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July 28, 2017

***VIA ELECTRONIC FILING AND HUDDLE***

Public Utility Commission of Oregon  
201 High Street SE, Suite 100  
Salem, OR 97301-3398

Attn: Filing Center

**RE: LC 67 – PacifiCorp’s Informational Filing**

PacifiCorp d/b/a Pacific Power provides the attached informational filing regarding PacifiCorp’s 2017 Integrated Resource Plan (IRP). Supporting work papers will be posted to Huddle.

The enclosed informational filing provides an updated economic analysis and related discussion on the wind repowering and new transmission and wind projects included in the 2017 IRP. This filing is provided as informational only. PacifiCorp committed to provide these materials at the July 10, 2017 workshop with the Public Utility Commission of Oregon.

In response to the Administrative Law Judge’s guidance to provide an indication of what has been updated or changed in this updated analysis, please refer to Section 2. Section 2 of the informational filing provides detailed discussion of the changes and updates made in assumptions, inputs, and modeling that were performed as part of the updated economic analysis.

Please direct any questions on this filing to Natasha Siores at (503) 813-6583.

Sincerely,

A handwritten signature in black ink, appearing to read "Etta Lockey", with a long, sweeping flourish extending to the right.

Etta Lockey  
Vice President, Regulation

# 2017 INTEGRATED RESOURCE PLAN

Energy Vision 2020 Update

July 28, 2017



**PACIFICORP**  
A BERKSHIRE HATHAWAY ENERGY COMPANY

# TABLE OF CONTENTS

---

<b>SECTION 1 – INTRODUCTION</b> .....	1
WIND REPOWERING OVERVIEW .....	1
NEW WIND AND TRANSMISSION OVERVIEW .....	3
<b>SECTION 2 – METHODOLOGY</b> .....	5
SYSTEM MODELING METHODOLOGY.....	5
<i>MODELS</i> .....	5
<i>PRICE-POLICY SCENARIOS</i> .....	6
ANNUAL REVENUE REQUIREMENT MODELING METHODOLOGY .....	10
<i>EXTENSION OF NET BENEFITS THROUGH 2050</i> .....	11
ASSUMPTIONS.....	12
<i>ENERGY VISION 2020 COST AND PERFORMANCE</i> .....	12
<i>AVOIDED DE-RATE BENEFITS</i> .....	13
<i>LINE LOSS BENEFITS</i> .....	13
<i>EIM BENEFITS</i> .....	13
<i>INVESTMENT RECOVERY</i> .....	14
<b>SECTION 3 – WIND REPOWERING</b> .....	15
WIND REPOWERING SCOPE.....	15
SYSTEM MODELING PRICE-POLICY RESULTS .....	15
<i>MODEL DIFFERENCES</i> .....	16
ANNUAL REVENUE REQUIREMENT PRICE-POLICY RESULTS .....	17
SENSITIVITY STUDIES .....	19
<i>40-YEAR LIFE SENSITIVITY</i> .....	19
<i>NEW WIND AND TRANSMISSION SENSITIVITY</i> .....	20
<i>WIND REPOWERING CAPACITY SENSITIVITY</i> .....	20
CONCLUSION .....	21
<b>SECTION 4 – NEW WIND AND TRANSMISSION</b> .....	23
SYSTEM MODELING PRICE-POLICY RESULTS .....	23
<i>MODEL DIFFERENCES</i> .....	24
ANNUAL REVENUE REQUIREMENT PRICE-POLICY RESULTS .....	24
SENSITIVITY STUDIES .....	26
<i>40-YEAR LIFE SENSITIVITY</i> .....	26
<i>WIND REPOWERING SENSITIVITY</i> .....	27
CONCLUSION .....	28

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**ATTACHMENTS** .....29

ATTACHMENT A – NOMINAL HENRY HUB NATURAL GAS PRICE FORECASTS (\$/MMBTU) .....29

ATTACHMENT B – SYSTEM MODELING PRICE-POLICY DETAIL FOR WIND REPOWERING .....31

ATTACHMENT C – ANNUAL REVENUE REQUIREMENT PRICE-POLICY DETAIL  
FOR WIND REPOWERING .....37

ATTACHMENT D – SYSTEM MODELING PRICE-POLICY DETAIL FOR NEW WIND AND  
TRANSMISSION .....41

ATTACHMENT E – ANNUAL REVENUE REQUIREMENT PRICE-POLICY DETAIL FOR NEW WIND AND  
TRANSMISSION .....47

## SECTION 1– INTRODUCTION

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In this informational filing, PacifiCorp presents an updated economic analysis supporting the wind repowering, new transmission, and new wind investments (collectively, the Energy Vision 2020 projects) identified in the 2017 IRP and the associated action plan, specifically action items 1a, 1b, and 2a. This updated economic analysis was developed to support a series of concurrent regulatory filings made with the Wyoming Public Service Commission (WPSC), the Utah Public Service Commission (UPSC), and the Idaho Public Utilities Commission (IPUC) on June 30, 2017. The updated economic analysis was prepared to ensure these filings were supported using the most currently available information and is being provided to IRP stakeholders so that all parties have access to the same analysis as they move forward with their on-going review of PacifiCorp’s 2017 IRP. In making this informational filing, PacifiCorp has not modified its 2017 IRP preferred portfolio or action plan in any way.

Since filing its 2017 IRP on April 4, 2017, and consistent with the 2017 IRP action plan, PacifiCorp filed applications for certificates of public convenience and necessity (CPCNs) with the WPSC on June 30, 2017. These CPCN applications are required for the new wind and new transmission investments outlined in action items 1a and 2a of the 2017 IRP action plan. PacifiCorp also filed an application with the WPSC on June 30, 2017, seeking approval of its proposed ratemaking treatment for the wind repowering project. Concurrent with these filings, PacifiCorp filed separate applications for Energy Vision 2020 projects, seeking approval of its proposed ratemaking treatment with the UPSC and the IPUC. There are existing rate-recovery mechanisms in Oregon and Washington for investments in renewable resources that provide a path for cost recovery closer in time to project completion. In California, PacifiCorp is required to file a general rate case in 2019, which may include the costs and benefits of Energy Vision 2020 investments; alternatively, California’s Post-Test Year Adjustment Mechanism may be used to recover costs after the 2019 general rate case.

### Wind Repowering Overview

Wind repowering takes advantage of technological advancements that allow greater generation from existing wind resources. Wind repowering involves installation of new rotors with longer blades and new nacelles with higher-capacity generators. These plant upgrades significantly increase energy output without changing the footprint, towers, and foundations of the wind facilities. Longer blades allow wind turbines to produce more energy over a wider range of wind speeds. The nacelle is the housing that sits atop the tower and contains the gear box, low- and high-speed shafts, generator, controller, and brake. The new nacelles will include sophisticated control systems and more robust components necessary to handle greater loads that come with longer blades.

Together, the new rotor and nacelles are estimated to increase generation from the repowered turbines by 13 to 35 percent, resulting in an overall average increase in generation of 19 percent (or 21 percent if new interconnection agreements are executed).

On December 18, 2015, Congress enacted changes to the federal Internal Revenue Code that extended the full value of production tax credits (PTCs) for wind energy facilities that began

construction in 2015 and 2016. The Internal Revenue Service (IRS) has issued guidance that establishes “safe harbor” for taxpayers to demonstrate the year a facility will be deemed to “begin construction,” thereby setting the value of the PTC.

