,914	4,378	4,500	4,943	7,673	7,895	8,075	8,868
Solar	188,773	1,223	1,271	1,467	3,815	5,002	6,651	6,627	6,879	6,922	8,264	10,550	10,524	13,597	13,577	13,561	13,536	16,289	16,264	16,240	16,513
Wind	362,361	9,172	9,228	9,701	10,007	15,804	18,222	18,223	18,375	18,345	20,142	20,133	21,678	21,575	21,601	21,609	21,718	21,647	21,654	21,652	21,875
Other System	114,828	3,857	3,962	3,457	3,213	2,958	2,974	2,965	5,797	5,791	5,760	5,725	5,759	5,767	5,697	5,695	5,695	5,717	11,001	11,027	12,010
Total	1,476,373	66,333	67,168	68,596	70,409	71,828	71,797	72,182	72,479	71,811	72,872	73,919	75,165	76,034	76,641	77,459	78,021	77,491	78,100	78,571	79,496
Generation (GWH)																					
JB12 GC	977	0	0	0	525	281	118	127	245	59	12	1	0	0	0	0	0	97	0	0	0

Discount Rate
6.88%

P02a-MMGR-BDG-GC-MN ST Split Run Cost Data LT 9076 ST 20969

Total	Is FOM	Sample:	Mean

$ millions	NPV	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
1 Coal VOM Costs																					
Retired Coal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EOL Coal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2 Coal Fixed Costs																					
Retired Coal FOM	300	74	77	72	51	49	16	16	16	0	0	0	0	0	0	0	0	0	0	0	0
Reclamation Costs	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Retirement Costs	243	0	0	0	52	0	124	0	41	12	37	0	0	0	0	0	0	63	128	0	43
EOL Coal FOM	2,489	211	246	246	272	264	269	264	225	208	237	232	247	238	255	247	251	174	136	128	106
Total	3,032	285	323	318	374	313	409	280	283	220	274	232	247	238	255	247	251	237	264	128	149
3 Coal Fuel Costs																					
Retired Coal	346	173	102	102	8	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Retired Coal Start Fuel	11	4	4	4	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EOL Coal	4,514	403	416	421	503	497	463	475	431	449	416	424	435	417	428	435	459	370	220	226	194
EOL Coal Start Fuel	124	14	15	14	16	14	13	13	10	9	10	10	10	10	10	10	11	9	6	5	5
Total	4,995	593	537	541	528	519	476	489	440	457	426	434	445	428	438	445	469	379	226	231	199
4 Emission Cost (CO2)																					
Retired Coal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EOL Coal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 Proxy Generation Costs																					
Solar VOM	23	(4)	(2)	4	4	4	4	4	4	4	4	4	4	4	4	4	4	1	1	0	0
Wind VOM	(3,441)	(309)	(311)	(333)	(335)	(481)	(534)	(554)	(545)	(573)	(586)	(211)	(219)	(206)	(203)	(52)	14	14	15	15	15
Gas VOM	108	11	14	16	15	10	7	7	8	7	7	6	6	5	6	6	6	13	16	16	18
Battery VOM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LT Contract VOM	871	108	109	129	127	110	100	99	98	95	64	36	36	35	35	35	34	29	28	28	28
QFs VOM	2,054	275	266	252	233	231	228	210	208	194	190	189	174	148	145	143	112	31	23	9	6
Other VOM	(57)	1	1	1	1	1	1	1	(36)	(36)	(35)	(35)	(36)	(35)	15	15	15	15	28	28	31
Fuel	2,439	271	304	309	298	208	156	165	194	181	161	161	150	126	145	150	167	283	348	370	436
Start Fuel	58	9	5	5	6	8	7	7	9	5	4	4	4	3	3	4	4	4	4	4	4
Energy not Served	15	1	0	8	0	0	2	2	0	1	2	2	2	1	0	1	3	0	0	0	0
Dumped Energy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Deficiency Cost	103	50	39	24	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Emissions Costs	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	2,173	412	424	414	352	91	(30)	(59)	(60)	(122)	(190)	155	121	80	149	306	359	389	463	470	538
VOM Integration, Wind + Solar																					
6 Proxy Generation Resource Fixed Costs																					
Generator Fixed / Build Costs	5,788	8	8	8	140	140	343	343	477	477	662	771	831	1,125	1,125	1,125	1,125	1,311	1,506	1,506	1,754
Battery Fixed / Build Costs	453	0	0	0	0	0	0	0	0	74	74	74	74	74	74	74	74	162	162	162	162
Solar FOM	1,762	0	0	0	92	129	154	157	168	169	211	234	239	293	299	303	310	349	350	355	374
Wind FOM	4,893	160	163	191	198	467	523	539	559	572	604	620	678	679	613	603	616	623	638	646	656
Gas FOM	438	36	38	38	40	41	42	43	46	49	52	54	55	33	34	34	35	36	37	37	37
Battery FOM	62	0	0	0	1	(1)	(1)	(2)	(0)	12	10	10	9	9	9	9	9	23	18	30	31
Other FOM	586	12	5	5	6	5	7	7	85	86	80	81	83	85	86	88	90	92	187	190	239
Use of Service	(6)	0	0	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(2)	(2)	(2)	(2)
Total	13,976	215	213	241	476	782	1,069	1,087	1,335	1,438	1,693	1,843	1,969	2,297	2,239	2,237	2,258	2,594	2,896	2,926	3,250
Remove Portfolio Credits																					
7 DSM Costs																					
DR VOM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DR FOM	610	0	6	19	29	34	38	42	46	51	55	60	63	86	90	105	117	138	157	166	230
EE VOM	1,085	9	21	30	40	50	60	74	88	103	121	138	153	167	181	195	205	221	240	260	276
EE FOM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	1,695	9	27	49	70	84	98	115	134	154	176	198	216	253	271	300	322	359	397	427	506
8 Market Costs																					
System Market Sales	(4,798)	(467)	(411)	(380)	(393)	(377)	(402)	(457)	(458)	(452)	(483)	(477)	(478)	(476)	(479)	(512)	(535)	(505)	(498)	(482)	(533)
System Market Purchases	718	88	80	83	65	46	30	34	44	50	52	55	52	51	56	57	62	95	128	134	188
Total	(4,080)	(379)	(331)	(296)	(328)	(331)	(372)	(422)	(413)	(402)	(431)	(422)	(426)	(424)	(422)	(455)	(473)	(410)	(370)	(349)	(345)
9 Transmission Costs																					
Transmission Build / Reinforcement Costs	1,341	0	0	0	1	99	151	151	157	157	159	177	199	214	214	214	214	256	256	256	296
Total	1,341	0	0	0	1	99	151	151	157	157	159	177	199	214	214	214	214	256	256	256	296

11 Total System Cost	22,944	1,135	1,193	1,266	1,472	1,528	1,771	1,613	1,847	1,874	2,078	2,588	2,742	3,055	3,186	3,263	3,371	3,775	4,101	4,060	4,561
Fixed	18,959	500	542	578	881	1,228	1,666	1,561	1,822	1,867	2,181	2,312	2,478	2,834	2,798	2,802	2,841	3,225	3,573	3,477	3,924
Variable	4,172	636	652	688	592	329	134	81	55	37	(74)	305	293	250	346	491	560	580	558	613	667
Adjustments	(187)	0	(0)	(0)	(0)	(29)	(29)	(29)	(29)	(29)	(29)	(29)	(30)	(30)	41	(30)	(30)	(30)	(30)	(30)	(30)
12 Risk Adjusted PVRR	23,123		179																		
Generation (GWH)																					
Retired Coal	17,366	7,374	5,213	4,234	275	270	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
EOL Coal	378,667	24,073	24,063	23,837	26,488	25,973	24,174	24,230	20,205	19,957	18,627	18,401	18,280	17,242	17,181	17,498	18,146	14,010	9,324	9,350	7,608
DSM	147,104	2,446	2,936	3,450	3,985	4,452	4,930	5,500	6,116	6,731	7,357	7,907	8,409	8,826	9,288	9,733	9,986	10,423	11,033	11,570	12,027
LT Contracts	32,362	1,441	1,685	2,597	3,063	2,434	2,264	2,229	2,213	2,149	1,656	1,204	1,185	1,172	1,160	1,145	1,132	925	914	904	891
QFs	73,167	5,736	5,611	5,380	5,067	5,024	4,970	4,719	4,682	4,460	4,410	4,384	4,172	3,667	3,371	3,330	2,627	655	552	256	94
Gas	153,630	11,013	13,361	14,471	13,220	8,481	6,144	6,258	6,813	6,046	5,256	5,092	4,650	3,687	4,235	4,318	4,681	7,656	9,124	9,220	9,902
Solar	205,916	1,223	1,271	1,466	5,625	6,772	8,411	8,377	8,651	8,732	10,078	11,241	11,216	14,286	14,269	14,253	14,229	16,400	16,397	16,372	16,645
Wind	362,281	9,171	9,219	9,709	10,018	15,818	18,228	18,232	18,372	18,345	20,122	20,118	21,660	21,559	21,586	21,598	21,710	21,646	21,651	21,644	21,875
Other System	106,320	3,860	3,946	3,457	3,171	2,944	2,940	2,945	5,789	5,778	5,758	5,724	5,758	5,766	5,692	5,688	5,689	5,718	8,237	8,257	9,205
Total	1,476,814	66,337	67,304	68,602	70,911	72,168	72,064	72,489	72,842	72,198	73,264	74,071	75,330	76,206	76,783	77,564	78,200	77,432	77,231	77,573	78,246

Discount Rate
6.88%

P02-MMGR-LN ST Split Run Cost Data LT 5230 ST 20591

Total Is FOM Sample: Mean

$ millions	NPV	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
1 Coal VOM Costs																					
Retired Coal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EOL Coal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2 Coal Fixed Costs																					
Retired Coal FOM	426	77	94	79	67	63	30	30	32	13	13	13	13	14	13	13	14	17	0	0	0
Reclamation Costs	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Retirement Costs	243	0	0	0	0	0	124	0	41	12	37	0	0	0	0	0	0	63	259	0	43
EOL Coal FOM	2,489	211	246	246	272	264	269	264	225	208	237	232	247	238	255	247	251	174	136	128	106
Total	3,158	289	339	325	339	327	423	294	299	234	287	245	260	252	268	260	265	254	395	128	149
3 Coal Fuel Costs																					
Retired Coal	396	170	88	100	29	24	13	10	13	8	11	5	4	0	0	0	0	5	0	0	0
Retired Coal Start Fuel	18	3	3	4	3	2	1	1	2	1	2	1	1	0	0	0	0	1	0	0	0
EOL Coal	3,312	325	358	355	396	338	310	336	297	286	232	235	235	289	317	359	397	321	180	187	162
EOL Coal Start Fuel	109	13	13	13	14	14	12	12	9	8	8	6	7	7	8	8	9	7	5	5	3
Total	3,834	511	463	472	442	378	336	359	321	302	253	248	247	296	325	367	406	334	184	192	165
4 Emission Cost (CO2)																					
Retired Coal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EOL Coal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 Proxy Generation Costs																					
Solar VOM	23	(4)	(2)	4	4	4	4	4	4	4	4	4	4	4	4	4	4	1	1	0	0
Wind VOM	(3,444)	(310)	(312)	(333)	(335)	(481)	(535)	(554)	(545)	(573)	(586)	(211)	(219)	(206)	(203)	(52)	14	14	15	15	15
Gas VOM	166	14	17	18	19	17	16	15	16	17	17	16	16	12	12	10	10	16	15	16	18
Battery VOM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LT Contract VOM	871	108	109	129	127	110	100	99	98	95	64	36	36	35	35	35	34	29	28	28	28
QFs VOM	2,054	275	266	252	233	231	228	210	208	194	190	189	174	148	145	143	112	31	23	9	6
Other VOM	(46)	1	1	1	1	1	1	1	(36)	(35)	(35)	(35)	(36)	(35)	15	15	15	15	41	41	44
Fuel	2,407	216	220	241	236	221	209	213	218	241	241	236	244	197	201	181	180	249	243	252	297
Start Fuel	43	5	2	2	3	4	5	6	6	5	4	4	5	4	4	4	4	3	3	3	3
Energy not Served	16	3	0	8	0	0	1	2	0	1	2	2	2	1	0	1	3	0	0	0	0
Dumped Energy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Deficiency Cost	111	50	36	25	13	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Emissions Costs	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	2,201	358	337	346	301	109	29	(5)	(31)	(54)	(100)	240	226	160	213	342	377	357	370	364	410
VOM Integration, Wind + Solar																					
6 Proxy Generation Resource Fixed Costs																					
Generator Fixed / Build Costs	5,089	8	8	8	15	15	218	218	352	352	537	704	765	1,035	1,035	1,035	1,035	1,237	1,601	1,601	1,849
Battery Fixed / Build Costs	453	0	0	0	0	0	0	0	0	74	74	74	74	74	74	74	74	162	162	162	162
Solar FOM	1,593	0	0	0	63	100	125	128	139	140	181	220	225	280	285	289	295	344	344	350	368
Wind FOM	4,893	160	163	191	198	467	523	539	559	572	604	620	678	679	613	603	616	623	638	646	656
Gas FOM	438	36	38	38	40	41	42	43	46	49	52	54	55	33	34	34	35	36	37	37	37
Battery FOM	62	0	0	0	1	(1)	(1)	(2)	(0)	12	10	10	9	9	9	9	9	23	18	30	31
Other FOM	667	12	5	5	6	5	7	7	85	86	80	81	83	85	86	88	90	92	280	286	336
Use of Service	(6)	0	0	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(2)	(2)	(2)	(2)
Total	13,189	215	213	241	322	628	915	933	1,181	1,284	1,538	1,763	1,889	2,193	2,135	2,132	2,153	2,515	3,078	3,110	3,436
Remove Portfolio Credits																					
7 DSM Costs																					
DR VOM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DR FOM	610	0	6	19	29	34	38	42	46	51	55	60	63	86	90	105	117	138	157	166	230
EE VOM	1,085	9	21	30	40	50	60	74	88	103	121	138	153	167	181	195	205	221	240	260	276
EE FOM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	1,695	9	27	49	70	84	98	115	134	154	176	198	216	253	271	300	322	359	397	427	506
8 Market Costs																					
System Market Sales	(3,157)	(210)	(192)	(208)	(214)	(230)	(272)	(317)	(313)	(310)	(322)	(318)	(330)	(366)	(378)	(403)	(415)	(412)	(412)	(394)	(479)
System Market Purchases	545	69	52	60	52	46	30	31	38	45	48	48	46	41	44	44	47	65	70	73	107
Total	(2,612)	(142)	(140)	(148)	(162)	(184)	(242)	(286)	(276)	(265)	(274)	(270)	(284)	(325)	(334)	(359)	(368)	(347)	(341)	(321)	(371)
9 Transmission Costs																					
Transmission Build / Reinforcement Costs	1,341	0	0	0	1	99	151	151	157	157	159	177	199	214	214	214	214	256	256	256	296
Total	1,341	0	0	0	1	99	151	151	157	157	159	177	199	214	214	214	214	256	256	256	296

11 Total System Cost	22,620	1,240	1,239	1,284	1,312	1,413	1,681	1,533	1,757	1,783	2,009	2,572	2,724	3,012	3,133	3,226	3,339	3,700	4,309	4,127	4,560
Fixed	18,298	503	558	585	691	1,089	1,526	1,420	1,683	1,725	2,039	2,246	2,411	2,744	2,707	2,711	2,749	3,164	3,886	3,661	4,110
Variable	4,509	737	680	699	622	353	183	141	103	87	(0)	356	342	298	385	545	620	566	453	496	480
Adjustments	(187)	0	(0)	(0)	(0)	(29)	(29)	(29)	(29)	(29)	(29)	(29)	(30)	(30)	41	(30)	(30)	(30)	(30)	(30)	(30)
12 Risk Adjusted PVRR	22,821		201																		
Generation (GWH)																					
Retired Coal	21,697	7,132	4,403	4,212	1,652	1,286	681	456	584	327	449	213	160	3	0	0	-	138	-	-	-
EOL Coal	274,282	19,324	20,501	19,888	20,347	17,450	16,069	17,143	13,637	12,243	10,136	9,807	9,520	11,697	12,593	14,348	15,565	12,117	7,687	7,807	6,404
DSM	147,261	2,454	2,954	3,447	3,996	4,486	4,960	5,530	6,138	6,731	7,359	7,908	8,411	8,828	9,289	9,733	9,986	10,423	11,033	11,570	12,026
LT Contracts	32,361	1,441	1,684	2,597	3,063	2,434	2,264	2,229	2,213	2,149	1,656	1,204	1,185	1,172	1,160	1,145	1,132	925	914	904	891
QFs	73,171	5,736	5,611	5,384	5,067	5,024	4,970	4,719	4,682	4,460	4,410	4,384	4,172	3,667	3,371	3,330	2,627	655	552	256	94
Gas	239,634	13,840	15,935	16,743	16,967	15,096	13,656	13,212	13,054	13,477	13,196	12,474	12,470	9,058	8,708	7,509	7,188	9,331	8,904	8,984	9,832
Solar	188,802	1,223	1,271	1,467	3,821	4,990	6,648	6,629	6,885	6,931	8,267	10,554	10,530	13,601	13,582	13,562	13,536	16,289	16,264	16,240	16,513
Wind	362,654	9,187	9,248	9,720	10,021	15,831	18,256	18,253	18,385	18,345	20,155	20,161	21,697	21,594	21,621	21,617	21,729	21,650	21,656	21,653	21,875
Other System	116,576	4,016	4,198	3,638	3,482	3,400	3,188	3,097	5,900	5,903	5,758	5,726	5,761	5,768	5,707	5,682	5,679	5,719	10,971	10,994	11,988
Total	1,456,439	64,352	65,805	67,095	68,415	69,998	70,693	71,267	71,477	70,567	71,387	72,431	73,906	75,388	76,031	76,925	77,442	77,246	77,982	78,408	79,623
Generation (GWH)																					
JB12 GC	3,754	0	0	0	1,501	1,236	681	456	584	327	449	213	160	3	0	0	0	138	0	0	0

Discount Rate
6.88%

P02a-MMGR-BDG-GC-LN ST Split Run Cost Data LT 9076 ST 23132

Total Is FOM Sample: Mean

$ millions	NPV	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
1 Coal VOM Costs																					
Retired Coal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EOL Coal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2 Coal Fixed Costs																					
Retired Coal FOM	300	74	77	72	51	49	16	16	16	0	0	0	0	0	0	0	0	0	0	0	0
Reclamation Costs	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Retirement Costs	243	0	0	0	52	0	124	0	41	12	37	0	0	0	0	0	0	63	128	0	43
EOL Coal FOM	2,489	211	246	246	272	264	269	264	225	208	237	232	247	238	255	247	251	174	136	128	106
Total	3,032	285	323	318	374	313	409	280	283	220	274	232	247	238	255	247	251	237	264	128	149
3 Coal Fuel Costs																					
Retired Coal	328	170	96	98	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Retired Coal Start Fuel	9	3	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EOL Coal	3,250	324	350	357	391	334	300	323	286	269	211	230	229	281	314	354	389	320	189	198	168
EOL Coal Start Fuel	107	13	13	13	14	12	12	12	9	7	7	7	7	7	7	8	9	7	5	5	4
Total	3,694	511	463	471	409	347	312	335	295	276	218	237	236	288	321	363	398	327	193	203	172
4 Emission Cost (CO2)																					
Retired Coal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EOL Coal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 Proxy Generation Costs																					
Solar VOM	23	(4)	(2)	4	4	4	4	4	4	4	4	4	4	4	4	4	4	1	1	0	0
Wind VOM	(3,444)	(310)	(312)	(332)	(336)	(481)	(535)	(554)	(545)	(573)	(586)	(211)	(219)	(206)	(203)	(52)	14	14	15	15	15
Gas VOM	166	14	17	18	19	17	15	15	15	16	16	16	16	12	12	10	10	16	18	18	20
Battery VOM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LT Contract VOM	870	108	109	129	127	110	100	99	98	95	64	36	36	35	35	35	34	29	28	28	28
QFs VOM	2,054	275	266	252	233	231	228	210	208	194	190	189	174	148	145	143	112	31	23	9	6
Other VOM	(57)	1	1	1	1	1	1	1	(36)	(35)	(35)	(35)	(36)	(35)	15	15	15	15	28	28	31
Fuel	2,419	216	220	241	238	221	206	210	214	234	237	234	242	194	194	176	177	248	279	289	339
Start Fuel	41	5	2	2	3	4	4	5	5	4	4	4	5	4	4	4	4	3	3	3	4
Energy not Served	16	2	0	8	0	0	1	2	0	1	2	2	2	1	0	1	3	0	0	0	0
Dumped Energy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Deficiency Cost	106	51	40	24	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Emissions Costs	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	2,194	357	341	346	292	108	25	(10)	(36)	(62)	(104)	238	223	156	206	336	372	357	395	390	441
VOM Integration, Wind + Solar																					
6 Proxy Generation Resource Fixed Costs																					
Generator Fixed / Build Costs	5,788	8	8	8	140	140	343	343	477	477	662	771	831	1,125	1,125	1,125	1,125	1,311	1,506	1,506	1,754
Battery Fixed / Build Costs	453	0	0	0	0	0	0	0	0	74	74	74	74	74	74	74	74	162	162	162	162
Solar FOM	1,762	0	0	0	92	129	154	157	168	169	211	234	239	293	299	303	310	349	350	355	374
Wind FOM	4,893	160	163	191	198	467	523	539	559	572	604	620	678	679	613	603	616	623	638	646	656
Gas FOM	438	36	38	38	40	41	42	43	46	49	52	54	55	33	34	34	35	36	37	37	37
Battery FOM	62	0	0	0	1	(1)	(1)	(2)	(0)	12	10	10	9	9	9	9	9	23	18	30	31
Other FOM	586	12	5	5	6	5	7	7	85	86	80	81	83	85	86	88	90	92	187	190	239
Use of Service	(6)	0	0	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(2)	(2)	(2)	(2)
Total	13,976	215	213	241	476	782	1,069	1,087	1,335	1,438	1,693	1,843	1,969	2,297	2,239	2,237	2,258	2,594	2,896	2,926	3,250
Remove Portfolio Credits																					
7 DSM Costs																					
DR VOM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DR FOM	610	0	6	19	29	34	38	42	46	51	55	60	63	86	90	105	117	138	157	166	230
EE VOM	1,085	9	21	30	40	50	60	74	88	103	121	138	153	167	181	195	205	221	240	260	276
EE FOM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	1,695	9	27	49	70	84	98	115	134	154	176	198	216	253	271	300	322	359	397	427	506
8 Market Costs																					
System Market Sales	(3,142)	(210)	(193)	(208)	(217)	(232)	(274)	(320)	(315)	(311)	(323)	(316)	(329)	(367)	(379)	(404)	(416)	(407)	(391)	(373)	(441)
System Market Purchases	551	69	51	60	48	41	28	30	35	44	48	48	46	41	43	43	46	68	88	92	133
Total	(2,591)	(141)	(141)	(147)	(169)	(191)	(246)	(290)	(279)	(267)	(274)	(269)	(283)	(326)	(335)	(361)	(370)	(340)	(303)	(281)	(308)
9 Transmission Costs																					
Transmission Build / Reinforcement Costs	1,341	0	0	0	1	99	151	151	157	157	159	177	199	214	214	214	214	256	256	256	296
Total	1,341	0	0	0	1	99	151	151	157	157	159	177	199	214	214	214	214	256	256	256	296

11	Total System Cost	23,154	1,236	1,226	1,278	1,453	1,513	1,788	1,641	1,860	1,888	2,112	2,627	2,779	3,090	3,212	3,305	3,416	3,761	4,068	4,019	4,475
	Fixed	18,959	500	542	578	881	1,228	1,666	1,561	1,822	1,867	2,181	2,312	2,478	2,834	2,798	2,802	2,841	3,225	3,573	3,477	3,924
	Variable	4,382	736	684	700	572	313	151	109	68	50	(40)	344	330	286	373	533	605	566	525	572	581
	Adjustments	(187)	0	(0)	(0)	(0)	(29)	(29)	(29)	(29)	(29)	(29)	(29)	(30)	(30)	41	(30)	(30)	(30)	(30)	(30)	(30)
12	Risk Adjusted PVRR	23,350		196																		
	Generation (GWH)																					
	Retired Coal	16,231	7,158	4,782	4,092	161	38	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	EOL Coal	269,101	19,306	20,147	19,970	20,096	17,236	15,420	16,361	13,056	11,440	9,226	9,526	9,255	11,349	12,370	14,058	15,231	12,075	8,090	8,226	6,661
	DSM	147,172	2,454	2,956	3,449	3,991	4,463	4,942	5,510	6,112	6,731	7,359	7,908	8,409	8,828	9,289	9,733	9,986	10,423	11,033	11,570	12,027
	LT Contracts	32,356	1,440	1,684	2,592	3,063	2,434	2,264	2,229	2,213	2,149	1,656	1,204	1,185	1,172	1,160	1,145	1,132	925	914	904	891
	QFs	73,169	5,736	5,611	5,382	5,067	5,024	4,970	4,719	4,682	4,460	4,410	4,384	4,172	3,667	3,371	3,330	2,627	655	552	256	94
	Gas	240,715	13,830	15,949	16,757	16,965	14,991	13,426	12,904	12,693	13,079	12,957	12,366	12,332	8,882	8,430	7,284	7,047	9,301	10,228	10,291	11,004
	Solar	205,986	1,223	1,271	1,467	5,635	6,760	8,410	8,385	8,664	8,753	10,089	11,246	11,223	14,291	14,273	14,253	14,229	16,400	16,397	16,372	16,645
	Wind	362,583	9,187	9,250	9,681	10,042	15,843	18,269	18,267	18,382	18,345	20,151	20,152	21,681	21,579	21,607	21,601	21,720	21,647	21,654	21,650	21,875
	Other System	108,433	4,020	4,184	3,645	3,552	3,445	3,184	3,132	5,945	5,903	5,758	5,725	5,760	5,769	5,700	5,670	5,671	5,719	8,222	8,238	9,190
	Total	1,455,748	64,354	65,835	67,036	68,571	70,234	70,887	71,507	71,746	70,860	71,606	72,512	74,017	75,537	76,200	77,074	77,642	77,144	77,091	77,507	78,386

Discount Rate
6.88%

P02-MMGR-HH ST Split Run Cost Data LT 5230 ST 20570

Total Is FOM Sample: Mean

$ millions	NPV	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
1 Coal VOM Costs																					
Retired Coal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EOL Coal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2 Coal Fixed Costs																					
Retired Coal FOM	426	77	94	79	67	63	30	30	32	13	13	13	13	14	13	13	14	17	0	0	0
Reclamation Costs	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Retirement Costs	243	0	0	0	0	0	124	0	41	12	37	0	0	0	0	0	0	63	259	0	43
EOL Coal FOM	2,489	211	246	246	272	264	269	264	225	208	237	232	247	238	255	247	251	174	136	128	106
Total	3,158	289	339	325	339	327	423	294	299	234	287	245	260	252	268	260	265	254	395	128	149
3 Coal Fuel Costs																					
Retired Coal	431	171	97	117	24	17	7	9	12	7	2	11	8	9	17	14	19	23	0	0	0
Retired Coal Start Fuel	26	4	4	4	3	3	2	2	3	1	1	2	2	1	2	2	2	2	0	0	0
EOL Coal	3,119	422	459	469	538	366	318	319	285	257	183	163	160	154	147	141	150	138	34	32	26
EOL Coal Start Fuel	126	13	15	15	15	17	16	17	14	11	13	8	7	7	7	6	8	7	3	3	3
Total	3,703	610	575	605	580	403	342	347	314	277	200	184	178	171	173	164	180	171	37	35	29
4 Emission Cost (CO2)																					
Retired Coal	39	0	0	0	0	10	3	4	5	3	1	5	4	5	9	8	12	16	0	0	0
EOL Coal	2,478	0	0	0	0	460	433	467	420	377	300	275	286	295	300	309	364	353	123	124	106
Total	2,517	0	0	0	0	470	436	471	425	380	301	280	290	300	309	317	376	369	123	124	106
5 Proxy Generation Costs																					
Solar VOM	23	(4)	(2)	4	4	4	4	4	4	4	4	4	4	4	4	4	4	1	1	0	0
Wind VOM	(3,443)	(309)	(310)	(332)	(334)	(482)	(536)	(555)	(546)	(573)	(586)	(211)	(219)	(206)	(203)	(51)	14	14	15	15	15
Gas VOM	149	10	11	12	11	14	14	14	14	15	17	16	16	15	15	16	17	18	16	17	17
Battery VOM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LT Contract VOM	871	108	109	129	127	110	100	99	98	95	64	36	36	35	35	35	34	29	28	28	28
QFs VOM	2,054	275	266	252	233	231	228	210	208	194	190	189	174	148	145	143	112	31	23	9	6
Other VOM	(44)	1	1	1	1	1	1	1	(36)	(35)	(35)	(35)	(36)	(35)	15	15	15	15	43	43	46
Fuel	4,380	267	322	350	320	371	360	393	390	437	474	470	487	471	512	537	558	539	495	517	544
Start Fuel	100	11	9	9	11	9	9	10	12	9	8	8	10	9	10	11	9	7	6	6	6
Energy not Served	15	1	0	8	0	0	2	2	0	1	1	2	2	1	0	1	3	0	0	0	0
Dumped Energy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Deficiency Cost	102	50	35	25	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Emissions Costs	1,653	0	0	0	0	127	130	148	155	181	209	219	241	235	268	304	343	353	341	388	412
Total	5,860	410	439	458	378	387	311	325	300	326	346	698	715	676	801	1,015	1,109	1,007	968	1,024	1,074
VOM Integration, Wind + Solar																					
6 Proxy Generation Resource Fixed Costs																					
Generator Fixed / Build Costs	5,089	8	8	8	15	15	218	218	352	352	537	704	765	1,035	1,035	1,035	1,035	1,237	1,601	1,601	1,849
Battery Fixed / Build Costs	453	0	0	0	0	0	0	0	0	74	74	74	74	74	74	74	74	162	162	162	162
Solar FOM	1,593	0	0	0	63	100	125	128	139	140	181	220	225	280	285	289	295	344	344	350	368
Wind FOM	4,893	160	163	191	198	467	523	539	559	572	604	620	678	679	613	603	616	623	638	646	656
Gas FOM	438	36	38	38	40	41	42	43	46	49	52	54	55	33	34	34	35	36	37	37	37
Battery FOM	62	0	0	0	1	(1)	(1)	(2)	(0)	12	10	10	9	9	9	9	9	23	18	30	31
Other FOM	667	12	5	5	6	5	7	7	85	86	80	81	83	85	86	88	90	92	280	286	336
Use of Service	(6)	0	0	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(2)	(2)	(2)	(2)
Total	13,189	215	213	241	322	628	915	933	1,181	1,284	1,538	1,763	1,889	2,193	2,135	2,132	2,153	2,515	3,078	3,110	3,436
Remove Portfolio Credits																					
7 DSM Costs																					
DR VOM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DR FOM	610	0	6	19	29	34	38	42	46	51	55	60	63	86	90	105	117	138	157	166	230
EE VOM	1,085	9	21	30	40	50	60	74	88	103	121	138	153	167	181	195	205	221	240	260	276
EE FOM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	1,695	9	27	49	70	84	98	115	134	154	176	198	216	253	271	300	322	359	397	427	506
8 Market Costs																					
System Market Sales	(4,553)	(292)	(290)	(326)	(325)	(357)	(423)	(481)	(487)	(473)	(485)	(494)	(507)	(523)	(518)	(517)	(529)	(507)	(509)	(502)	(576)
System Market Purchases	2,085	84	91	93	98	152	136	139	150	193	206	227	236	245	286	314	355	401	415	446	521
Total	(2,468)	(208)	(199)	(232)	(227)	(205)	(288)	(341)	(337)	(280)	(279)	(267)	(271)	(277)	(232)	(203)	(173)	(106)	(93)	(56)	(56)
9 Transmission Costs																					
Transmission Build / Reinforcement Costs	1,341	0	0	0	1	99	151	151	157	157	159	177	199	214	214	214	214	256	256	256	296
Total	1,341	0	0	0	1	99	151	151	157	157	159	177	199	214	214	214	214	256	256	256	296