Repowering PacifiCorp’s wind fleet now will allow the resources to requalify for PTCs, which will expire 10 years from the original commercial operation date of the resource (expiration dates range from 2016 through 2020). To maximize the PTC benefit, in December 2016, PacifiCorp contracted with General Electric, Inc., and Vestas-American Wind Technology, Inc., for the purchase of new wind-turbine generator equipment. These safe-harbor equipment purchases allow the repowered facilities to qualify for 100 percent of available PTC benefits if they are commercially operational within four calendar years—or by the end of 2020. PacifiCorp’s purchases last year were important because wind facilities that begin construction after 2016 and come online after 2020 will receive a 20 percent decrease in the tax benefits that can be passed on to customers each year. Thus, a delay in acquiring safe-harbor equipment would have made the economics of repowering less attractive and deprived customers of the substantial benefits that can be achieved if repowering is completed by the end of 2020.

To meet the 2020 deadline, PacifiCorp plans to order the necessary equipment and execute the necessary contracts in early 2018 and complete much of the construction in 2019. The renewal of the PTC has dramatically increased the demand for materials, equipment, and labor for wind facilities. By completing the majority of the construction in 2019, PacifiCorp will mitigate the risk of construction delays, or delays associated with the procurement of equipment, and allow sufficient time to meet the 2020 deadline.

In addition, completing the majority of construction in 2019 will maximize the value of the existing PTCs, while minimizing the period between the expiration of the prior PTCs and the eligibility for new PTCs. By achieving commercial operation in 2019 for most of the facilities (Dunlap will be completed in 2020), PacifiCorp will also minimize the time during which the wind facilities are ineligible for PTCs.

The customer benefits resulting from wind repowering derive in part from the fact that repowering allows PacifiCorp’s existing wind resources to requalify for PTCs—which are then passed through to customers. Customer benefits are expected to exceed the cost of wind repowering and save customers money. Wind repowering creates benefits by:

- Increasing energy production from wind facilities by 13 to 35 percent because of longer blades and higher-capacity generators;
- Reducing ongoing operating costs associated with aging wind turbines;
- Extending the useful lives of the wind facilities by at least 10 years;
- Reducing customer costs by requalifying the wind projects for PTCs for an additional 10 years; and
- Improving the ability of wind facilities to deliver cost-effective, renewable energy into the transmission system through enhanced voltage support and power quality.

PacifiCorp’s updated economic analysis of the wind repowering project demonstrates that it will provide substantial customer benefits. As described in more detail in Sections 2 and 3 of this informational update, PacifiCorp analyzed nine different scenarios, each with varying natural gas

and carbon dioxide (CO<sub>2</sub>) price assumptions, and all nine scenarios show customer benefits ranging from \$41 million when assuming low natural gas and zero CO<sub>2</sub> prices to \$589 million when assuming high natural gas and high CO<sub>2</sub> prices. With medium natural gas price and CO<sub>2</sub> price assumptions, wind repowering results in customer benefits of \$359 million.

## **New Wind and Transmission Overview**

The new wind and transmission projects in the 2017 IRP preferred portfolio are central to PacifiCorp's current plans to use opportunities presented by the extension of the federal PTC to make major investments that provide significant savings to customers over the lives of the resources. The new wind and transmission projects are mutually dependent on one another. The new wind resources rely on the new transmission for interconnection into PacifiCorp's transmission system. In turn, the new transmission is supported by key economic attributes of the new wind: zero-fuel-cost generation that lowers net power costs (NPC) and provides ten years of PTCs. The new wind will also generate renewable energy credits (RECs), which can be sold in the market and lower net customer costs or otherwise be used to meet state renewable resource procurement targets. The new wind resources help decarbonize PacifiCorp's resource portfolio, mitigating long-term risk associated with potential future state and federal policies targeting CO<sub>2</sub> emissions reductions from the electric sector.

The new transmission also provides significant benefits to customers. The Aeolus-to-Bridger/Anticline transmission line is a sub-segment of PacifiCorp's Energy Gateway West transmission project, and is an integral component of the long-term transmission plan for the region. PacifiCorp, with stakeholder involvement, has pursued permitting of the Energy Gateway West transmission project since 2008. The new transmission will relieve congestion on the current transmission system in eastern Wyoming, provide voltage support to the Wyoming transmission network, improve overall reliability of the transmission system, enhance PacifiCorp's ability to comply with mandated reliability and performance standards, reduce line losses, and create the potential for further increases to the transfer capability across the Aeolus-to-Bridger/Anticline transmission line with the construction of additional segments of the Energy Gateway project.

Timing is critical for both the new wind and transmission projects. These assets must achieve commercial operation by the end of 2020 to qualify for the full benefits of the PTCs and maintain favorable economics. Thus, PacifiCorp must move quickly, particularly on the new transmission, which will take several years to fully permit, obtain the necessary rights-of-way, and construct. To complete construction of the new wind and transmission by December 31, 2020, PacifiCorp has requested expedited review of its CPCN applications.

Because of the time-sensitivity of the new wind and transmission projects, PacifiCorp is conducting its 2017R request for proposals (RFP) process simultaneously with its CPCN applications and on-going review of these investments by parties participating in PacifiCorp's 2017 IRP process. Although unusual, this approach is necessary in this case. If PacifiCorp waited until the conclusion of the 2017R RFP to seek CPCNs, or similarly, waited for conclusion of review of PacifiCorp's 2017 IRP to issue its 2017R RFP, the new wind and transmission projects could not be completed by the end of 2020, and customers would lose significant PTC benefits. To allow the new wind and transmission projects to move forward, PacifiCorp has pursued specific wind projects that will be benchmark resources in the 2017R RFP. These resources include three

250 MW facilities (referred to as Ekola Flats, TB Flats I, and TB Flats II) and a fourth 110 MW facility (McFadden Ridge II), all located in Wyoming. These proxy resources, in addition to 320 MW of qualifying facility (QF) resources enabled by the new transmission investment, are included in the updated economic analysis of the new wind and transmission projects.

PacifiCorp will update its economic analysis to reflect the specific resources selected to the 2017R RFP final shortlist, which the company plans to establish in early January 2018. If other resources are ultimately selected through the 2017R RFP, they will be equal to or better than the wind projects assumed in PacifiCorp's updated economic analysis.

The new transmission investment includes six major elements: (1) the 140-mile, Aeolus-to-Anticline 500 kV line, which includes construction of the new Aeolus and Anticline substations; (2) the five-mile Anticline to Jim Bridger 345 kV line, which includes modifications at the existing Jim Bridger substation to allow termination of the 345 kV line; (3) installation of a voltage control device at the Latham substation; (4) a new 16-mile 230 kV transmission line parallel to an existing 230 kV line from the Shirley Basin substation to the proposed Aeolus substation, including modifications to the existing Shirley Basin substation; (5) the reconstruction of four miles of an existing 230 kV line between the proposed Aeolus substation and the Freezeout substation, including modification as required at the Freezeout substation; and (6) the reconstruction of 14 miles of an existing 230 kV transmission line between the Freezeout substation and the Standpipe substation, including modifications as required at the Freezeout and Standpipe substations.

The benefits of the transmission project fall into three broad categories. First, the new transmission project will relieve congestion in eastern Wyoming, which will allow greater resource interconnection in that part of the state. PacifiCorp's current transmission system in eastern Wyoming is operating at capacity, which limits transfer of existing resources from eastern Wyoming and precludes the ability to interconnect additional resources east of the proposed Aeolus-to-Bridger/Anticline line. The new transmission will increase the transfer capability from east to west by 750 MW. When the new transmission project is complete, they it will allow interconnection of up to 1,270 MW of incremental wind resources.

Second, the new transmission will provide critical voltage support to the transmission system in southeastern Wyoming. Under certain operating conditions, voltage control issues have limited the ability to add additional resources, particularly wind resources. The addition of the new transmission will solve the voltage control issues.

Third, the transmission projects will also increase reliability, reduce capacity and energy losses on the transmission system, and provide greater flexibility to manage existing generation resources. Currently, outages on the existing 230 kV system in eastern Wyoming result in deration of the transfer capacity in the area and some outage scenarios require significant generation curtailment. The new 500 kV transmission segment will significantly reduce, if not eliminate, many of the impacts caused by the 230 kV outages.

PacifiCorp's updated economic analysis of the new wind and transmission projects demonstrates that these investments will provide substantial customer benefits. As described in more detail in Section 4 of this informational update, when using medium natural gas and CO<sub>2</sub> price assumptions, PacifiCorp's updated economic analysis shows a present-value reduction in revenue requirement due to the new wind and transmission projects of \$137 million.



## SECTION 2 – METHODOLOGY

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### System Modeling Methodology

In updating and refining its analytics for the Energy Vision 2020 projects, PacifiCorp relied upon the same modeling tools used to develop and analyze resource portfolios in its 2017 IRP. These modeling tools calculate system present value revenue requirement (PVRR) by identifying least-cost resource portfolios and dispatching system resources over a 20-year forecast period (2017–2036). Net customer benefits are calculated as the present-value revenue requirement differential (PVRR(d)) between two simulations of PacifiCorp’s system. One simulation includes the relevant components of the Energy Vision 2020 projects (*i.e.*, either wind repowering or new wind and new transmission) and the other simulation excludes these investments. Customers are expected to realize benefits when the system PVRR with the Energy Vision 2020 projects is lower than the system PVRR without these investments. Conversely, customers would experience increased costs if the system PVRR with Energy Vision 2020 projects were higher than the system PVRR without them.

### Models

PacifiCorp used the System Optimizer (SO) model and the Planning and Risk model (PaR) to develop resource portfolios and to forecast dispatch of system resources in simulations with and without the Energy Vision 2020 projects.

The SO model is used to develop resource portfolios with sufficient capacity to achieve a target planning-reserve margin. The SO model selects a portfolio of resources from a broad range of resource alternatives by minimizing the system PVRR. In selecting the least-cost resource portfolio for a given set of input assumptions, the SO model performs time-of-day, least-cost dispatch for existing resources and prospective resource alternatives, while considering the cost-and-performance characteristics of existing contracts and prospective demand-side-management (DSM) resources—all within or connected to PacifiCorp’s system. The system PVRR from the SO model reflects the cost of existing contracts, wholesale-market purchases and sales, the cost of new and existing generating resources (fuel, fixed and variable operations and maintenance, and emissions, as applicable), the cost of new DSM resources, and levelized revenue requirement of capital additions for existing coal resources and potential new generating resources.

PaR is used to develop a chronological unit commitment and dispatch forecast of the resource portfolio generated by the SO model, accounting for operating reserves, volatility and uncertainty in key system variables. PaR captures volatility and uncertainty in its unit commitment and dispatch forecast by using Monte Carlo sampling of stochastic variables, which include load, wholesale electricity and natural gas prices, hydro generation, and thermal unit outages. PaR uses the same common input assumptions that are used in the SO model, with resource-portfolio data provided by the SO model results. The PVRR from PaR reflects a distribution of system variable costs, including variable costs associated with existing contracts, wholesale-market purchases and sales, fuel costs, variable operations and maintenance costs, emissions costs, as applicable, and costs associated with energy or reserve deficiencies. Fixed costs that do not change with system dispatch, including the cost of DSM resources, fixed operations and maintenance costs, and the

levelized revenue requirement of capital additions for existing coal resources and potential new generating resources, are based on the fixed costs from the SO model, which are combined with the distribution of PaR variable costs to establish a distribution of system PVRR for each simulation.

PacifiCorp uses the SO model and PaR to produce and evaluate resource portfolios in its IRP. PacifiCorp also uses these models to analyze resource-acquisition opportunities, resource retirements, resource capital investments, and system transmission projects. The models were used to support the successful acquisition of the Chehalis combined-cycle plant, to support selection of the Lake Side 2 combined-cycle resource through an RFP process, and to evaluate installation of emissions control equipment. These models will also be used to evaluate bids in the soon-to-be-issued 2017R RFP, which is being issued to solicit bids for new wind resources.

The SO model and PaR are the appropriate modeling tools when evaluating significant capital investments that influence PacifiCorp's resource mix and affect least-cost dispatch of system resources. The SO model simultaneously and endogenously evaluates capacity and energy trade-offs associated with resource capital projects and is needed to understand how the type, timing, and location of future resources might be affected by Energy Vision 2020 projects. PaR provides additional granularity on how Energy Vision 2020 projects are forecasted to affect system operations, recognizing that key system conditions are volatile and uncertain. Together, the SO model and PaR are best suited to perform a net-benefit analysis for Energy Vision 2020 projects that is consistent with long-standing least-cost, least-risk planning principles applied in PacifiCorp's IRP.

Just as it evaluates resource-portfolio alternatives in the IRP, PacifiCorp uses the stochastic-mean PVRR and risk-adjusted PVRR, calculated from PaR study results, to assess the stochastic system cost risk of its proposed Energy Vision 2020 projects. With Monte Carlo sampling of stochastic variables, PaR produces a distribution of system variable costs. The stochastic-mean PVRR is the average of net variable operating costs from the distribution of system variable costs, combined with system fixed costs from the SO model. PacifiCorp uses a risk-adjusted PVRR to evaluate stochastic system cost risk. The risk-adjusted PVRR incorporates the expected value of low-probability, high-cost outcomes. The risk-adjusted PVRR is calculated by adding five percent of system variable costs, from the 95th percentile of the distribution of system variable costs, to the stochastic-mean PVRR.

When applied to its updated economic analysis, the stochastic-mean PVRR represents the expected level of system costs from cases with and without Energy Vision 2020 projects. The risk-adjusted PVRR is used to assess whether Energy Vision 2020 projects cause a disproportionate increase to system variable costs under low-probability, high-cost system conditions.

## **Price-Policy Scenarios**

In addition to assessing stochastic system cost risk, PacifiCorp analyzed the wind repowering project under a range of assumptions regarding wholesale market prices and CO<sub>2</sub> policy (price-policy) assumptions. These assumptions drive benefits associated with NPC, and so it is important to understand how the net-benefit analysis is affected under a range of potential outcomes. Each pair of model simulations—with and without the relevant components of the Energy Vision 2020

projects, in both the SO model and PaR—was analyzed under varying combinations of these price-policy assumptions.