11 Total System Cost	28,807	1,324	1,394	1,446	1,462	2,164	2,359	2,266	2,443	2,502	2,698	3,249	3,446	3,750	3,980	4,168	4,416	4,797	5,131	5,019	5,509
Fixed	18,298	503	558	585	691	1,089	1,526	1,420	1,683	1,725	2,039	2,246	2,411	2,744	2,707	2,711	2,749	3,164	3,886	3,661	4,110
Variable	10,697	821	836	861	771	1,104	861	875	789	806	689	1,033	1,065	1,036	1,232	1,487	1,697	1,663	1,275	1,388	1,429
Adjustments	(187)	0	(0)	(0)	(0)	(29)	(29)	(29)	(29)	(29)	(29)	(29)	(30)	(30)	41	(30)	(30)	(30)	(30)	(30)	(30)
12 Risk Adjusted PVRR	29,308		501																		
Generation (GWH)																					
Retired Coal	20,814	7,279	4,902	5,126	639	432	154	187	253	135	48	213	150	151	270	222	296	358	-	-	-
EOL Coal	226,056	24,948	26,322	26,175	28,375	18,162	15,526	15,223	12,787	10,542	7,524	6,281	5,902	5,472	5,025	4,672	4,971	4,380	1,440	1,314	1,015
DSM	146,998	2,413	2,908	3,365	3,980	4,484	4,931	5,500	6,115	6,732	7,359	7,909	8,411	8,829	9,290	9,733	9,986	10,423	11,033	11,570	12,027
LT Contracts	32,363	1,441	1,685	2,597	3,063	2,434	2,264	2,229	2,213	2,149	1,656	1,204	1,185	1,172	1,160	1,145	1,132	925	914	904	891
QFs	73,171	5,736	5,611	5,384	5,067	5,024	4,970	4,719	4,682	4,460	4,410	4,384	4,172	3,667	3,371	3,330	2,627	655	552	256	94
Gas	221,263	9,517	10,511	11,061	10,276	12,353	11,480	11,908	11,284	12,164	12,827	12,180	12,054	10,650	10,935	11,256	11,493	10,814	9,462	9,718	9,321
Solar	188,589	1,223	1,271	1,467	3,787	4,993	6,573	6,564	6,844	6,932	8,266	10,554	10,529	13,603	13,584	13,560	13,535	16,289	16,264	16,239	16,513
Wind	362,853	9,162	9,209	9,686	9,989	15,878	18,300	18,304	18,393	18,345	20,176	20,183	21,718	21,617	21,636	21,646	21,752	21,662	21,661	21,661	21,874
Other System	114,063	3,683	3,651	3,161	3,087	2,958	2,980	2,965	5,790	5,802	5,756	5,722	5,759	5,766	5,720	5,729	5,723	5,746	11,061	11,082	11,922
Total	1,386,170	65,402	66,071	68,023	68,262	66,719	67,179	67,599	68,362	67,259	68,021	68,631	69,880	70,926	70,990	71,294	71,514	71,251	72,387	72,744	73,656
Generation (GWH)																					
JB12 GC	1,597	0	0	0	360	298	154	187	253	135	48	213	150	151	270	222	296	358	0	0	0

Discount Rate
6.88%

P02a-MMGR-BDG-GC-HH ST Split Run Cost Data LT 9076 ST 20927

Total Is FOM Sample: Mean

$ millions	NPV	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
1 Coal VOM Costs																					
Retired Coal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EOL Coal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2 Coal Fixed Costs																					
Retired Coal FOM	300	74	77	72	51	49	16	16	16	0	0	0	0	0	0	0	0	0	0	0	0
Reclamation Costs	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Retirement Costs	243	0	0	0	52	0	124	0	41	12	37	0	0	0	0	0	0	63	128	0	43
EOL Coal FOM	2,489	211	246	246	272	264	269	264	225	208	237	232	247	238	255	247	251	174	136	128	106
Total	3,032	285	323	318	374	313	409	280	283	220	274	232	247	238	255	247	251	237	264	128	149
3 Coal Fuel Costs																					
Retired Coal	352	170	104	115	8	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Retired Coal Start Fuel	11	4	4	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EOL Coal	3,051	422	452	471	531	354	301	301	272	239	161	159	156	150	145	136	144	137	50	43	36
EOL Coal Start Fuel	121	14	15	15	16	16	15	15	11	9	10	7	7	7	7	6	8	8	4	4	3
Total	3,535	609	575	606	555	372	316	316	284	248	171	167	163	156	152	143	152	145	54	47	39
4 Emission Cost (CO2)																					
Retired Coal	2	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EOL Coal	2,397	0	0	0	0	441	408	437	399	349	260	266	277	285	295	299	347	349	182	168	150
Total	2,400	0	0	0	0	445	408	437	399	349	260	266	277	285	295	299	347	349	182	168	150
5 Proxy Generation Costs																					
Solar VOM	23	(4)	(2)	4	4	4	4	4	4	4	4	4	4	4	4	4	4	1	1	0	0
Wind VOM	(3,443)	(309)	(310)	(332)	(334)	(482)	(536)	(555)	(546)	(573)	(586)	(211)	(219)	(206)	(203)	(51)	14	14	15	15	15
Gas VOM	149	10	11	12	11	14	13	14	13	14	16	16	16	14	15	16	16	18	18	19	18
Battery VOM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LT Contract VOM	871	108	109	129	127	110	100	99	98	95	64	36	36	35	35	35	34	29	28	28	28
QFs VOM	2,054	275	266	252	233	231	228	210	208	194	190	189	174	148	145	143	112	31	23	9	6
Other VOM	(53)	1	1	1	1	1	1	1	(36)	(35)	(35)	(35)	(36)	(35)	15	15	15	16	29	31	36
Fuel	4,385	267	321	351	307	365	352	386	375	417	458	470	482	458	505	530	550	549	554	597	651
Start Fuel	96	11	9	9	9	8	8	9	11	8	8	9	10	9	10	10	9	7	6	7	8
Energy not Served	18	2	0	8	0	0	1	2	0	1	2	2	2	1	0	10	3	0	0	0	0
Dumped Energy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Deficiency Cost	103	50	39	24	2	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Emissions Costs	1,659	0	0	0	0	124	126	145	148	172	202	219	238	228	261	297	336	353	381	431	457
Total	5,862	410	443	457	361	377	299	314	277	296	322	698	707	656	787	1,008	1,095	1,018	1,056	1,137	1,219
VOM Integration, Wind + Solar																					
6 Proxy Generation Resource Fixed Costs																					
Generator Fixed / Build Costs	5,788	8	8	8	140	140	343	343	477	477	662	771	831	1,125	1,125	1,125	1,125	1,311	1,506	1,506	1,754
Battery Fixed / Build Costs	453	0	0	0	0	0	0	0	0	74	74	74	74	74	74	74	74	162	162	162	162
Solar FOM	1,762	0	0	0	92	129	154	157	168	169	211	234	239	293	299	303	310	349	350	355	374
Wind FOM	4,893	160	163	191	198	467	523	539	559	572	604	620	678	679	613	603	616	623	638	646	656
Gas FOM	438	36	38	38	40	41	42	43	46	49	52	54	55	33	34	34	35	36	37	37	37
Battery FOM	62	0	0	0	1	(1)	(1)	(2)	(0)	12	10	10	9	9	9	9	9	23	18	30	31
Other FOM	586	12	5	5	6	5	7	7	85	86	80	81	83	85	86	88	90	92	187	190	239
Use of Service	(6)	0	0	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(2)	(2)	(2)	(2)
Total	13,976	215	213	241	476	782	1,069	1,087	1,335	1,438	1,693	1,843	1,969	2,297	2,239	2,237	2,258	2,594	2,896	2,926	3,250
Remove Portfolio Credits																					
7 DSM Costs																					
DR VOM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DR FOM	610	0	6	19	29	34	38	42	46	51	55	60	63	86	90	105	117	138	157	166	230
EE VOM	1,085	9	21	30	40	50	60	74	88	103	121	138	153	167	181	195	205	221	240	260	276
EE FOM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	1,695	9	27	49	70	84	98	115	134	154	176	198	216	253	271	300	322	359	397	427	506
8 Market Costs																					
System Market Sales	(4,513)	(292)	(291)	(326)	(337)	(370)	(433)	(487)	(492)	(479)	(489)	(492)	(506)	(512)	(504)	(506)	(506)	(477)	(475)	(443)	(505)
System Market Purchases	2,086	84	89	94	86	138	123	131	141	184	201	224	233	250	290	319	365	417	450	496	563
Total	(2,427)	(207)	(201)	(233)	(251)	(232)	(310)	(356)	(352)	(294)	(287)	(269)	(273)	(263)	(213)	(186)	(141)	(60)	(25)	53	59
9 Transmission Costs																					
Transmission Build / Reinforcement Costs	1,341	0	0	0	1	99	151	151	157	157	159	177	199	214	214	214	214	256	256	256	296
Total	1,341	0	0	0	1	99	151	151	157	157	159	177	199	214	214	214	214	256	256	256	296

11 Total System Cost	29,226	1,321	1,381	1,437	1,586	2,211	2,411	2,318	2,487	2,540	2,738	3,282	3,476	3,807	4,041	4,230	4,469	4,868	5,051	5,112	5,637
Fixed	18,959	500	542	578	881	1,228	1,666	1,561	1,822	1,867	2,181	2,312	2,478	2,834	2,798	2,802	2,841	3,225	3,573	3,477	3,924
Variable	10,454	821	839	860	705	1,012	774	786	695	702	586	999	1,027	1,002	1,202	1,458	1,658	1,673	1,508	1,665	1,743
Adjustments	(187)	0	(0)	(0)	(0)	(29)	(29)	(29)	(29)	(29)	(29)	(29)	(30)	(30)	41	(30)	(30)	(30)	(30)	(30)	(30)
12 Risk Adjusted PVRR	29,712		487																		
Generation (GWH)																					
Retired Coal	17,938	7,264	5,293	5,022	277	81	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
EOL Coal	220,966	24,973	26,003	26,278	27,924	17,482	14,671	14,279	12,158	9,758	6,536	6,075	5,710	5,282	4,932	4,509	4,726	4,324	2,131	1,775	1,439
DSM	146,867	2,413	2,910	3,369	3,958	4,451	4,905	5,473	6,091	6,731	7,359	7,908	8,409	8,828	9,289	9,733	9,986	10,423	11,033	11,570	12,027
LT Contracts	32,363	1,441	1,685	2,597	3,063	2,434	2,264	2,229	2,213	2,149	1,656	1,204	1,185	1,172	1,160	1,145	1,132	925	914	904	891
QFs	73,171	5,736	5,611	5,384	5,067	5,024	4,970	4,719	4,682	4,460	4,410	4,384	4,172	3,667	3,371	3,330	2,627	655	552	256	94
Gas	220,686	9,499	10,508	11,088	9,924	12,185	11,256	11,694	10,803	11,643	12,384	12,094	11,874	10,345	10,656	10,981	11,278	10,809	10,560	10,768	10,338
Solar	205,721	1,223	1,271	1,467	5,576	6,754	8,333	8,317	8,608	8,755	10,090	11,246	11,221	14,292	14,275	14,252	14,228	16,400	16,397	16,372	16,644
Wind	362,832	9,162	9,201	9,692	9,998	15,885	18,301	18,305	18,388	18,345	20,173	20,180	21,711	21,610	21,629	21,642	21,751	21,662	21,661	21,661	21,875
Other System	105,893	3,681	3,649	3,162	3,059	2,951	2,962	2,965	5,805	5,798	5,756	5,724	5,759	5,767	5,734	5,736	5,725	5,771	8,291	8,354	9,244
Total	1,386,438	65,391	66,132	68,059	68,846	67,246	67,664	67,982	68,749	67,639	68,363	68,816	70,042	70,963	71,046	71,328	71,452	70,969	71,540	71,660	72,551