Wholesale-power prices, often set by natural gas prices, and the system cost impacts of potential CO<sub>2</sub> policies influence the forecast of net system benefits from the Energy Vision 2020 projects. Wholesale-power prices and CO<sub>2</sub> policy outcomes affect the value of system energy, the dispatch of system resources, and PacifiCorp’s resource mix. Consequently, wholesale-power prices and CO<sub>2</sub> policy assumptions affect NPC benefits, non-NPC variable cost benefits, and system fixed-cost benefits of the Energy Vision 2020 projects. Because wholesale-power prices and CO<sub>2</sub> policy outcomes are both uncertain and important drivers to the updated economic analysis, PacifiCorp studied the economics of the Energy Vision 2020 projects under a range of different price-policy scenarios.

Considering that there is a high level of correlation between wholesale-power prices and natural gas prices, the wholesale-power price scenarios were based on a range of natural gas price assumptions. This ensures consistency between power price and natural gas price assumptions for each scenario. PacifiCorp implemented its CO<sub>2</sub> policy assumptions through a CO<sub>2</sub> price, expressed in dollars-per-ton.

Since filing the 2017 IRP, it has become increasingly unlikely that the CPP will be implemented in its current form. However, it is possible that future CO<sub>2</sub> policies targeting electric-sector emissions could be adopted and impose incremental costs to drive emissions reductions. CO<sub>2</sub> price assumptions used in the price-policy scenarios are not intended to mimic a specific type of policy mechanism (*i.e.*, a tax or an allowance price under a cap-and-trade program), but are intended to recognize that there might be future CO<sub>2</sub> policies that impose a cost to reduce emissions. Table 2.1 summarizes the nine price-policy scenarios used to analyze the Energy Vision 2020 projects.

**Table 2.1 – Price-Policy Scenarios**

Price-Policy Scenario	Natural Gas Prices (Levelized \$/MMBtu)*	CO <sub>2</sub> Price Description
Low Gas, Zero CO <sub>2</sub>	\$3.19	\$0/ton
Low Gas, Medium CO <sub>2</sub>	\$3.19	\$3.41/ton in 2025 growing to \$14.40/ton in 2036
Low Gas, High CO <sub>2</sub>	\$3.19	\$4.73/ton in 2025 growing to \$38.42/ton in 2036
Medium Gas, Zero CO <sub>2</sub>	\$4.07	\$0/ton
Medium Gas, Medium CO <sub>2</sub>	\$4.13	\$3.41/ton in 2025 growing to \$14.40/ton in 2036
Medium Gas, High CO <sub>2</sub>	\$4.13	\$4.73/ton in 2025 growing to \$38.42/ton in 2036
High Gas, Zero CO <sub>2</sub>	\$5.83	\$0/ton
High Gas, Medium CO <sub>2</sub>	\$5.83	\$3.41/ton in 2025 growing to \$14.40/ton in 2036
High Gas, High CO <sub>2</sub>	\$5.83	\$4.73/ton in 2025 growing to \$38.42/ton in 2036

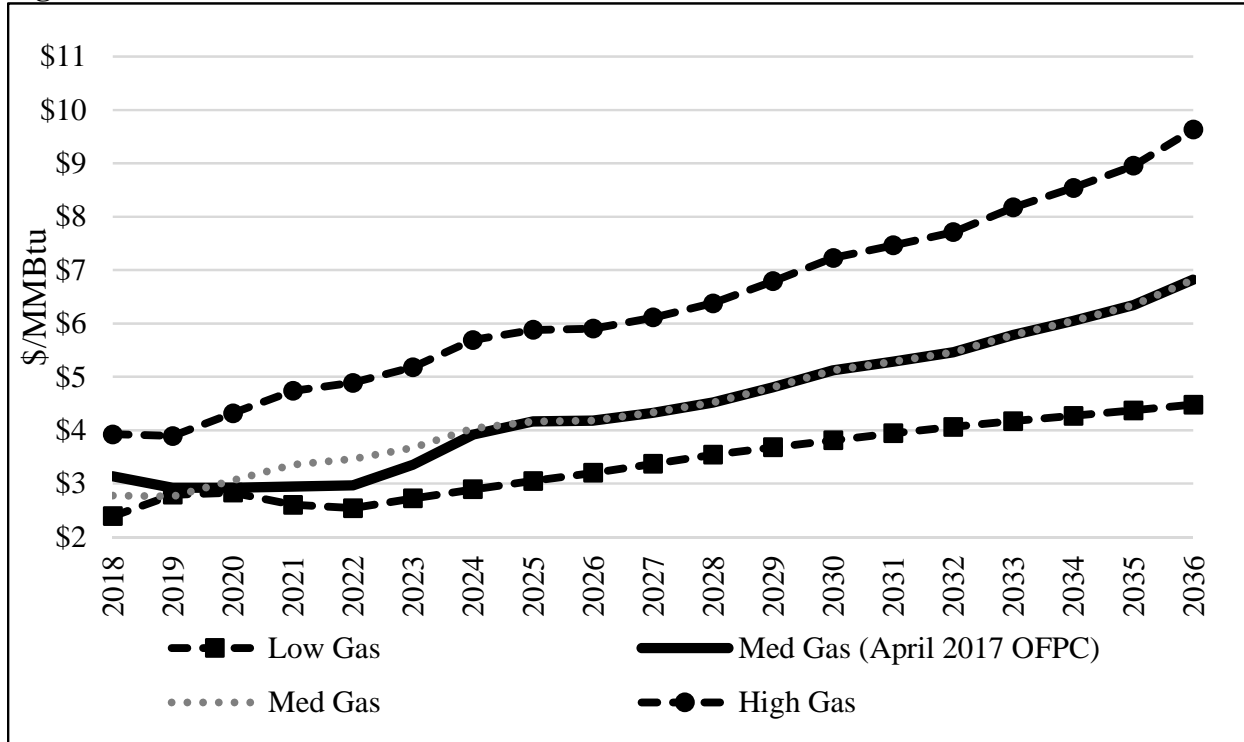
The medium-natural-gas-price assumptions that are paired with zero CO<sub>2</sub> prices reflect natural-gas prices from PacifiCorp’s official forward price curve (OFPC) dated April 26, 2017. The OFPC

uses observed forward market prices as of April 26, 2017, for 72 months, followed by a 12-month transition to natural-gas prices based on a forecast developed by an independent third party. The low-, medium-, and high-natural-gas price assumptions used for all other scenarios were chosen after reviewing a range of credible third-party forecasts. Attachment A to this informational filing shows the range in natural-gas price assumptions from these third-party forecasts relative to those adopted for the price-policy scenarios to evaluate the Energy Vision 2020 projects.

The low-natural-gas price assumption was derived from a low-price scenario developed by an independent third party, which is based on surging growth in price-inelastic associated gas, technology improvements, stagnant liquefied-natural-gas exports, and an ever-expanding resource base. The medium-natural-gas price assumption, which is used beyond month 84 in the April 2017 OFPC, and in all months when medium-natural-gas prices are paired with medium or low CO<sub>2</sub> price assumptions, is based on a base-case forecast from another independent third party that is reasonably aligned with other base-case forecasts. The high-natural-gas price assumption was based on a high-price scenario from this same forecaster. The high-price scenario is based on risk-aversion, whereby natural-gas developers are reluctant to commit capital before demand, and the associated price response, materializes. This gives rise to exaggerated boom-bust cycles (cyclical periods of high prices and low prices). PacifiCorp smoothed the boom-bust cycle in the third party's high-price scenario because the specific timing of these cycles are extremely difficult to project with reasonable accuracy.