Discount Rate
6.88%

P02-MMGR-SC ST Split Run Cost Data LT 5230 ST 20633

Total Is FOM Sample: Mean

$ millions	NPV	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
1 Coal VOM Costs																					
Retired Coal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EOL Coal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2 Coal Fixed Costs																					
Retired Coal FOM	426	77	94	79	67	63	30	30	32	13	13	13	13	14	13	13	14	17	0	0	0
Reclamation Costs	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Retirement Costs	243	0	0	0	0	0	124	0	41	12	37	0	0	0	0	0	0	63	259	0	43
EOL Coal FOM	2,489	211	246	246	272	264	269	264	225	208	237	232	247	238	255	247	251	174	136	128	106
Total	3,158	289	339	325	339	327	423	294	299	234	287	245	260	252	268	260	265	254	395	128	149
3 Coal Fuel Costs																					
Retired Coal	756	82	53	49	116	122	90	91	66	75	69	66	58	52	57	64	85	86	0	0	0
Retired Coal Start Fuel	59	7	7	9	4	5	6	6	5	5	6	5	5	5	5	6	8	6	0	0	0
EOL Coal	816	197	199	196	132	76	41	45	33	31	19	12	10	7	9	12	15	18	9	9	15
EOL Coal Start Fuel	216	33	35	36	49	37	21	20	22	11	7	4	4	2	2	3	4	3	1	1	2
Total	1,846	319	293	290	301	240	158	162	126	122	101	87	77	66	74	84	112	113	10	10	17
4 Emission Cost (CO2)																					
Retired Coal	1,547	286	223	185	188	198	145	148	104	112	104	98	88	78	87	99	134	137	0	0	0
EOL Coal	3,902	901	926	929	667	374	197	218	169	142	87	58	49	34	46	62	82	85	54	54	90
Total	5,449	1,188	1,149	1,114	854	573	342	366	273	254	191	156	136	112	133	161	215	222	54	54	90
5 Proxy Generation Costs																					
Solar VOM	23	(4)	(2)	4	4	4	4	4	4	4	4	4	4	4	4	4	4	1	1	0	0
Wind VOM	(3,457)	(314)	(314)	(336)	(338)	(482)	(536)	(555)	(546)	(573)	(586)	(211)	(219)	(206)	(203)	(51)	14	14	15	15	15
Gas VOM	181	15	17	18	18	17	16	17	17	17	17	17	17	16	17	17	18	19	16	17	17
Battery VOM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LT Contract VOM	871	108	109	129	127	110	100	99	98	95	64	36	36	35	35	35	34	29	28	28	28
QFs VOM	2,054	275	266	252	233	231	228	210	208	194	190	189	174	148	145	143	112	31	23	9	6
Other VOM	(41)	1	1	1	1	1	1	1	(36)	(35)	(35)	(35)	(36)	(35)	15	15	15	15	46	48	47
Fuel	4,376	364	409	396	435	414	386	404	401	430	416	412	424	400	409	418	430	415	403	458	455
Start Fuel	78	8	5	5	6	8	8	9	11	8	8	8	8	7	8	8	7	5	5	6	6
Energy not Served	43	11	0	8	2	0	1	2	0	1	0	2	2	0	0	1	3	0	0	0	69
Dumped Energy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Deficiency Cost	184	73	52	42	20	11	5	11	4	0	0	0	0	0	0	0	0	0	0	0	1
Emissions Costs	6,744	545	640	692	682	650	619	649	627	632	615	610	638	591	621	650	679	658	562	603	615
Total	11,055	1,082	1,182	1,211	1,192	964	831	848	789	771	693	1,031	1,048	961	1,050	1,240	1,316	1,188	1,100	1,185	1,258
VOM Integration, Wind + Solar																					
6 Proxy Generation Resource Fixed Costs																					
Generator Fixed / Build Costs	5,089	8	8	8	15	15	218	218	352	352	537	704	765	1,035	1,035	1,035	1,035	1,237	1,601	1,601	1,849
Battery Fixed / Build Costs	453	0	0	0	0	0	0	0	0	74	74	74	74	74	74	74	74	162	162	162	162
Solar FOM	1,593	0	0	0	63	100	125	128	139	140	181	220	225	280	285	289	295	344	344	350	368
Wind FOM	4,893	160	163	191	198	467	523	539	559	572	604	620	678	679	613	603	616	623	638	646	656
Gas FOM	438	36	38	38	40	41	42	43	46	49	52	54	55	33	34	34	35	36	37	37	37
Battery FOM	62	0	0	0	1	(1)	(1)	(2)	(0)	12	10	10	9	9	9	9	9	23	18	30	31
Other FOM	667	12	5	5	6	5	7	7	85	86	80	81	83	85	86	88	90	92	280	286	336
Use of Service	(6)	0	0	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(2)	(2)	(2)	(2)
Total	13,189	215	213	241	322	628	915	933	1,181	1,284	1,538	1,763	1,889	2,193	2,135	2,132	2,153	2,515	3,078	3,110	3,436
Remove Portfolio Credits																					
7 DSM Costs																					
DR VOM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DR FOM	610	0	6	19	29	34	38	42	46	51	55	60	63	86	90	105	117	138	157	166	230
EE VOM	1,085	9	21	30	40	50	60	74	88	103	121	138	153	167	181	195	205	221	240	260	276
EE FOM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	1,695	9	27	49	70	84	98	115	134	154	176	198	216	253	271	300	322	359	397	427	506
8 Market Costs																					
System Market Sales	(3,004)	(154)	(159)	(144)	(164)	(180)	(229)	(243)	(278)	(299)	(316)	(360)	(388)	(411)	(410)	(431)	(425)	(423)	(464)	(455)	(599)
System Market Purchases	5,126	428	485	497	499	481	474	478	470	495	468	450	446	431	455	464	519	538	517	533	576
Total	2,122	274	326	352	335	300	245	235	192	196	151	90	58	20	46	33	94	115	52	78	(23)
9 Transmission Costs																					
Transmission Build / Reinforcement Costs	1,341	0	0	0	1	99	151	151	157	157	159	177	199	214	214	214	214	256	256	256	296
Total	1,341	0	0	0	1	99	151	151	157	157	159	177	199	214	214	214	214	256	256	256	296

11 Total System Cost	39,667	3,374	3,529	3,582	3,414	3,187	3,134	3,076	3,122	3,143	3,267	3,718	3,854	4,040	4,232	4,393	4,661	4,994	5,312	5,218	5,698
Fixed	18,298	503	558	585	691	1,089	1,526	1,420	1,683	1,725	2,039	2,246	2,411	2,744	2,707	2,711	2,749	3,164	3,886	3,661	4,110
Variable	21,556	2,871	2,970	2,996	2,723	2,127	1,637	1,685	1,468	1,447	1,258	1,502	1,472	1,326	1,484	1,713	1,942	1,860	1,456	1,587	1,618
Adjustments	(187)	0	(0)	(0)	(0)	(29)	(29)	(29)	(29)	(29)	(29)	(29)	(30)	(30)	41	(30)	(30)	(30)	(30)	(30)	(30)
12 Risk Adjusted PVRR	40,693		1027																		
Generation (GWH)																					
Retired Coal	35,165	3,254	2,517	1,932	3,691	3,602	2,596	2,557	1,745	1,836	1,631	1,501	1,294	1,104	1,190	1,301	1,702	1,712	-	-	-
EOL Coal	53,398	10,650	10,468	10,102	6,857	3,570	1,815	1,969	1,452	1,263	745	493	394	279	361	471	596	589	377	361	586
DSM	147,065	2,447	2,947	3,433	3,982	4,456	4,917	5,482	6,100	6,731	7,359	7,909	8,411	8,828	9,291	9,733	9,986	10,423	11,033	11,570	12,028
LT Contracts	32,375	1,445	1,689	2,601	3,063	2,434	2,264	2,229	2,213	2,149	1,656	1,204	1,185	1,172	1,160	1,145	1,132	925	914	904	891
QFs	73,171	5,736	5,611	5,384	5,067	5,024	4,970	4,719	4,682	4,460	4,410	4,384	4,172	3,667	3,371	3,330	2,627	655	552	256	94
Gas	262,036	14,480	16,231	16,732	16,762	15,177	14,299	14,580	13,849	13,917	13,286	12,764	12,847	11,640	11,784	11,909	12,039	11,334	9,321	9,623	9,462
Solar	188,262	1,223	1,271	1,467	3,774	4,903	6,498	6,467	6,796	6,931	8,266	10,554	10,529	13,601	13,581	13,560	13,535	16,289	16,264	16,239	16,513
Wind	363,594	9,370	9,388	9,843	10,154	15,897	18,310	18,309	18,385	18,345	20,177	20,184	21,719	21,618	21,638	21,647	21,752	21,662	21,660	21,661	21,874
Other System	119,330	4,407	4,602	4,198	3,705	3,563	3,321	3,296	6,001	5,951	5,758	5,725	5,762	5,769	5,723	5,727	5,728	5,745	11,151	11,237	11,961
Total	1,274,397	53,013	54,724	55,692	57,056	58,626	58,990	59,607	61,224	61,583	63,288	64,719	66,311	67,680	68,099	68,823	69,096	69,333	71,273	71,852	73,408
Generation (GWH)																					
JB12 GC	15,467	0	0	0	3,688	3,579	2,596	2,557	1,745	1,836	1,631	1,501	1,294	1,104	1,190	1,301	1,702	1,712	0	0	0

Discount Rate
6.88%

P02a-MMGR-BDG-GC-SC ST Split Run Cost Data LT 9076 ST 20990

Total Is FOM Sample: Mean

$ millions	NPV	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
1 Coal VOM Costs																					
Retired Coal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EOL Coal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2 Coal Fixed Costs																					
Retired Coal FOM	300	74	77	72	51	49	16	16	16	0	0	0	0	0	0	0	0	0	0	0	0
Reclamation Costs	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Retirement Costs	243	0	0	0	52	0	124	0	41	12	37	0	0	0	0	0	0	63	128	0	43
EOL Coal FOM	2,489	211	246	246	272	264	269	264	225	208	237	232	247	238	255	247	251	174	136	128	106
Total	3,032	285	323	318	374	313	409	280	283	220	274	232	247	238	255	247	251	237	264	128	149
3 Coal Fuel Costs																					
Retired Coal	164	84	53	47	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Retired Coal Start Fuel	20	7	7	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EOL Coal	968	196	199	196	164	103	57	63	44	46	36	31	27	24	27	31	45	40	19	17	20
EOL Coal Start Fuel	201	33	34	37	37	32	18	17	18	8	7	6	6	5	5	6	8	5	2	3	3
Total	1,353	319	293	288	201	136	75	80	62	54	43	37	33	29	32	37	53	45	21	20	23
4 Emission Cost (CO2)																					
Retired Coal	617	289	226	177	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EOL Coal	4,604	899	923	930	793	498	272	297	216	204	161	146	132	118	135	161	230	200	115	114	130
Total	5,221	1,189	1,149	1,107	794	502	272	297	216	204	161	146	132	118	135	161	230	200	115	114	130
5 Proxy Generation Costs																					
Solar VOM	23	(4)	(2)	4	4	4	4	4	4	4	4	4	4	4	4	4	4	1	1	0	0
Wind VOM	(3,457)	(314)	(314)	(336)	(338)	(482)	(536)	(555)	(546)	(573)	(586)	(211)	(219)	(206)	(203)	(51)	14	14	15	15	15
Gas VOM	181	15	17	18	18	17	16	17	16	17	16	16	17	16	17	17	17	19	18	19	19
Battery VOM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LT Contract VOM	871	108	109	129	127	110	100	99	98	95	64	36	36	35	35	35	34	29	28	28	28
QFs VOM	2,054	275	266	252	233	231	228	210	208	194	190	189	174	148	145	143	112	31	23	9	6
Other VOM	(45)	1	1	1	1	1	1	1	(36)	(35)	(35)	(35)	(36)	(35)	15	15	15	25	37	38	39
Fuel	4,526	363	408	397	447	428	396	414	400	431	406	415	423	392	401	411	424	549	511	551	568
Start Fuel	78	8	5	5	6	8	8	8	10	8	8	8	9	7	7	8	7	7	6	7	7
Energy not Served	26	10	0	9	0	0	1	2	0	1	0	2	1	0	0	1	3	4	0	0	6
Dumped Energy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Deficiency Cost	194	74	58	52	14	10	5	11	5	0	0	0	0	0	0	0	0	1	0	0	0
Emissions Costs	6,817	544	639	693	699	671	633	663	623	633	599	614	637	579	609	638	669	658	629	669	681
Total	11,268	1,081	1,186	1,223	1,212	997	857	872	783	774	667	1,038	1,046	940	1,030	1,220	1,300	1,338	1,269	1,335	1,370
VOM Integration, Wind + Solar																					
6 Proxy Generation Resource Fixed Costs																					
Generator Fixed / Build Costs	5,788	8	8	8	140	140	343	343	477	477	662	771	831	1,125	1,125	1,125	1,125	1,311	1,506	1,506	1,754
Battery Fixed / Build Costs	453	0	0	0	0	0	0	0	0	74	74	74	74	74	74	74	74	162	162	162	162
Solar FOM	1,762	0	0	0	92	129	154	157	168	169	211	234	239	293	299	303	310	349	350	355	374
Wind FOM	4,893	160	163	191	198	467	523	539	559	572	604	620	678	679	613	603	616	623	638	646	656
Gas FOM	438	36	38	38	40	41	42	43	46	49	52	54	55	33	34	34	35	36	37	37	37
Battery FOM	62	0	0	0	1	(1)	(1)	(2)	(0)	12	10	10	9	9	9	9	9	23	18	30	31
Other FOM	586	12	5	5	6	5	7	7	85	86	80	81	83	85	86	88	90	92	187	190	239
Use of Service	(6)	0	0	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(2)	(2)	(2)	(2)
Total	13,976	215	213	241	476	782	1,069	1,087	1,335	1,438	1,693	1,843	1,969	2,297	2,239	2,237	2,258	2,594	2,896	2,926	3,250
Remove Portfolio Credits																					
7 DSM Costs																					
DR VOM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DR FOM	610	0	6	19	29	34	38	42	46	51	55	60	63	86	90	105	117	138	157	166	230
EE VOM	1,085	9	21	30	40	50	60	74	88	103	121	138	153	167	181	195	205	221	240	260	276
EE FOM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	1,695	9	27	49	70	84	98	115	134	154	176	198	216	253	271	300	322	359	397	427	506
8 Market Costs																					
System Market Sales	(2,876)	(154)	(159)	(135)	(152)	(168)	(224)	(241)	(282)	(306)	(326)	(342)	(374)	(400)	(393)	(410)	(403)	(376)	(425)	(400)	(508)
System Market Purchases	5,197	428	486	497	500	488	476	478	463	479	455	460	453	437	466	479	539	569	564	590	631
Total	2,321	274	327	362	348	320	252	238	181	173	129	119	79	37	73	69	136	193	139	190	123
9 Transmission Costs																					
Transmission Build / Reinforcement Costs	1,341	0	0	0	1	99	151	151	157	157	159	177	199	214	214	214	214	256	256	256	296
Total	1,341	0	0	0	1	99	151	151	157	157	159	177	199	214	214	214	214	256	256	256	296

11 Total System Cost	40,019	3,371	3,518	3,588	3,475	3,204	3,154	3,092	3,122	3,145	3,272	3,760	3,891	4,096	4,291	4,454	4,735	5,193	5,327	5,366	5,815
Fixed	18,959	500	542	578	881	1,228	1,666	1,561	1,822	1,867	2,181	2,312	2,478	2,834	2,798	2,802	2,841	3,225	3,573	3,477	3,924
Variable	21,248	2,871	2,976	3,010	2,595	2,005	1,517	1,560	1,329	1,308	1,120	1,477	1,443	1,292	1,452	1,682	1,924	1,998	1,784	1,919	1,921
Adjustments	(187)	0	(0)	(0)	(0)	(29)	(29)	(29)	(29)	(29)	(29)	(29)	(30)	(30)	41	(30)	(30)	(30)	(30)	(30)	(30)
12 Risk Adjusted PVRR	41,028		1009																		
Generation (GWH)																					
Retired Coal	7,757	3,289	2,548	1,892	3	25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
EOL Coal	66,003	10,633	10,443	10,064	8,370	4,926	2,607	2,775	1,942	1,870	1,413	1,241	1,076	955	1,034	1,199	1,651	1,393	808	761	842
DSM	146,968	2,447	2,947	3,429	3,974	4,447	4,890	5,457	6,081	6,731	7,359	7,907	8,410	8,828	9,290	9,733	9,986	10,423	11,033	11,570	12,027
LT Contracts	32,375	1,445	1,689	2,601	3,063	2,434	2,264	2,229	2,213	2,149	1,656	1,204	1,185	1,172	1,160	1,145	1,132	925	914	904	891
QFs	73,171	5,736	5,611	5,384	5,067	5,024	4,970	4,719	4,682	4,460	4,410	4,384	4,172	3,667	3,371	3,330	2,627	655	552	256	94
Gas	263,280	14,480	16,206	16,716	16,913	15,285	14,219	14,468	13,582	13,632	12,897	12,747	12,744	11,402	11,559	11,686	11,854	11,332	10,414	10,667	10,475
Solar	205,470	1,223	1,271	1,467	5,583	6,694	8,267	8,237	8,560	8,755	10,089	11,245	11,220	14,292	14,273	14,252	14,227	16,400	16,397	16,372	16,644
Wind	363,528	9,370	9,388	9,842	10,153	15,894	18,300	18,297	18,380	18,345	20,173	20,181	21,713	21,610	21,630	21,641	21,751	21,662	21,661	21,661	21,875
Other System	113,015	4,397	4,600	4,214	3,921	3,819	3,595	3,565	6,102	6,112	5,758	5,725	5,761	5,768	5,719	5,719	5,722	6,080	8,538	8,573	9,326
Total	1,271,567	53,021	54,704	55,610	57,046	58,548	59,112	59,747	61,542	62,053	63,755	64,636	66,282	67,695	68,036	68,705	68,950	68,870	70,317	70,764	72,174