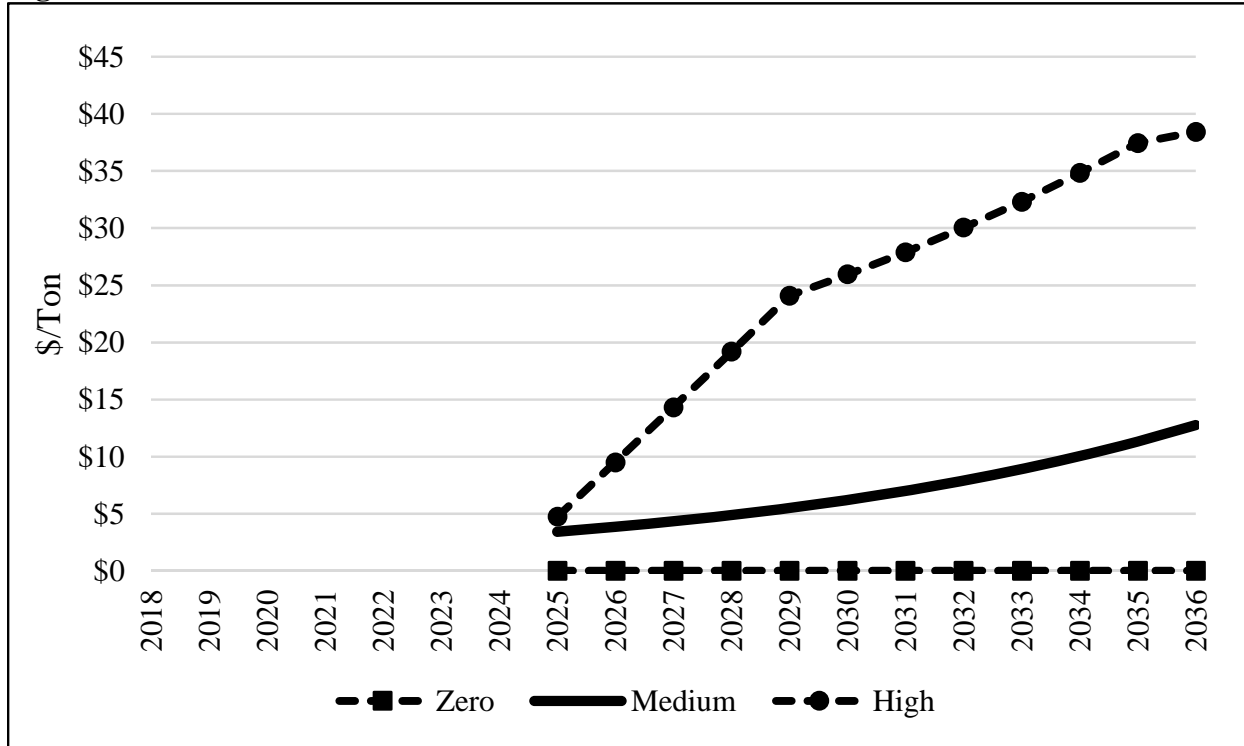
Figure 2.1 shows Henry Hub natural-gas price assumptions from the April 2017 OFPC, low-, medium-, and high-natural-gas price scenarios. The April 2017 OFPC forecast only differs from the medium-natural-gas-price assumption in that it reflects observed-market forwards through the first 72 months followed by a twelve-month transition to an independent third-party's base-case forecast.

**Figure 2.1 -- Nominal Natural-Gas Price Scenarios**



As with natural-gas prices, the medium- and high-CO<sub>2</sub> price assumptions are based on independent third-party projections assuming CO<sub>2</sub> prices start in 2025. To bracket the low end of potential policy outcomes, PacifiCorp assumes there are no future policies adopted that would require incremental costs to achieve emissions reductions in the electric sector. In this scenario, the assumed CO<sub>2</sub> price is zero. Figure 2.2 shows the three CO<sub>2</sub> price assumptions used to analyze the Energy Vision 2020 projects.

**Figure 2.2 -- Nominal CO<sub>2</sub>-Price Scenarios**



### Annual Revenue Requirement Modeling Methodology

The system PVRR from the SO model and PaR is calculated from an annual stream of forecasted revenue requirement over a 20-year time frame, consistent with the planning period in the IRP. The annual stream of forecasted revenue requirement captures nominal revenue requirement for non-capital items (e.g., NPC, fixed operations and maintenance) and levelized revenue requirement for capital expenditures. To estimate the annual revenue requirement impacts of the Energy Vision 2020 projects, project capital costs need to be considered in nominal terms (i.e., not levelized).

Levelization of capital revenue requirement is necessary in these models to avoid potential distortions in the economic analysis of capital-intensive assets that have different lives and in-service dates. Without levelization, this potential distortion is driven by how capital costs are included in rate base over time. Capital revenue requirement is generally highest in the first year an asset is placed in service and declines over time as the asset depreciates.

Consider the potential implications of modeling nominal capital revenue requirement for a future generating resource needed in 2036, the last year of the 2017 IRP planning period. If nominal capital revenue requirement were assumed, the model would capture in its economic assessment of resource alternatives the highest, first-year revenue requirement capital cost without having any foresight on the potential benefits that resource would provide beyond 2036. If nominal capital costs were applied, the model’s economic assessment of resource alternatives for the 2036 resource need would inappropriately favor less capital-intensive projects or projects having longer asset lives, even if those alternatives would increase system costs over their remaining life. Levelized

capital costs for assets that have different lives and in-service dates is an established way to address these types of distortions in the comparative economic analysis of resource alternatives.

In the model simulations that exclude Energy Vision 2020 projects, the annual stream of costs for wind facilities that are within the wind repowering scope, including levelized capital, are removed from the annual stream of costs used to calculate the stochastic-mean system PVRR. Similarly, in the simulation that includes Energy Vision 2020 projects, the annual stream of costs for repowered wind facilities and new wind facilities, including levelized capital and PTCs, and costs associated with the new transmission project are temporarily removed from the annual stream of costs used to calculate the stochastic-mean PVRR. The differential in the remaining stream of annual costs, which includes all system costs except for those associated with the Energy Vision 2020 projects, represents the net system benefit caused by the Energy Vision 2020 projects.

These data are disaggregated to isolate the estimated annual NPC benefits, other non-NPC variable-cost benefits (i.e., variable operations and maintenance and emissions costs for those scenarios that include a CO<sub>2</sub> price assumption), and fixed-cost benefits. To complete the annual revenue requirement forecast, the change in fixed costs for Energy Vision 2020 projects, including nominal capital revenue requirement and PTCs, are added back in with the annual system net benefits caused by these investments.

## **Extension of Net Benefits Through 2050**

The change in annual revenue requirement is estimated through 2050. This captures the full 30-year life of the new equipment installed on repowered wind facilities and the full 30-year life of new wind resources that are part of the Energy Vision 2020 projects.

The PaR forecast period runs from 2017 through 2036. The change in net system benefits caused by Energy Vision 2020 projects over the 2028 through 2036 time frame, expressed in dollars-per-MWh of incremental energy output from repowered and new wind facilities, were used to estimate the change in system net benefits from 2037 through 2050. This calculation was performed in several steps.