REDACTED
Docket No. UE 433
Exhibit PAC/902
Witness: Thomas R. Burns

BEFORE THE PUBLIC UTILITY COMMISSION

OF OREGON

PACIFICORP

REDACTED

Exhibit Accompanying Direct Testimony of Thomas R. Burns

Rock Creek I Analysis

February 2024

REDACTED

Estimated Annual Revenue Requirement Results ($ million)

Medium Gas, Medium CO2

(Benefit) /Cost	*PVRR(d)*	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Cost of Project	$611	$0	$0	$0	$0	$73	$67	$70	$70	$67	$66	$66	$68	$70	$71	$104	$128	$130	$133	$135	$138
[redacted]																					
Change in NPC	($171)	$0	$0	$0	$0	($27)	($38)	($39)	($31)	($18)	($18)	($22)	($22)	$122	($34)	($34)	($32)	($38)	($42)	($51)	($71)
Change in Emissions	($75)	$0	$0	$0	$0	($11)	($17)	($20)	($10)	($6)	($8)	($8)	($9)	$39	($15)	($16)	($22)	($14)	($16)	($18)	($16)
Change in VOM & Driver Adjustments	$8	$0	$0	$0	$0	$0	$0	($0)	($1)	($1)	($1)	($1)	($1)	$37	($1)	($1)	($2)	($2)	($3)	($3)	($5)
Change in DSM	($20)	$0	$0	($0)	($0)	($0)	($0)	($1)	($2)	($2)	($2)	($2)	($1)	($1)	($4)	($6)	($6)	($6)	($7)	($7)	($7)
Change in Deficiency	$5	$0	$0	$0	($0)	($4)	($0)	($0)	($2)	$1	$0	$0	$2	$15	$0	($0)	$0	$0	$0	$0	$5
Change in System Fixed Cost	($502)	$0	$0	$0	$0	$0	$0	$0	($28)	($63)	($63)	($63)	($64)	($407)	($38)	($38)	($94)	($108)	($108)	($109)	($109)
Net (Benefit) /Cost	($143)	$0	$0	$0	$0	$32	$11	$9	($5)	($22)	($26)	($30)	($27)	($125)	($21)	$7	($28)	($39)	($43)	($52)	($64)
Risk Adjustment	($20)																				
Net (Benefit) /Cost with Risk Adjustment	($163)																				

Medium Gas, No CO2

(Benefit) /Cost	*PVRR(d)*	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Cost of Project	$615	$0	$0	$0	$0	$75	$68	$72	$70	$67	$66	$66	$68	$70	$71	$104	$127	$130	$132	$135	$138
[redacted]																					
Change in NPC	($104)	$0	($0)	$0	($0)	($35)	($29)	($28)	($26)	$18	$15	$12	($16)	($56)	$1	$3	($0)	($321)	$82	$89	$125
Change in Emissions	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Change in VOM & Driver Adjustments	$44	$0	$0	($0)	($0)	$0	$10	$9	$9	$10	$10	$10	$10	$9	$10	$10	($1)	$8	($11)	($11)	($8)
Change in DSM	($19)	$0	$0	($0)	($0)	($1)	($1)	($1)	($2)	($3)	($4)	($4)	($3)	($3)	($3)	($3)	($3)	($3)	($3)	($3)	($3)
Change in Deficiency	($1)	$0	$0	$0	$0	($3)	($0)	($0)	$1	$28	$10	$8	$3	($41)	$0	$0	$1	($22)	$0	$0	$2
Change in System Fixed Cost	($568)	$0	$0	$0	$0	$0	($29)	($30)	($34)	($176)	($177)	($178)	($72)	$76	($151)	($152)	($153)	$406	($233)	($234)	($237)
Net (Benefit) /Cost	($33)	$0	($0)	$0	($0)	$35	$18	$22	$18	($56)	($79)	($85)	($11)	$54	($71)	($38)	($28)	$197	($33)	($25)	$17
Risk Adjustment	($18)																				
Net (Benefit) /Cost with Risk Adjustment	($51)																				

Low Gas, No CO2

(Benefit) /Cost	*PVRR(d)*	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Cost of Project	$613	$0	$0	$0	$0	$74	$67	$71	$70	$67	$66	$66	$68	$70	$71	$104	$128	$130	$133	$135	$138
[redacted]																					
Change in NPC	($65)	$0	$0	$0	($0)	($19)	($28)	($31)	($2)	($2)	($3)	($3)	($2)	($3)	($3)	($3)	($3)	($1)	$2	($4)	($2)
Change in Emissions	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Change in VOM & Driver Adjustments	($8)	$0	$0	$0	$0	$0	$0	($0)	($1)	($1)	($1)	($1)	($1)	($1)	($1)	($1)	($1)	($2)	($1)	($2)	($2)
Change in DSM	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Change in Deficiency	($6)	$0	$0	$0	$0	($7)	($0)	($1)	($0)	$0	($0)	$0	$0	$0	$0	$0	$0	$0	$0	($0)	$1
Change in System Fixed Cost	($519)	$0	$0	$0	$0	$0	$0	$0	($96)	($96)	($97)	($97)	($98)	($98)	($99)	($99)	($99)	($100)	($100)	($101)	($101)
Net (Benefit) /Cost	$16	$0	$0	$0	($0)	$48	$39	$38	($30)	($33)	($35)	($36)	($33)	($32)	($32)	$1	$24	$28	$32	$28	$34
Risk Adjustment	($14)																				
Net (Benefit) /Cost with Risk Adjustment	$2																				

Docket No. UE 433
Exhibit PAC/903
Witness: Thomas R. Burns

BEFORE THE PUBLIC UTILITY COMMISSION

OF OREGON

PACIFICORP

Exhibit Accompanying Direct Testimony of Thomas R. Burns

Rock River I Analysis

February 2024

Table 7 Rock River 1 110%PTC

	PVRR(d) Net (Benefit)/Cost ($million)	**Nom. Lev. Net Benefit ($/MWh of Incremental Energy)**
High Natural Gas, High CO_2	($91.69)	($43/MWh)
Medium Natural Gas, Medium CO_2	($54.09)	($25/MWh)
Low Natural Gas, No CO_2	($15.12)	($7/MWh)
Medium Natural Gas, SCGHG	($167.35)	($78/MWh)

Table 1 Rock River 1 60%PTC

	PVRR(d) Net (Benefit)/Cost ($million)	**Nom. Lev. Net Benefit ($/MWh of Incremental Energy)**
High Natural Gas, High CO_2	($67.76)	($31/MWh)
Medium Natural Gas, Medium CO_2	($30.15)	($14/MWh)
Low Natural Gas, No CO_2	$23.12	$11/MWh
Medium Natural Gas, SCGHG	($143.42)	($67/MWh)

Table 1 Rock River 1 110% vs 60%PTC

	PVRR(d) Net (Benefit)/Cost ($million)	**Nom. Lev. Net Benefit ($/MWh of Incremental Energy)**
High Natural Gas, High CO2	($23.94)	($11/MWh)
Medium Natural Gas, Medium CO2	($23.94)	($11/MWh)
Low Natural Gas, No CO2	($38.24)	($18/MWh)
Medium Natural Gas, SCGHG	($23.94)	($11/MWh)

	Nominal Discount Rate	6.88%
	Inflation Rate	2.155%
Line	Real Discount Rate	4.63%
No.	Project Size (MW)	53.58

45.5%

Line No.	Rock River I	Formula	PVRR(d)	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054
(1)	**Generation (GWh)**		2,153	50	213	213	213	214	213	213	213	214	213	213	213	214	213	213	213	214	213	213	213	214	213	213	213	214	213	213	213	214	201	123
	Project Costs																																	
	Capital Rev. Req.		$85.7	$2.1	$11.1	$10.4	$9.9	$9.5	$9.2	$8.9	$8.8	$8.6	$8.4	$8.2	$8.1	$8.0	$7.9	$7.8	$7.7	$7.6	$7.5	$7.5	$7.4	$7.3	$7.3	$7.2	$7.2	$7.2	$7.2	$7.3	$7.5	$7.7	$7.7	($12.0)
	PTCs		($52.7)	($2.0)	($8.7)	($8.7)	($9.0)	($9.1)	($9.3)	($9.3)	($9.6)	($10.0)	($10.0)	($7.9)	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
	O&M		$13.6	$0.3	$1.4	$1.4	$1.5	$1.6	$1.2	$1.2	$1.0	$1.0	$1.0	$1.0	$1.3	$1.3	$1.3	$1.3	$1.4	$1.4	$1.4	$1.4	$1.5	$1.5	$1.5	$1.6	$1.6	$1.6	$1.7	$1.7	$1.7	$1.8	$1.8	$1.2
	Gen Tax		$1.7	$0.0	$0.0	$0.0	$0.0	$0.2	$0.2	$0.2	$0.2	$0.2	$0.2	$0.2	$0.2	$0.2	$0.2	$0.2	$0.2	$0.2	$0.2	$0.2	$0.2	$0.2	$0.2	$0.2	$0.2	$0.2	$0.2	$0.2	$0.2	$0.2	$0.2	$0.1
	Property Tax		$3.8	$0.0	$0.6	$0.6	$0.5	$0.5	$0.5	$0.4	$0.4	$0.4	$0.4	$0.4	$0.4	$0.3	$0.3	$0.3	$0.3	$0.3	$0.3	$0.3	$0.2	$0.2	$0.2	$0.2	$0.2	$0.2	$0.1	$0.1	$0.1	$0.1	$0.0	($0.0)
	Transmission Upgrades		$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
(2)	**Project Costs ($ million)**		$52.1	$0.4	$4.3	$3.7	$3.0	$2.7	$1.7	$1.5	$0.7	$0.3	$0.0	$2.0	$10.0	$9.9	$9.8	$9.7	$9.6	$9.5	$9.4	$9.4	$9.3	$9.3	$9.2	$9.2	$9.2	$9.2	$9.2	$9.3	$9.5	$9.7	$9.7	($10.7)
(3)	**Project Cost ($/MWh)**	(2) / (1)	$24.19	$8.58	$20.36	$17.14	$13.96	$12.74	$8.15	$6.88	$3.47	$1.20	$0.10	$9.15	$46.76	$46.17	$45.84	$45.45	$45.08	$44.39	$44.21	$43.89	$43.61	$43.21	$43.18	$43.04	$42.99	$42.88	$43.24	$43.70	$44.59	$45.43	$48.50	($87.13)

Line No.	Medium Natural Gas, Medium CO_2	Formula	PVRR	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054
(4)	System (Benefit)/Cost (2024-2040)			($29.20)	($29.20)	($26.75)	($30.97)	($35.62)	($35.65)	($39.72)	($36.37)	($41.40)	($39.58)	($43.38)	($48.97)	($47.20)	($61.26)	($58.27)	($68.92)	($71.94)														
(5)	Real Lev. 2032-2040											($47.76)	($48.79)	($49.85)	($50.92)	($52.02)	($53.14)	($54.28)	($55.45)	($56.65)	($57.87)	($59.12)	($60.39)	($61.69)	($63.02)	($64.38)	($65.77)	($67.18)	($68.63)	($70.11)	($71.62)	($73.16)	($74.74)	($76.35)
(6)	Real Lev. 2038-2040																	($64.73)	($66.13)	($67.55)	($69.01)	($70.49)	($72.01)	($73.56)	($75.15)	($76.77)	($78.42)	($80.11)	($81.84)	($83.60)	($85.40)	($87.25)	($89.13)	($91.05)
(7)	System (Benefit)/Cost w/ '32-'40 Extrap.		($46.39)	($29.20)	($29.20)	($26.75)	($30.97)	($35.62)	($35.65)	($39.72)	($36.37)	($41.40)	($39.58)	($43.38)	($48.97)	($47.20)	($61.26)	($58.27)	($68.92)	($71.94)	($57.87)	($59.12)	($60.39)	($61.69)	($63.02)	($64.38)	($65.77)	($67.18)	($68.63)	($70.11)	($71.62)	($73.16)	($74.74)	($76.35)
(8)	System (Benefit)/Cost w/ '38-'40 Extrap.		($49.31)	($29.20)	($29.20)	($26.75)	($30.97)	($35.62)	($35.65)	($39.72)	($36.37)	($41.40)	($39.58)	($43.38)	($48.97)	($47.20)	($61.26)	($58.27)	($68.92)	($71.94)	($69.01)	($70.49)	($72.01)	($73.56)	($75.15)	($76.77)	($78.42)	($80.11)	($81.84)	($83.60)	($85.40)	($87.25)	($89.13)	($91.05)
	System (Benefit)/Cost ($ million)																																	
(9)	MM '32-'40 Extrap.	(1) X (7)	($99.9)	($1.5)	($6.2)	($5.7)	($6.6)	($7.6)	($7.6)	($8.5)	($7.8)	($8.9)	($8.4)	($9.3)	($10.4)	($10.1)	($13.1)	($12.4)	($14.7)	($15.4)	($12.3)	($12.6)	($12.9)	($13.2)	($13.4)	($13.7)	($14.0)	($14.4)	($14.6)	($15.0)	($15.3)	($15.7)	($15.0)	($9.4)
(10)	MM '38-'40 Extrap.	(1) X (8)	($106.2)	($1.5)	($6.2)	($5.7)	($6.6)	($7.6)	($7.6)	($8.5)	($7.8)	($8.9)	($8.4)	($9.3)	($10.4)	($10.1)	($13.1)	($12.4)	($14.7)	($15.4)	($14.7)	($15.0)	($15.4)	($15.8)	($16.0)	($16.4)	($16.7)	($17.2)	($17.5)	($17.8)	($18.2)	($18.7)	($17.9)	($11.2)
	Net (Benefit)/Cost ($ million)																																	
(11)	MM '32-'40 Extrap.	(2) + (9)	**($47.8)**	($1.0)	($1.9)	($2.1)	($3.6)	($4.9)	($5.9)	($7.0)	($7.0)	($8.6)	($8.4)	($7.3)	($0.5)	($0.2)	($3.3)	($2.7)	($5.1)	($5.9)	($2.9)	($3.2)	($3.6)	($4.0)	($4.2)	($4.6)	($4.9)	($5.2)	($5.4)	($5.6)	($5.8)	($5.9)	($5.3)	($20.1)
(12)	MM '38-'40 Extrap.	(2) + (10)	**($54.1)**	($1.0)	($1.9)	($2.1)	($3.6)	($4.9)	($5.9)	($7.0)	($7.0)	($8.6)	($8.4)	($7.3)	($0.5)	($0.2)	($3.3)	($2.7)	($5.1)	($5.9)	($5.3)	($5.7)	($6.1)	($6.5)	($6.8)	($7.2)	($7.6)	($8.0)	($8.2)	($8.5)	($8.7)	($9.0)	($8.2)	($21.9)
	Net (Benefit)/Cost ($/MWh)																																	
(13)	MM '32-'40 Extrap.	(11) / (1)	**($22.21)**	($20.62)	($8.84)	($9.62)	($17.01)	($22.88)	($27.50)	($32.83)	($32.91)	($40.20)	($39.48)	($34.23)	($2.21)	($1.03)	($15.42)	($12.82)	($23.85)	($27.55)	($13.66)	($15.22)	($16.78)	($18.48)	($19.84)	($21.34)	($22.78)	($24.30)	($25.39)	($26.41)	($27.03)	($27.74)	($26.24)	($163.48)
(14)	MM '38-'40 Extrap.	(12) / (1)	**($25.12)**	($20.62)	($8.84)	($9.62)	($17.01)	($22.88)	($27.50)	($32.83)	($32.91)	($40.20)	($39.48)	($34.23)	($2.21)	($1.03)	($15.42)	($12.82)	($23.85)	($27.55)	($24.80)	($26.60)	($28.40)	($30.35)	($31.97)	($33.73)	($35.43)	($37.23)	($38.60)	($39.90)	($40.81)	($41.82)	($40.63)	($178.18)

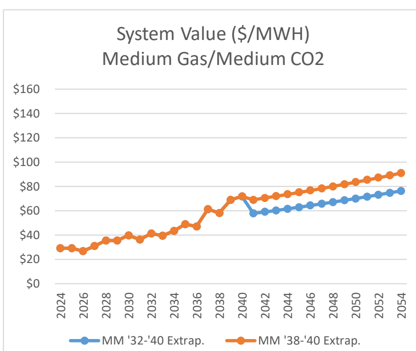
Line No.	Low Natural Gas, No CO_2	Formula	PVRR	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054
(15)	System (Benefit)/Cost (2024-2040)			($19.20)	($22.93)	($18.71)	($21.47)	($28.93)	($23.49)	($22.49)	($21.91)	($25.13)	($27.92)	($28.05)	($29.11)	($42.62)	($36.33)	($36.22)	($37.15)	($42.30)														
(16)	Real Lev. 2032-2040											($30.52)	($31.18)	($31.85)	($32.54)	($33.24)	($33.96)	($34.69)	($35.44)	($36.20)	($36.98)	($37.78)	($38.59)	($39.42)	($40.27)	($41.14)	($42.03)	($42.93)	($43.86)	($44.80)	($45.77)	($46.75)	($47.76)	($48.79)
(17)	Real Lev. 2038-2040																	($37.64)	($38.45)	($39.28)	($40.13)	($40.99)	($41.88)	($42.78)	($43.70)	($44.64)	($45.60)	($46.59)	($47.59)	($48.62)	($49.66)	($50.73)	($51.83)	($52.94)
(18)	System (Benefit)/Cost w/ '32-'40 Extrap.		($30.39)	($19.20)	($22.93)	($18.71)	($21.47)	($28.93)	($23.49)	($22.49)	($21.91)	($25.13)	($27.92)	($28.05)	($29.11)	($42.62)	($36.33)	($36.22)	($37.15)	($42.30)	($36.98)	($37.78)	($38.59)	($39.42)	($40.27)	($41.14)	($42.03)	($42.93)	($43.86)	($44.80)	($45.77)	($46.75)	($47.76)	($48.79)
(19)	System (Benefit)/Cost w/ '38-'40 Extrap.		($31.21)	($19.20)	($22.93)	($18.71)	($21.47)	($28.93)	($23.49)	($22.49)	($21.91)	($25.13)	($27.92)	($28.05)	($29.11)	($42.62)	($36.33)	($36.22)	($37.15)	($42.30)	($40.13)	($40.99)	($41.88)	($42.78)	($43.70)	($44.64)	($45.60)	($46.59)	($47.59)	($48.62)	($49.66)	($50.73)	($51.83)	($52.94)
	System (Benefit)/Cost ($ million)																																	
(20)	LN '32-'40 Extrap.	(1) X (18)	($65.4)	($1.0)	($4.9)	($4.0)	($4.6)	($6.2)	($5.0)	($4.8)	($4.7)	($5.4)	($6.0)	($6.0)	($6.2)	($9.1)	($7.8)	($7.7)	($7.9)	($9.1)	($7.9)	($8.1)	($8.2)	($8.4)	($8.6)	($8.8)	($9.0)	($9.2)	($9.4)	($9.6)	($9.8)	($10.0)	($9.6)	($6.0)
(21)	LN '38-'40 Extrap.	(1) X (19)	($67.2)	($1.0)	($4.9)	($4.0)	($4.6)	($6.2)	($5.0)	($4.8)	($4.7)	($5.4)	($6.0)	($6.0)	($6.2)	($9.1)	($7.8)	($7.7)	($7.9)	($9.1)	($8.6)	($8.7)	($8.9)	($9.2)	($9.3)	($9.5)	($9.7)	($10.0)	($10.2)	($10.4)	($10.6)	($10.9)	($10.4)	($6.5)
	Net (Benefit)/Cost ($ million)																																	
(22)	LN '32-'40 Extrap.	(2) + (20)	**($13.3)**	($0.5)	($0.5)	($0.3)	($1.6)	($3.5)	($3.3)	($3.3)	($3.9)	($5.1)	($5.9)	($4.0)	$3.8	$0.8	$2.0	$2.0	$1.7	$0.4	$1.5	$1.3	$1.1	$0.8	$0.6	$0.4	$0.2	($0.0)	($0.1)	($0.2)	($0.3)	($0.3)	$0.1	($16.7)
(23)	LN '38-'40 Extrap.	(2) + (21)	**($15.1)**	($0.5)	($0.5)	($0.3)	($1.6)	($3.5)	($3.3)	($3.3)	($3.9)	($5.1)	($5.9)	($4.0)	$3.8	$0.8	$2.0	$2.0	$1.7	$0.4	$0.9	$0.6	$0.4	$0.1	($0.1)	($0.3)	($0.6)	($0.8)	($0.9)	($1.0)	($1.1)	($1.1)	($0.7)	($17.2)
	Net (Benefit)/Cost ($/MWh)																																	
(24)	LN '32-'40 Extrap.	(22) / (1)	**($6.20)**	($10.62)	($2.57)	($1.57)	($7.51)	($16.19)	($15.35)	($15.61)	($18.45)	($23.93)	($27.83)	($18.90)	$17.65	$3.55	$9.51	$9.24	$7.93	$2.09	$7.23	$6.12	$5.02	$3.79	$2.90	$1.90	$0.96	($0.05)	($0.61)	($1.10)	($1.18)	($1.33)	$0.74	($135.92)
(25)	LN '38-'40 Extrap.	(23) / (1)	**($7.02)**	($10.62)	($2.57)	($1.57)	($7.51)	($16.19)	($15.35)	($15.61)	($18.45)	($23.93)	($27.83)	($18.90)	$17.65	$3.55	$9.51	$9.24	$7.93	$2.09	$4.08	$2.90	$1.74	$0.43	($0.52)	($1.60)	($2.61)	($3.71)	($4.35)	($4.91)	($5.07)	($5.31)	($3.33)	($140.07)

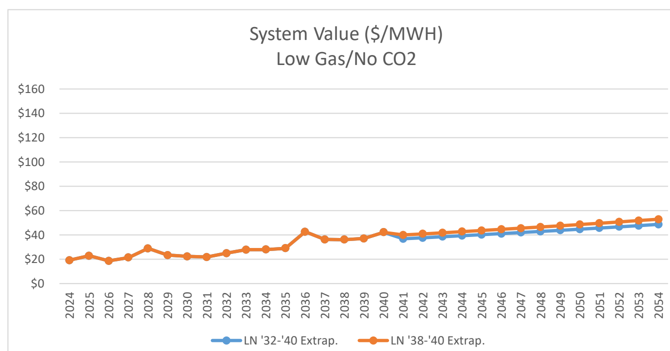
Line No.	High Natural Gas, High CO_2	Formula	PVRR	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054
(26)	System (Benefit)/Cost (2024-2040)			($41.80)	($41.80)	($41.07)	($44.47)	($47.08)	($49.91)	($54.85)	($55.47)	($70.40)	($64.43)	($68.56)	($79.20)	($80.43)	($89.26)	($88.91)	($40.67)	($107.64)														
(27)	Real Lev. 2032-2040											($70.03)	($71.54)	($73.08)	($74.66)	($76.27)	($77.91)	($79.59)	($81.30)	($83.05)	($84.84)	($86.67)	($88.54)	($90.45)	($92.40)	($94.39)	($96.42)	($98.50)	($100.62)	($102.79)	($105.01)	($107.27)	($109.58)	($111.94)
(28)	Real Lev. 2038-2040																	($77.09)	($78.75)	($80.44)	($82.18)	($83.95)	($85.76)	($87.61)	($89.49)	($91.42)	($93.39)	($95.41)	($97.46)	($99.56)	($101.71)	($103.90)	($106.14)	($108.43)
(29)	System (Benefit)/Cost w/ '32-'40 Extrap.		($67.48)	($41.80)	($41.80)	($41.07)	($44.47)	($47.08)	($49.91)	($54.85)	($55.47)	($70.40)	($64.43)	($68.56)	($79.20)	($80.43)	($89.26)	($88.91)	($40.67)	($107.64)	($84.84)	($86.67)	($88.54)	($90.45)	($92.40)	($94.39)	($96.42)	($98.50)	($100.62)	($102.79)	($105.01)	($107.27)	($109.58)	($111.94)
(30)	System (Benefit)/Cost w/ '38-'40 Extrap.		($66.78)	($41.80)	($41.80)	($41.07)	($44.47)	($47.08)	($49.91)	($54.85)	($55.47)	($70.40)	($64.43)	($68.56)	($79.20)	($80.43)	($89.26)	($88.91)	($40.67)	($107.64)	($82.18)	($83.95)	($85.76)	($87.61)	($89.49)	($91.42)	($93.39)	($95.41)	($97.46)	($99.56)	($101.71)	($103.90)	($106.14)	($108.43)
	System (Benefit)/Cost ($ million)																																	
(31)	HH '32-'40 Extrap.	(1) X (29)	($145.3)	($2.1)	($8.9)	($8.8)	($9.5)	($10.1)	($10.6)	($11.7)	($11.8)	($15.1)	($13.7)	($14.6)	($16.9)	($17.2)	($19.0)	($19.0)	($8.7)	($23.0)	($18.1)	($18.5)	($18.9)	($19.4)	($19.7)	($20.1)	($20.6)	($21.1)	($21.5)	($21.9)	($22.4)	($23.0)	($22.0)	($13.7)
(32)	HH '38-'40 Extrap.	(1) X (30)	($143.8)	($2.1)	($8.9)	($8.8)	($9.5)	($10.1)	($10.6)	($11.7)	($11.8)	($15.1)	($13.7)	($14.6)	($16.9)	($17.2)	($19.0)	($19.0)	($8.7)	($23.0)	($17.5)	($17.9)	($18.3)	($18.8)	($19.1)	($19.5)	($19.9)	($20.4)	($20.8)	($21.2)	($21.7)	($22.2)	($21.3)	($13.3)
	Net (Benefit)/Cost ($ million)																																	
(33)	HH '32-'40 Extrap.	(2) + (31)	**($93.2)**	($1.7)	($4.6)	($5.1)	($6.5)	($7.4)	($8.9)	($10.2)	($11.1)	($14.8)	($13.7)	($12.7)	($6.9)	($7.3)	($9.3)	($9.3)	$0.9	($13.5)	($8.7)	($9.1)	($9.6)	($10.1)	($10.5)	($11.0)	($11.4)	($11.9)	($12.2)	($12.6)	($12.9)	($13.2)	($12.3)	($24.4)
(34)	HH '38-'40 Extrap.	(2) + (32)	**($91.7)**	($1.7)	($4.6)	($5.1)	($6.5)	($7.4)	($8.9)	($10.2)	($11.1)	($14.8)	($13.7)	($12.7)	($6.9)	($7.3)	($9.3)	($9.3)	$0.9	($13.5)	($8.1)	($8.5)	($9.0)	($9.5)	($9.9)	($10.3)	($10.8)	($11.2)	($11.6)	($11.9)	($12.2)	($12.5)	($11.6)	($24.0)
	Net (Benefit)/Cost ($/MWh)																																	
(35)	HH '32-'40 Extrap.	(33) / (1)	**($43.29)**	($33.22)	($21.43)	($23.93)	($30.51)	($34.33)	($41.76)	($47.96)	($52.01)	($69.21)	($64.34)	($59.41)	($32.45)	($34.26)	($43.42)	($43.45)	$4.41	($63.25)	($40.64)	($42.78)	($44.93)	($47.24)	($49.22)	($51.35)	($53.43)	($55.62)	($57.38)	($59.09)	($60.42)	($61.84)	($61.08)	($199.07)
(36)	HH '38-'40 Extrap.	(34) / (1)	**($42.59)**	($33.22)	($21.43)	($23.93)	($30.51)	($34.33)	($41.76)	($47.96)	($52.01)	($69.21)	($64.34)	($59.41)	($32.45)	($34.26)	($43.42)	($43.45)	$4.41	($63.25)	($37.97)	($40.06)	($42.14)	($44.39)	($46.32)	($48.38)	($50.40)	($52.53)	($54.22)	($55.86)	($57.12)	($58.47)	($57.64)	($195.56)

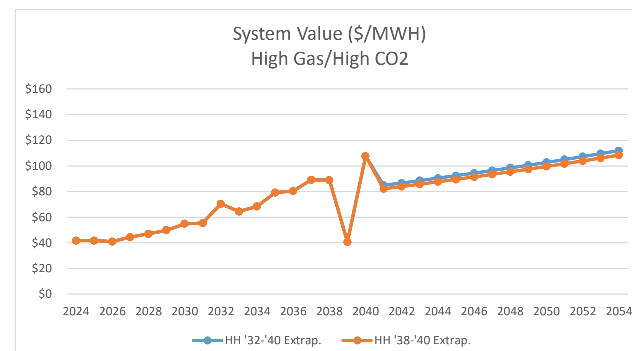
Line No.	Medium Natural Gas, SCGHG	Formula	PVRR	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054
(37)	System (Benefit)/Cost (2024-2040)			($90.80)	($90.80)	($95.25)	($101.03)	($81.04)	($88.52)	($100.64)	($94.48)	($91.92)	($89.39)	($92.67)	($94.66)	($102.02)	($108.84)	($108.30)	($101.83)	($106.34)														
(38)	Real Lev. 2032-2040											($91.17)	($93.13)	($95.14)	($97.19)	($99.29)	($101.43)	($103.61)	($105.84)	($108.12)	($110.45)	($112.84)	($115.27)	($117.75)	($120.29)	($122.88)	($125.53)	($128.23)	($131.00)	($133.82)	($136.70)	($139.65)	($142.66)	($145.73)
(39)	Real Lev. 2038-2040																	($103.39)	($105.62)	($107.90)	($110.22)	($112.60)	($115.02)	($117.50)	($120.03)	($122.62)	($125.26)	($127.96)	($130.72)	($133.54)	($136.41)	($139.35)	($142.36)	($145.42)
(40)	System (Benefit)/Cost w/ '32-'40 Extrap.		($101.99)	($90.80)	($90.80)	($95.25)	($101.03)	($81.04)	($88.52)	($100.64)	($94.48)	($91.92)	($89.39)	($92.67)	($94.66)	($102.02)	($108.84)	($108.30)	($101.83)	($106.34)	($110.45)	($112.84)	($115.27)	($117.75)	($120.29)	($122.88)	($125.53)	($128.23)	($131.00)	($133.82)	($136.70)	($139.65)	($142.66)	($145.73)
(41)	System (Benefit)/Cost w/ '38-'40 Extrap.		($101.93)	($90.80)	($90.80)	($95.25)	($101.03)	($81.04)	($88.52)	($100.64)	($94.48)	($91.92)	($89.39)	($92.67)	($94.66)	($102.02)	($108.84)	($108.30)	($101.83)	($106.34)	($110.22)	($112.60)	($115.02)	($117.50)	($120.03)	($122.62)	($125.26)	($127.96)	($130.72)	($133.54)	($136.41)	($139.35)	($142.36)	($145.42)