First, the net system benefits caused by Energy Vision 2020 projects were divided by the change in incremental energy expected from repowered and new wind facilities, as modeled in PaR over the 2028-through-2036 time frame. Next, the net system benefits per MWh of incremental energy from the repowered and new wind projects over the 2028-through-2036 time frame were levelized. These levelized results were extended out through 2050 at inflation. The levelized net system benefits per MWh of incremental energy output from the repowered and new wind projects over the 2037-through-2050 time frame were then multiplied by the change in incremental energy output from repowered and new wind projects over the same period.

Consistent with the 2017 IRP, PacifiCorp's updated economic analysis assumes the Dave Johnston coal plant, located in eastern Wyoming, retires at the end of 2027. When this plant is assumed to retire, transmission congestion affecting energy output from resources in eastern Wyoming, where many repowered wind resources are located and all of the new wind resources are located, is reduced. The incremental energy output from repowered and new wind resources provides more system benefits when not constrained by transmission limitations. Consequently, the net system

benefits caused by repowered and new wind over the 2028-through-2036 time frame, after Dave Johnston is assumed to retire, is representative of net system benefits that could be expected beyond 2036.

## Assumptions

### Energy Vision 2020 Cost and Performance

Beyond the price-policy assumptions used to analyze a range of NPC-related benefits, the updated economic analysis reflects updated assumptions for up-front capital costs, run-rate operating costs, and energy output associated with Energy Vision 2020 projects. Table 2.2 summarizes updated cost and performance assumptions for Energy Vision 2020 projects. Additional detail is included in the confidential work papers supporting this informational filing.

**Table 2.2 – Updated Cost and Performance Assumptions for Energy Vision 2020 Projects**

	2017 IRP	Updated Analysis
In-Service Capital Cost	\$3.54 billion	\$3.21 billion
In-Service Incremental Annual Energy	4,431 GWh	4,823 GWh
Existing Wind Capacity in Repowering Scope	905 MW	999 MW
New Wyoming Wind Capacity	1,100 MW	1,180 MW
Transmission Transfer Capacity	750 MW	750 MW

Consistent with action item 1a in the 2017 IRP action plan and as discussed further in Section 3 below, PacifiCorp’s updated economic analysis includes an assessment of the scope of the wind repowering project. Based on this assessment, the scope of the wind repowering project has been expanded to include the 94 MW Goodnoe Hills wind facility located in Washington.

PacifiCorp also updated its assumptions for new wind resource capacity to reflect specific wind projects, which includes 860 MW of wind resource capacity that the company will offer as benchmark resources in the 2017R RFP and 320 MW from certain QF wind projects that are located in the Aeolus area, have executed power purchase agreements (PPAs) with PacifiCorp, and have preferential positions in the transmission interconnection queue. These QF projects are reasonably expected to interconnect to PacifiCorp’s transmission system after the new transmission project is placed in service and are assumed to achieve commercial operation at the end of 2021, consistent with the terms in their PPAs. Because these QF projects are not expected to be able to interconnect with PacifiCorp’s transmission system without the new transmission investments, they are only included in SO model and PaR simulations that include Energy Vision 2020 projects.

Consistent with the assumptions used in the 2017 IRP, PacifiCorp’s updated economic analysis continues to assume that the up-front capital costs for the new transmission will contribute to retail-customer rate base and that the revenue requirement for these investments will be partially offset by incremental revenue from other transmission customers. The up-front transmission cost will flow into PacifiCorp’s formula transmission rate under its Open Access Transmission Tariff (OATT) and generate revenue credits that offset costs for retail customers.



PacifiCorp's merchant function, which uses PacifiCorp's transmission system to serve retail-customer load and manage retail-customer NPC through off-system market sales and purchases, is the largest user of PacifiCorp's transmission system. However, other transmission customers pay OATT-based transmission rates that generate revenue credits and offset the cost of PacifiCorp's transmission revenue requirement. The new transmission investment is considered a network transmission asset under PacifiCorp's OATT and therefore will be given rolled-in treatment under the company's transmission formula rate. Over recent history, these revenue credits have accounted for approximately 12 percent of PacifiCorp's transmission revenue requirement. Based on this recent history, PacifiCorp's analysis continues to assume its retail customers pay 88 percent of the revenue requirement from the up-front capital cost of the new transmission investment after accounting for an assumed 12 percent revenue credit from other transmission customers.

### **Avoided De-Rate Benefits**

In its final 2017 IRP resource-portfolio screening process, PacifiCorp identified and quantified reliability benefits associated with the Aeolus-to-Bridger/Anticline transmission project. This new transmission project would eliminate de-rates caused by outages on 230-kV transmission system elements. Historical outages on this part of PacifiCorp's transmission system indicate an average de-rate of 146 MW over approximately 88 outage days per year, which equates to approximately one 146-MW, 24-hour outage every four days. Without knowing when these events might occur, de-rates on the existing 230-kV transmission system were captured in the SO model and PaR as a 36.5 MW reduction in the transfer capability from eastern Wyoming to the Aeolus area. In simulations that include the new wind and transmission, this de-rate assumption was eliminated when the new transmission project is assumed to be placed in service at the end of October 2020.

### **Line Loss Benefits**

Line-loss benefits are only applicable if the Aeolus-to-Bridger/Anticline transmission project is built and therefore were only considered in the simulations that include the new wind and transmission. In these simulations, when the Aeolus-to-Bridger/Anticline transmission project is added in parallel to the existing transmission lines, resistance is reduced, which lowers line losses. With reduced line losses, an incremental 11.6 average MW (aMW) of energy, which equates to approximately 102 GWh, will be able to flow out of eastern Wyoming each year. The line-loss benefit was reflected in the SO model and PaR by reducing northeast Wyoming load by approximately 11.6 aMW each year.

### **EIM Benefits**

In its final 2017 IRP resource-portfolio screening process, PacifiCorp described how the Energy Imbalance Market (EIM) can provide potential benefits when incremental energy is added to transmission-constrained areas of Wyoming. Unscheduled or unused transmission from participating EIM entities enables more efficient power flows within the hour. With increasing participation in the EIM, there will be increasing opportunities to move incremental energy from Wyoming to offset higher-priced generation in the PacifiCorp system or other EIM participants'

systems. The more efficient use of transmission that is expected with growing participation in the EIM was captured in the updated economic analysis by increasing the transfer capability between the east and west sides of PacifiCorp's system by 300 MW (from the Jim Bridger plant to south-central Oregon). The ability to more efficiently use intra-hour transmission from a growing list of EIM participants is not driven by the Energy Vision 2020 projects; however, this increased connectivity provides the opportunity to move low-cost incremental energy out of transmission-constrained areas of Wyoming.

## **Investment Recovery**

As was assumed in the 2017 IRP, the updated economic analysis continues to assume that PacifiCorp will fully recover the unrecovered investment in the original equipment on existing wind resources and earn its authorized rate of return on the unrecovered balance over the remainder of the original 30-year depreciable life of each repowered wind facility. PacifiCorp does not assume any salvage value for the equipment that will be replaced with repowering; however, any salvage value for the existing equipment would decrease the unrecovered investment and increase customer benefits.