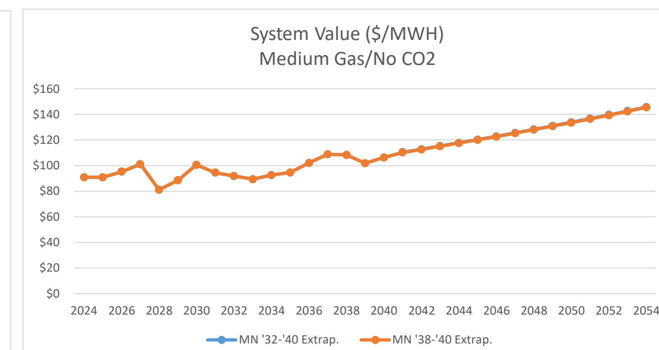
System (Benefit)/Cost ($ million)																																		
(42)	MN '32-'40 Extrap.	(1) X (40)	($219.6)	($4.5)	($19.4)	($20.3)	($21.6)	($17.4)	($18.9)	($21.5)	($20.2)	($19.7)	($19.1)	($19.8)	($20.2)	($21.8)	($23.2)	($23.1)	($21.7)	($22.8)	($23.6)	($24.1)	($24.6)	($25.2)	($25.7)	($26.2)	($26.8)	($27.5)	($27.9)	($28.5)	($29.2)	($29.9)	($28.7)	($17.9)
(43)	MN '38-'40 Extrap.	(1) X (41)	($219.4)	($4.5)	($19.4)	($20.3)	($21.6)	($17.4)	($18.9)	($21.5)	($20.2)	($19.7)	($19.1)	($19.8)	($20.2)	($21.8)	($23.2)	($23.1)	($21.7)	($22.8)	($23.5)	($24.0)	($24.5)	($25.2)	($25.6)	($26.2)	($26.7)	($27.4)	($27.9)	($28.5)	($29.1)	($29.8)	($28.6)	($17.8)
Net (Benefit)/Cost ($ million)																																		
(44)	MN '32-'40 Extrap.	(2) + (42)	**($167.5)**	($4.1)	($15.0)	($16.7)	($18.6)	($14.6)	($17.1)	($20.0)	($19.4)	($19.4)	($19.0)	($17.8)	($10.2)	($12.0)	($13.4)	($13.4)	($12.1)	($13.3)	($14.1)	($14.7)	($15.3)	($16.0)	($16.5)	($17.0)	($17.6)	($18.3)	($18.7)	($19.2)	($19.7)	($20.2)	($18.9)	($28.6)
(45)	MN '38-'40 Extrap.	(2) + (43)	**($167.4)**	($4.1)	($15.0)	($16.7)	($18.6)	($14.6)	($17.1)	($20.0)	($19.4)	($19.4)	($19.0)	($17.8)	($10.2)	($12.0)	($13.4)	($13.4)	($12.1)	($13.3)	($14.1)	($14.7)	($15.2)	($15.9)	($16.4)	($17.0)	($17.6)	($18.2)	($18.7)	($19.2)	($19.6)	($20.1)	($18.9)	($28.5)
Net (Benefit)/Cost ($/MWh)																																		
(46)	MN '32-'40 Extrap.	(44) / (1)	**($77.80)**	($82.23)	($70.44)	($78.11)	($87.07)	($68.30)	($80.38)	($93.76)	($91.01)	($90.72)	($89.29)	($83.53)	($47.91)	($55.85)	($63.00)	($62.85)	($56.75)	($61.95)	($66.25)	($68.94)	($71.65)	($74.54)	($77.11)	($79.84)	($82.54)	($85.36)	($87.75)	($90.12)	($92.11)	($94.22)	($94.16)	($232.86)
(47)	MN '38-'40 Extrap.	(45) / (1)	**($77.74)**	($82.23)	($70.44)	($78.11)	($87.07)	($68.30)	($80.38)	($93.76)	($91.01)	($90.72)	($89.29)	($83.53)	($47.91)	($55.85)	($63.00)	($62.85)	($56.75)	($61.95)	($66.02)	($68.70)	($71.41)	($74.29)	($76.86)	($79.58)	($82.27)	($85.08)	($87.48)	($89.83)	($91.82)	($93.93)	($93.86)	($232.55)

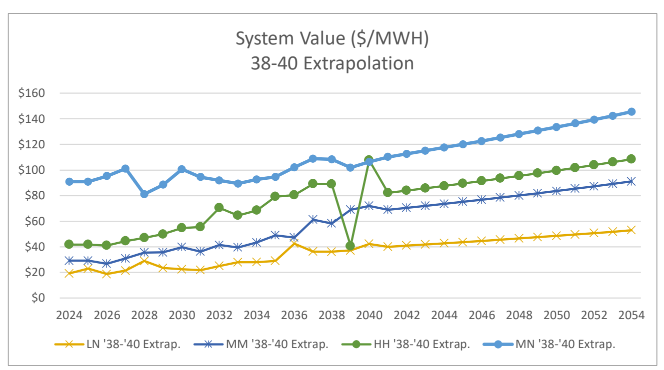
2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054
$29.20	$29.20	$26.75	$30.97	$35.62	$35.65	$39.72	$36.37	$41.40	$39.58	$43.38	$48.97	$47.20	$61.26	$58.27	$68.92	$71.94	$57.87	$59.12	$60.39	$61.69	$63.02	$64.38	$65.77	$67.18	$68.63	$70.11	$71.62	$73.16	$74.74	$76.35
$29.20	$29.20	$26.75	$30.97	$35.62	$35.65	$39.72	$36.37	$41.40	$39.58	$43.38	$48.97	$47.20	$61.26	$58.27	$68.92	$71.94	$69.01	$70.49	$72.01	$73.56	$75.15	$76.77	$78.42	$80.11	$81.84	$83.60	$85.40	$87.25	$89.13	$91.05
$19.20	$22.93	$18.71	$21.47	$28.93	$23.49	$22.49	$21.91	$25.13	$27.92	$28.05	$29.11	$42.62	$36.33	$36.22	$37.15	$42.30	$36.98	$37.78	$38.59	$39.42	$40.27	$41.14	$42.03	$42.93	$43.86	$44.80	$45.77	$46.75	$47.76	$48.79
$19.20	$22.93	$18.71	$21.47	$28.93	$23.49	$22.49	$21.91	$25.13	$27.92	$28.05	$29.11	$42.62	$36.33	$36.22	$37.15	$42.30	$40.13	$40.99	$41.88	$42.78	$43.70	$44.64	$45.60	$46.59	$47.59	$48.62	$49.66	$50.73	$51.83	$52.94
$41.80	$41.80	$41.07	$44.47	$47.08	$49.91	$54.85	$55.47	$70.40	$64.43	$68.56	$79.20	$80.43	$89.26	$88.91	$40.67	$107.64	$84.84	$86.67	$88.54	$90.45	$92.40	$94.39	$96.42	$98.50	$100.62	$102.79	$105.01	$107.27	$109.58	$111.94
$41.80	$41.80	$41.07	$44.47	$47.08	$49.91	$54.85	$55.47	$70.40	$64.43	$68.56	$79.20	$80.43	$89.26	$88.91	$40.67	$107.64	$82.18	$83.95	$85.76	$87.61	$89.49	$91.42	$93.39	$95.41	$97.46	$99.56	$101.71	$103.90	$106.14	$108.43
$90.80	$90.80	$95.25	$101.03	$81.04	$88.52	$100.64	$94.48	$91.92	$89.39	$92.67	$94.66	$102.02	$108.84	$108.30	$101.83	$106.34	$110.45	$112.84	$115.27	$117.75	$120.29	$122.88	$125.53	$128.23	$131.00	$133.82	$136.70	$139.65	$142.66	$145.73
$90.80	$90.80	$95.25	$101.03	$81.04	$88.52	$100.64	$94.48	$91.92	$89.39	$92.67	$94.66	$102.02	$108.84	$108.30	$101.83	$106.34	$110.22	$112.60	$115.02	$117.50	$120.03	$122.62	$125.26	$127.96	$130.72	$133.54	$136.41	$139.35	$142.36	$145.42











Project Summary

Project Name	Structure	Capacity (AC)	Start Date	End Date	Term/Life (years)	Curve	NDC (unadj)	NDC (avg CC)	NDC (ann CC)	Avg Cap Contrib	NB/C (unadj)	NB/C (avg CC)	NB/C (ann CC)
Rock River I	BTA	53.6	11/1/2024	10/31/2054	30	Wyoming East	($6.81)	($47.11)	($46.38)	14.5%	($6.81)	($47.11)	($46.38)

Rock River I Asset Purchase Summary - 60% PTC

	Value of Generation	Value of RECs (1)	Value of Storage	Market Value of PTC (2)	Capital Revenue Requirement (3) w/o TV	RRCap Revenue Requirement (3)	Cost of O&M (Storage)	Cost of O&M (Generation)	Cost of Property Taxes	Cost of Generation Tax	Cost of Integration	Cost of Wheeling (4)	Direct Assigned Rev Req w/o TV	Network Upgrade Rev Req w/o TV	CapEx Terminal Value	DA Terminal Value	NU Terminal Value	Net Delivery Cost	Net Benefit/(Cost)	Embedded Terminal Value
Nom. Lev ($/MWh)	$0.00	$0.00	$0.00	$24.46	($36.22)	($4.36)	$0.00	($5.13)	($1.77)	($0.79)	($1.16)	$0.00	$0.00	$0.00	$0.79	$0.00	$0.00	($24.19)	($24.19)	$0.79
Present Value ($)	$0	$0	$0	$52,661,029	($77,980,842)	($9,389,085)	$0	($11,051,152)	($3,807,203)	($1,701,156)	($2,507,821)	$0	$0	$0	$1,701,515	$0	$0	($52,074,716)	($52,074,716)	$1,701,515
PV ($/kw-mo)	$0.00	$0.00	$0.00	$6.89	($10.20)	($1.23)	$0.00	($1.45)	($0.50)	($0.22)	($0.33)	$0.00	$0.00	$0.00	$0.22	$0.00	$0.00	($6.81)	($6.81)	$0.22

Rock River I Asset Purchase Annual Cost Detail

Year	Value of Generation	Value of RECs (1)	Value of Storage	Market Value of PTC (2)	Capital Revenue Requirement (3) w/o TV	RRCap Revenue Requirement (3)	Cost of O&M (Storage)	Cost of O&M (Generation)	Cost of Property Taxes	Cost of Generation Tax	Cost of Integration	Cost of Wheeling (4)	Direct Assigned Rev Req w/o TV	Network Upgrade Rev Req w/o TV	CapEx Terminal Value	DA Terminal Value	NU Terminal Value	Net Delivery Cost	Net Benefit/(Cost)	Embedded Terminal Value
2024	$0	$0	$0	$1,958,327	($2,115,325)	($4,349)	$0	($164,383)	$0	$0	($100,710)	$0	$0	$0	$0	$0	$0	($426,439)	($426,439)	$0
2025	$0	$0	$0	$8,712,891	($11,026,576)	($38,916)	$0	($773,480)	($638,209)	$0	($579,575)	$0	$0	$0	$0	$0	$0	($4,343,865)	($4,343,865)	$0
2026	$0	$0	$0	$8,712,891	($10,291,609)	($99,865)	$0	($789,765)	($573,829)	$0	($613,933)	$0	$0	$0	$0	$0	$0	($3,656,110)	($3,656,110)	$0
2027	$0	$0	$0	$9,024,065	($9,757,806)	($158,662)	$0	($807,116)	($528,972)	($49,725)	($699,653)	$0	$0	$0	$0	$0	$0	($2,977,868)	($2,977,868)	$0
2028	$0	$0	$0	$9,058,022	($9,299,439)	($216,407)	$0	($824,111)	($495,808)	($214,137)	($736,491)	$0	$0	$0	$0	$0	$0	($2,728,371)	($2,728,371)	$0
2029	$0	$0	$0	$9,335,240	($8,897,650)	($273,535)	$0	($842,245)	($462,495)	($213,334)	($383,612)	$0	$0	$0	$0	$0	$0	($1,737,631)	($1,737,631)	$0
2030	$0	$0	$0	$9,335,240	($8,609,016)	($330,449)	$0	($860,734)	($437,953)	($213,334)	($351,831)	$0	$0	$0	$0	$0	$0	($1,468,077)	($1,468,077)	$0
2031	$0	$0	$0	$9,646,415	($8,376,960)	($387,838)	$0	($879,670)	($422,231)	($213,334)	($105,960)	$0	$0	$0	$0	$0	$0	($739,578)	($739,578)	$0
2032	$0	$0	$0	$9,995,059	($8,144,903)	($446,042)	$0	($899,023)	($406,443)	($214,137)	($140,535)	$0	$0	$0	$0	$0	$0	($256,023)	($256,023)	$0
2033	$0	$0	$0	$9,957,590	($7,912,846)	($505,129)	$0	($918,801)	($390,582)	($213,334)	($37,524)	$0	$0	$0	$0	$0	$0	($20,627)	($20,627)	$0
2034	$0	$0	$0	$7,875,253	($7,680,789)	($567,979)	$0	($962,664)	($374,639)	($213,334)	($27,507)	$0	$0	$0	$0	$0	$0	($1,951,659)	($1,951,659)	$0
2035	$0	$0	$0	$0	($7,448,733)	($667,338)	$0	($1,249,704)	($358,893)	($213,334)	($36,846)	$0	$0	$0	$0	$0	$0	($9,974,848)	($9,974,848)	$0
2036	$0	$0	$0	$0	($7,216,676)	($801,494)	$0	($1,277,198)	($346,303)	($214,137)	($31,830)	$0	$0	$0	$0	$0	$0	($9,887,637)	($9,887,637)	$0
2037	$0	$0	$0	$0	($6,984,619)	($935,256)	$0	($1,305,296)	($333,226)	($213,334)	($7,065)	$0	$0	$0	$0	$0	$0	($9,778,796)	($9,778,796)	$0
2038	$0	$0	$0	$0	($6,752,562)	($1,070,055)	$0	($1,334,013)	($319,750)	($213,334)	($6,641)	$0	$0	$0	$0	$0	$0	($9,696,355)	($9,696,355)	$0
2039	$0	$0	$0	$0	($6,520,506)	($1,206,715)	$0	($1,363,361)	($305,908)	($213,334)	($7,115)	$0	$0	$0	$0	$0	$0	($9,616,938)	($9,616,938)	$0
2040	$0	$0	$0	$0	($6,288,449)	($1,346,099)	$0	($1,334,013)	($291,668)	($214,137)	($30,406)	$0	$0	$0	$0	$0	$0	($9,504,771)	($9,504,771)	$0
2041	$0	$0	$0	$0	($6,056,392)	($1,489,509)	$0	($1,363,361)	($277,045)	($213,334)	($30,883)	$0	$0	$0	$0	$0	$0	($9,430,524)	($9,430,524)	$0
2042	$0	$0	$0	$0	($5,824,335)	($1,638,116)	$0	($1,394,718)	($262,044)	($213,334)	($31,485)	$0	$0	$0	$0	$0	$0	($9,364,032)	($9,364,032)	$0
2043	$0	$0	$0	$0	($5,592,279)	($1,793,054)	$0	($1,426,797)	($246,612)	($213,334)	($32,099)	$0	$0	$0	$0	$0	$0	($9,304,174)	($9,304,174)	$0
2044	$0	$0	$0	$0	($5,360,222)	($1,955,852)	$0	($1,459,613)	($230,685)	($214,137)	($32,848)	$0	$0	$0	$0	$0	$0	($9,253,357)	($9,253,357)	$0
2045	$0	$0	$0	$0	($5,128,165)	($2,128,616)	$0	($1,493,184)	($214,190)	($213,334)	($33,363)	$0	$0	$0	$0	$0	$0	($9,210,852)	($9,210,852)	$0
2046	$0	$0	$0	$0	($4,896,109)	($2,314,331)	$0	($1,527,527)	($197,032)	($213,334)	($34,014)	$0	$0	$0	$0	$0	$0	($9,182,346)	($9,182,346)	$0
2047	$0	$0	$0	$0	($4,664,052)	($2,517,380)	$0	($1,562,661)	($179,097)	($213,334)	($34,677)	$0	$0	$0	$0	$0	$0	($9,171,200)	($9,171,200)	$0
2048	$0	$0	$0	$0	($4,431,995)	($2,744,491)	$0	($1,595,476)	($160,235)	($214,137)	($35,486)	$0	$0	$0	$0	$0	$0	($9,181,821)	($9,181,821)	$0
2049	$0	$0	$0	$0	($4,199,938)	($3,006,615)	$0	($1,628,981)	($140,251)	($213,334)	($36,042)	$0	$0	$0	$0	$0	$0	($9,225,161)	($9,225,161)	$0
2050	$0	$0	$0	$0	($3,967,882)	($3,323,071)	$0	($1,663,190)	($118,871)	($213,334)	($36,745)	$0	$0	$0	$0	$0	$0	($9,323,093)	($9,323,093)	$0
2051	$0	$0	$0	$0	($3,735,825)	($3,732,315)	$0	($1,698,117)	($95,697)	($213,334)	($37,462)	$0	$0	$0	$0	$0	$0	($9,512,750)	($9,512,750)	$0
2052	$0	$0	$0	$0	($3,503,768)	($4,167,302)	$0	($1,733,778)	($70,086)	($214,137)	($38,336)	$0	$0	$0	$0	$0	$0	($9,727,406)	($9,727,406)	$0
2053	$0	$0	$0	$0	($3,271,711)	($4,426,329)	$0	($1,770,187)	($37,744)	($200,903)	($36,668)	$0	$0	$0	$0	$0	$0	($9,743,541)	($9,743,541)	$0
2054	$0	$0	$0	$0	($1,609,848)	($2,206,552)	$0	($1,156,468)	$2,189	($122,707)	($22,833)	$0	$0	$0	$15,807,629	$0	$0	$10,691,411	$10,691,411	$15,807,629
2055	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2056	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2057	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2058	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2059	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2060	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2061	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2062	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2063	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2064	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Totals	$0	$0	$0	$93,610,993	($195,566,984)	($46,499,660)	$0	($38,059,636)	($8,914,306)	($5,712,304)	($4,370,174)	$0	$0	$0	$15,807,629	$0	$0	($189,704,441)	($189,704,441)	$15,807,629

(1) No assumed price for the Market Value of RECs.
(2) Federal PTC and/or State Renewable Incentive
(3) Capital Revenue Requirement includes return on capital (7.460%) and capital depreciation expense.
(4) Cost of Transmission includes wheeling (PTP, Sch/Disp) and losses

Generation/Capacity

PV Generation MWh	PV Average MW	Capacity Factor	PV Capacity MW
2,152,805	3,802.6	45%	7,642

Adjusted by Capacity Contribution

ACC Value	Value of RE	Value of Sto	Market Valu	Capital Reve	RRCap Reve	Cost of O&M	Cost of O&M	Cost of Prop	Cost of Gene	Cost of Integ	Cost of Whe	Direct Assig	Network Up	CapEx Term	DA Termina	NU Termina	Net Delivery	Net Benefit/(	Embedded T	Adj Net Benefit/(Cost)
0	0	0	167.6188	-248.3767	-30.11217	0	-35.29449	-12.11801	-5.427358	-7.984682	0	0	0	7.0416095	0	0	-164.653	-164.653	7.0416095	-164.653
0	0	0	360850530	-5.35E+08	-64825610	0	-75982144	-26087713	-11684043	-17189460	0	0	0	15159210	0	0	-3.54E+08	-3.54E+08	15159210	-3.54E+08
0	0	0	47.216857	-69.96571	-8.482353	0	-9.942172	-3.413546	-1.528843	-2.24922	0	0	0	1.9835643	0	0	-46.38142	-46.38142	1.9835643	-46.38142
																	-68.76795	-68.76795		

Annual

Adjusted by Capacity Contribution

Total MWh	Average MW	Average CF	Capacity MW	Cap Contrib	ACC Value	Value of RE	Value of Stor	Market Valu	Capital Reve	RRCap Reve	Cost of O&M	Cost of O&M	Cost of Prop	Cost of Gene	Cost of Integ	Cost of Whe	Direct Assig	Network Up	CapEx Term	DA Termina	NU Termina	Net Delivery	Net Benefit/(	Embedded T	Net Benefit/(Cost)
49,725	34.0	63%	8.9	0.1459358	0	0	0	13419096	-14494893	-29800.69	0	-1126406	0	0	-690096.2	0	0	0	0	0	0	-2922101	-2922101	0	-2922101
213,334	24.4	45%	53.6	0.1459358	0	0	0	59703567	-75557692	-266664.6	0	-5300138	-4373215	0	-3971436	0	0	0	0	0	0	-29765578	-29765578	0	-29765578
213,334	24.4	45%	53.6	0.1459358	0	0	0	59703567	-70521457	-684310.4	0	-5411725	-3932064	0	-4206866	0	0	0	0	0	0	-25052855	-25052855	0	-25052855
213,334	24.4	45%	53.6	0.1459358	0	0	0	61835838	-66863666	-1087203	0	-5530621	-3624687	-340733.9	-4794251	0	0	0	0	0	0	-20405323	-20405323	0	-20405323
214,137	24.4	45%	53.6	0.1459358	0	0	0	62068519	-63722789	-1482889	0	-5647081	-3397435	-1467335	-5046678	0	0	0	0	0	0	-18695687	-18695687	0	-18695687
213,334	24.4	45%	53.6	0.1459358	0	0	0	63968108	-60969600	-1874352	0	-5771337	-3169166	-1461834	-2628633	0	0	0	0	0	0	-11906814	-11906814	0	-11906814
213,334	24.4	45%	53.6	0.1459358	0	0	0	63968108	-58991785	-2264343	0	-5898029	-3000997	-1461834	-2410861	0	0	0	0	0	0	-10059741	-10059741	0	-10059741
213,334	24.4	45%	53.6	0.1459358	0	0	0	66100378	-57401657	-2657593	0	-6027786	-2893264	-1461834	-726075.7	0	0	0	0	0	0	-5067832	-5067832	0	-5067832
214,137	24.4	45%	53.6	0.1459358	0	0	0	68489401	-55811528	-3056424	0	-6160397	-2785081	-1467335	-962989.7	0	0	0	0	0	0	-1754355	-1754355	0	-1754355
213,334	24.4	45%	53.6	0.1459358	0	0	0	68232648	-54221400	-3461310	0	-6295926	-2676395	-1461834	-257129.8	0	0	0	0	0	0	-141346.3	-141346.3	0	-141346.3
213,334	24.4	45%	53.6	0.1459358	0	0	0	53963801	-52631272	-3891979	0	-6596487	-2567147	-1461834	-188489.3	0	0	0	0	0	0	-13373406	-13373406	0	-13373406
213,334	24.4	45%	53.6	0.1459358	0	0	0	0	-51041143	-4572819	0	-8563381	-2459249	-1461834	-252481.3	0	0	0	0	0	0	-68350908	-68350908	0	-68350908
214,137	24.4	45%	53.6	0.1459358	0	0	0	0	-49451015	-5492098	0	-8751776	-2372978	-1467335	-218108.5	0	0	0	0	0	0	-67753309	-67753309	0	-67753309
213,334	24.4	45%	53.6	0.1459358	0	0	0	0	-47860886	-6408676	0	-8944315	-2283376	-1461834	-48410.72	0	0	0	0	0	0	-67007499	-67007499	0	-67007499
213,334	24.4	45%	53.6	0.1459358	0	0	0	0	-46270758	-7332366	0	-9141090	-2191031	-1461834	-45507.87	0	0	0	0	0	0	-66442587	-66442587	0	-66442587
213,334	24.4	45%	53.6	0.1459358	0	0	0	0	-44680630	-8268807	0	-9342194	-2096178	-1461834	-48752.41	0	0	0	0	0	0	-65898395	-65898395	0	-65898395
214,137	24.4	45%	53.6	0.1459358	0	0	0	0	-43090501	-9223907	0	-9141090	-1998604	-1467335	-208351.9	0	0	0	0	0	0	-65129789	-65129789	0	-65129789
213,334	24.4	45%	53.6	0.1459358	0	0	0	0	-41500373	-10206600	0	-9342194	-1898405	-1461834	-211618.5	0	0	0	0	0	0	-64621025	-64621025	0	-64621025
213,334	24.4	45%	53.6	0.1459358	0	0	0	0	-39910245	-11224903	0	-9557064	-1795612	-1461834	-215745	0	0	0	0	0	0	-64165402	-64165402	0	-64165402
213,334	24.4	45%	53.6	0.1459358	0	0	0	0	-38320116	-12286592	0	-9776877	-1689863	-1461834	-219952	0	0	0	0	0	0	-63755234	-63755234	0	-63755234
214,137	24.4	45%	53.6	0.1459358	0	0	0	0	-36729988	-13402137	0	-10001745	-1580730	-1467335	-225084.9	0	0	0	0	0	0	-63407020	-63407020	0	-63407020
213,334	24.4	45%	53.6	0.1459358	0	0	0	0	-35139860	-14585969	0	-10231785	-1467696	-1461834	-228613.8	0	0	0	0	0	0	-63115758	-63115758	0	-63115758
213,334	24.4	45%	53.6	0.1459358	0	0	0	0	-33549731	-15858547	0	-10467116	-1350127	-1461834	-233071.8	0	0	0	0	0	0	-62920427	-62920427	0	-62920427
213,334	24.4	45%	53.6	0.1459358	0	0	0	0	-31959603	-17249906	0	-10707860	-1227229	-1461834	-237616.7	0	0	0	0	0	0	-62844049	-62844049	0	-62844049
214,137	24.4	45%	53.6	0.1459358	0	0	0	0	-30369474	-18806150	0	-10932725	-1097983	-1467335	-243161.8	0	0	0	0	0	0	-62916829	-62916829	0	-62916829
213,334	24.4	45%	53.6	0.1459358	0	0	0	0	-28779346	-20602304	0	-11162312	-961042.3	-1461834	-246974.1	0	0	0	0	0	0	-63213813	-63213813	0	-63213813
213,334	24.4	45%	53.6	0.1459358	0	0	0	0	-27189218	-22770767	0	-11396720	-814541.9	-1461834	-251790.1	0	0	0	0	0	0	-63884871	-63884871	0	-63884871
213,334	24.4	45%	53.6	0.1459358	0	0	0	0	-25599089	-25575039	0	-11636052	-655745.7	-1461834	-256700	0	0	0	0	0	0	-65184460	-65184460	0	-65184460
214,137	24.4	45%	53.6	0.1459358	0	0	0	0	-24008961	-28555708	0	-11880409	-480250.1	-1467335	-262690.4	0	0	0	0	0	0	-66655353	-66655353	0	-66655353
200,903	22.9	43%	53.6	0.1459358	0	0	0	0	-22418833	-30330648	0	-12129897	-258631.1	-1376651	-251261.5	0	0	0	0	0	0	-66765921	-66765921	0	-66765921
122,707	16.8	31%	44.6	0.112243	0	0	0	0	-14342520	-19658703	0	-10303254	19501.736	-1093222	-203422	0	0	0	140833986	0	0	95252366	95252366	140833986	95252366
0	0.0	0%	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0.0	0%	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0.0	0%	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0.0	0%	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0.0	0%	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0.0	0%	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0.0	0%	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0.0	0%	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0.0	0%	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0.0	0%	0.0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6,352,306					0	0	0	641453032	-1.34E+09	-3.23E+08	0	-2.63E+08	-61079224	-39394964	-29992821	0	0	0	140833986	0	0	-1.28E+09	-1.28E+09	140833986	-1.28E+09

-5775484	-9374411	3598927.3	3598927.3	0	
-6256340	-9541632	3285292.4	6884219.6	-2935438	-2486019
-6579003	-9762906	3183903.2	10068123	-2616131	-2427744
-6820155	-10414647	3594492.6	13662615	-2397824	-2303287
-7009830	-11821202	4811371.6	18473987	-2235318	-2179077
-7367555	-8314728	947172.6	19421160	-2076067	-2054868
-7500585	-8280237	779651.87	20200812	-1959208	-1929229
-7809769	-8243034	433265.56	20634077	-1884061	-1814253
-8191210	-8218632	27422.358	20661499	-1808338	-1698845
-8416713	-8175585	-241127.2	20420372	-1739081	-1580340
-8847566	-8317625	-529941.8	19890430	-1668619	-1461749
-9291156	-8306497	-984659.3	18905771	-1597184	-1345122
-9732712	-8284689	-1448023	17457748	-1524854	-1245138
-10339353	-8248990	-2090363	15367385	-1451548	-1126356
-10858062	-8310082	-2547980	12819405	-1377281	-1008496
-11190855	-8348910	-2841945	9977459.7	-1302055	-978526.4
-11563466	-8289946	-3273521	6703939.1	-1225755	-926084.3
-11892513	-8529388	-3363124	3340814.9	-1148247	-759699.1
-12262289	-8609574	-3652715	-311900.4	-1069373	-909960
-12645335	-8831343	-3813993	-4125893	-988945.8	-890295.8
-13073485	-8806926	-4266559	-8392452	-906739.9	-886323.4
-13453258	-9003811	-4449447	-12841899	-822479.2	-747748.1
-13879197	-9117763	-4761434	-17603333	-735819.1	-847449.1
-14320530	-9214384	-5106146	-22709479	-646318.5	-854335
-14813050	-9204172	-5608878	-28318358	-553394.3	-840706.3
-15251735	-11640340	-3611395	-31929752	-456241.9	-707528.7
-15742844	-14429940	-1312904	-33242657	-353681.2	-799326.9
-16251823	-14677641	-1574181	-34816838	-243815.7	-3276797
-16818996	-14991165	-1827831	-36644669	-123076.4	-3322970
-17326134	-19003192	1677058.2	-34967611	28779.363	-3413515
					-7088434

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
MM			$0	($1)	($2)	($2)	($4)	($5)	($6)	($7)	($7)	($9)	($8)	($7)	($0)	($0)	($3)	($3)	($5)	($6)

Figure 2 **Total-System Change in Annual Revenue Requirement Due to the Transmission Projects ($ million)**