## SECTION 3 - WIND REPOWERING

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### Wind Repowering Scope

To assess the scope of the wind repowering project, PacifiCorp completed a series of SO model and PaR studies to determine how the system PVRR changes when a specific wind facility is added or removed from the scope of the wind repowering project. Starting with the wind repowering scope assumed in the 2017 IRP preferred portfolio, covering 905 MW of existing wind resource capacity, PacifiCorp first removed the Leaning Juniper facility from the wind repowering scope because it has the lowest expected annual average capacity factor among the owned wind facilities in PacifiCorp's wind fleet. A wind facility's capacity factor is a strong indicator of whether repowering is cost-effective because it is representative of energy output and is therefore tied to the amount of PTCs that will be generated if the facility is repowered. The risk-adjusted system PVRR from the case eliminating Leaning Juniper from the wind repowering project scope was \$7 million higher than the risk-adjusted system PVRR from the case including Leaning Juniper in the project scope. Based on these results, Leaning Juniper remains within the scope of the wind repowering project considered in PacifiCorp's updated economic analysis.

Because repowering of the Leaning Juniper facility, which has the lowest expected annual capacity factor relative to other wind facilities in PacifiCorp's fleet, provides incremental net benefits, all remaining wind facilities within the project scope would generate more PTCs and provide even larger incremental net benefits if repowered. Consequently, PacifiCorp did not analyze any further reductions to the wind repowering scope beyond its analysis of Leaning Juniper.

PacifiCorp next evaluated how expanding the wind repowering scope to include Goodnoe Hills would affect the system PVRR. The risk-adjusted system PVRR from the case including Goodnoe Hills in the project scope was \$20 million lower than the system PVRR from the case without Goodnoe Hills. Based on these results, Goodnoe Hills was added to the repowering project scope considered in PacifiCorp's updated economic analysis. With Goodnoe Hills included in the scope of the repowering project, the updated economic analysis covers 999.1 MW of existing wind capacity—594 MW of this capacity is located in Wyoming (Glenrock I and III, Rolling Hills, Seven Mile Hill I and II, High Plains, McFadden Ridge, and Dunlap), 100.5 MW is located in Oregon (Leaning Juniper), and 304.6 MW is located in Washington (Marengo I and II, and Goodnoe Hills).

### System Modeling Price-Policy Results

Table 3.1 summarizes the PVRR(d) results for each price-policy scenario. The PVRR(d) between cases with and without wind repowering are shown from the SO model and from PaR, which was used to calculate both the stochastic-mean PVRR(d) and the risk-adjusted PVRR(d). The data that was used to calculate the PVRR(d) results shown in the table are provided as Attachment B.

**Table 3.1 – SO Model and PaR PVRR(d) (Benefit)/Cost of Wind Repowering (\$ million)**

Price-Policy Scenario	SO Model PVRR(d)	PaR Stochastic-Mean PVRR(d)	PaR Risk-Adjusted PVRR(d)
Low Gas, Zero CO <sub>2</sub>	\$33	\$43	\$44
Low Gas, Medium CO <sub>2</sub>	\$0	\$9	\$8
Low Gas, High CO <sub>2</sub>	(\$18)	(\$17)	(\$19)
Medium Gas, Zero CO <sub>2</sub>	(\$33)	(\$24)	(\$25)
Medium Gas, Medium CO <sub>2</sub>	(\$22)	(\$13)	(\$15)
Medium Gas, High CO <sub>2</sub>	(\$41)	(\$35)	(\$36)
High Gas, Zero CO <sub>2</sub>	(\$75)	(\$40)	(\$43)
High Gas, Medium CO <sub>2</sub>	(\$64)	(\$34)	(\$37)
High Gas, High CO <sub>2</sub>	(\$103)	(\$80)	(\$85)

Over a 20-year period, before accounting for the increase in incremental energy output beyond 2036, the wind repowering project reduces customer costs in seven out of nine price-policy scenarios. This trend occurs in the PVRR(d) calculated from both the SO model and PaR. The only price-policy scenarios without net customer benefits are those assuming the lowest natural gas prices when paired with either medium or zero CO<sub>2</sub> price assumptions. The PVRR(d) results show customer benefits under the price-policy scenario with low natural gas prices and high CO<sub>2</sub> prices, in all three of the medium-natural-gas-price scenarios, and in all three of the high-natural-gas-price scenarios. Under the central price-policy scenario, assuming medium-natural-gas prices and medium CO<sub>2</sub> prices, the PVRR(d) benefits range between \$13 million, when based upon PaR-stochastic-mean results, and \$22 million, when based upon SO model results.

The PVRR(d) results show that the benefits of the wind repowering project increase with natural gas prices and CO<sub>2</sub> prices. PVRR(d) results for scenarios where medium CO<sub>2</sub> prices are assumed with medium or high natural gas prices show a slight drop in benefits relative the zero-CO<sub>2</sub>-price scenarios. This tends to be driven by changes to the timing of new resources in the outer years of the 20-year forecast period and would not likely persist if longer simulation periods were feasible.

The PVRR(d) results presented in Table 3.1 do not reflect the potential value of RECs generated by the incremental wind energy output from the repowered facilities. Customer benefits for all price-policy scenarios would improve by approximately \$4 million for every dollar assigned to the incremental RECs that will be generated from the repowered wind facilities through 2036.

## Model Differences

The two models assess the system impacts of the wind repowering project in different ways. The SO model is designed to dynamically assess system dispatch, with less granularity than PaR, while optimizing the selection of resources to the portfolio over time. PaR is able to dynamically assess system dispatch with more granularity than the SO model and with consideration of stochastic risk variables; however, PaR does not modify the type, timing, size and location of resources in the portfolio in response to its more detailed assessment of system dispatch. In evaluating differences in annual system costs between the two models, PaR's ability to better simulate system dispatch relative to the SO model results in lower benefits from repowering being reported from PaR in the earlier years of the forecast horizon. Because PaR cannot modify resource selections in response to its assessment of system dispatch, this effect is softened over the longer term, when changes to the resource portfolio in response to wind repowering are more notable.

Note that SO and PaR, while different, are both useful in establishing a range of wind repowering benefits through the 20-year forecast period. Importantly, the PVRR(d) results from both models show customer benefits across the same set of price-policy scenarios with consistent trends in the difference in PVRR(d) results between price-policy scenarios. The consistency in the trend of forecasted benefits between the two models, each having its own strengths, shows that the wind repowering benefits are robust across a range of price-policy assumptions and when analyzed using different modeling tools.

The risk-adjusted PVRR(d) results are very similar to the stochastic-mean PVRR(d) results. This indicates that the wind repowering project does not materially affect high-cost, low-probability outcomes that can occur due to volatility in stochastic variables like load, wholesale-market prices, hydro generation, and thermal-unit outages.

### Annual Revenue Requirement Price-Policy Results

Table 3.2 summarizes the PVRR(d) results for each price-policy scenario calculated off of the change in annual nominal revenue requirement through 2050. The annual data over the period 2017 through 2050 that was used to calculate the PVRR(d) results shown in the table are provided as Attachment C.

**Table 3.2 – Nominal Revenue Requirement PVRR(d) (Benefit)/Cost of Wind Repowering (\$ million)**

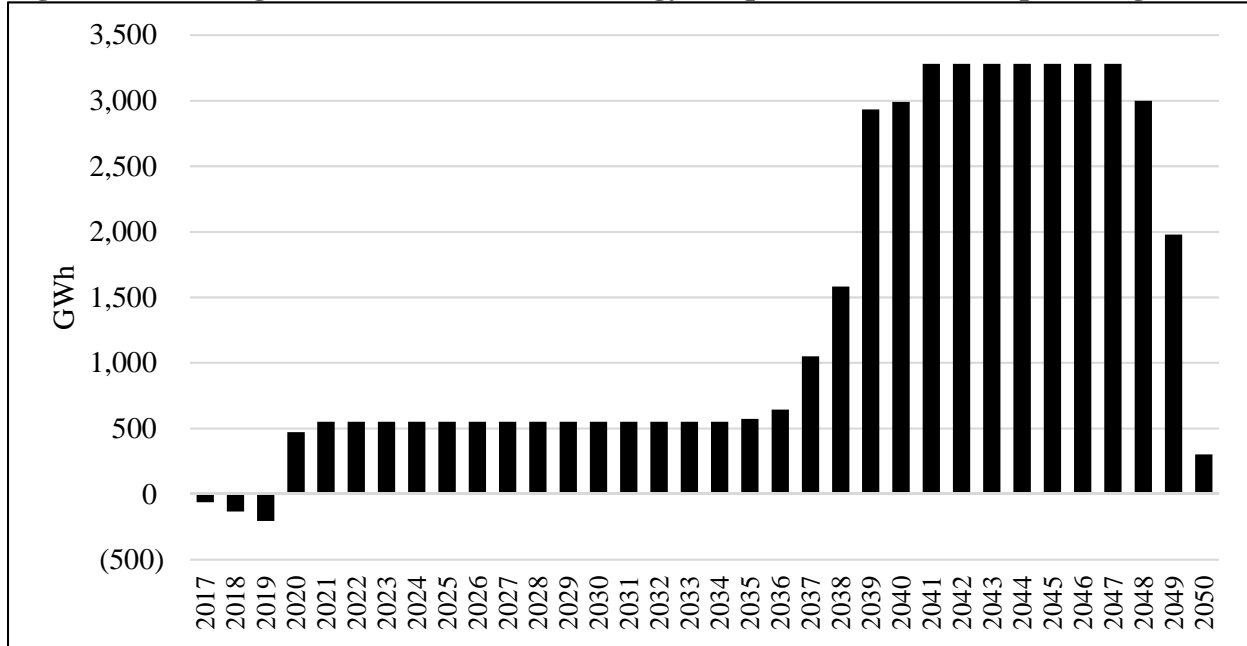
Price-Policy Scenario	Annual Revenue Requirement PVRR(d)
Low Gas, Zero CO <sub>2</sub>	(\$41)
Low Gas, Medium CO <sub>2</sub>	(\$245)
Low Gas, High CO <sub>2</sub>	(\$344)
Medium Gas, Zero CO <sub>2</sub>	(\$362)
Medium Gas, Medium CO <sub>2</sub>	(\$359)
Medium Gas, High CO <sub>2</sub>	(\$401)
High Gas, Zero CO <sub>2</sub>	(\$400)
High Gas, Medium CO <sub>2</sub>	(\$274)
High Gas, High CO <sub>2</sub>	(\$589)

When calculated through 2050, which covers the remaining life of the repowered facilities, the wind repowering project reduces customer costs in all nine price-policy scenarios, with PVRR(d) benefits ranging from \$41 million in the low- natural-gas-and-zero-CO<sub>2</sub> scenario to \$589 million in the high-natural-gas-and-high-CO<sub>2</sub> scenario. Under the central price-policy scenario, assuming medium natural gas prices and medium CO<sub>2</sub> prices, the PVRR(d) benefits are \$359 million.

The PVRR(d) calculated from estimated annual revenue requirement through 2050 picks up the sizable increase in incremental wind energy output beyond the 20-year forecast period analyzed with the SO model and PaR. As mentioned previously, the change in wind energy output between cases with and without wind repowering experiences a step change beyond this 20-year period, when the existing wind facilities would otherwise have hit the end of their depreciable life. Beyond the 20-year forecast period, the change in wind energy output between cases with and without repowering reflects the full energy output from the repowered wind facilities.

Figure 3.1 shows the incremental change in wind energy output resulting from the repowering project. Incremental energy output associated with wind repowering progressively increases over the 2036-through-2040 period, as wind facilities originally placed in service in the 2006-through-2010 time frame would have otherwise hit the end of their lives. Before 2036, and once all of the wind resources within the project scope are repowered, the average annual incremental increase in wind energy output is approximately 551 GWh. Beyond 2040, and before the new equipment hits the end of its depreciable life, the average annual incremental increase in wind-energy output is approximately 3,283 GWh.

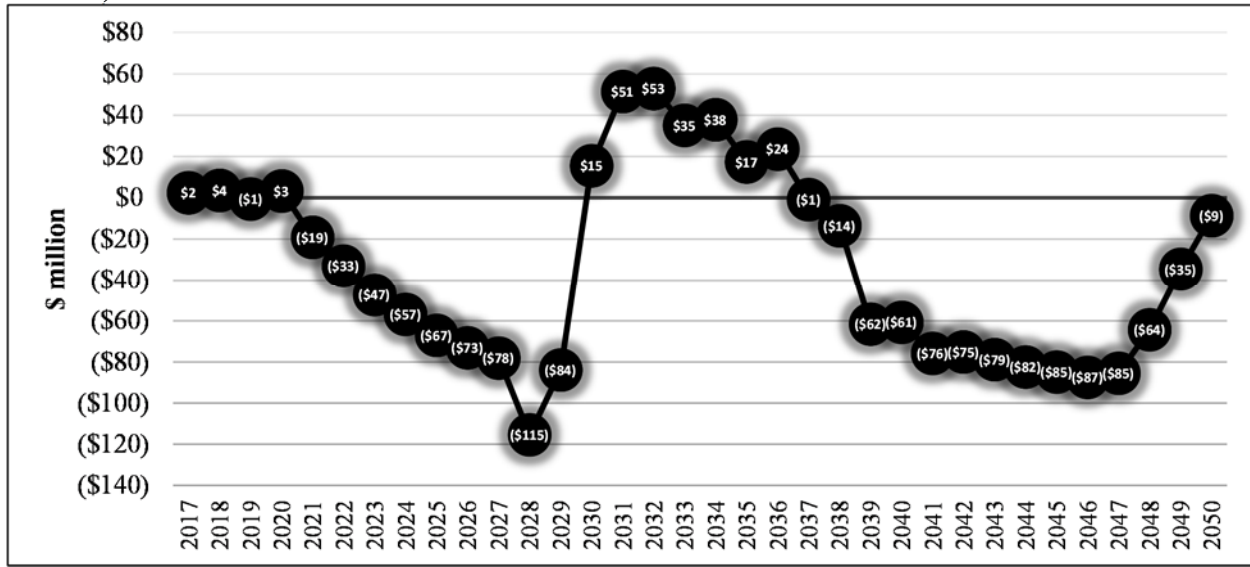
**Figure 3.1 – Change in Incremental Wind Energy Output Due to Wind Repowering (GWh)**



As in the case with the PVRR(d) results calculated from the SO model and PaR results through 2036, the PVRR(d) results presented in Table 3.2 do not reflect the potential value of RECs produced by the repowered facilities. Customer benefits for all price-policy scenarios would improve by approximately \$11 million for every dollar assigned to the incremental RECs that will be generated from the wind repowering project through 2050.

Figure 3.2 shows the estimated change in nominal revenue requirement due to wind repowering for the medium-natural-gas-and-medium-CO<sub>2</sub> price-policy scenario on a total-system basis. The change in nominal revenue requirement shown in the figure reflects project costs, including capital revenue requirement (*i.e.*, depreciation, return, income taxes, and property taxes), operations and maintenance expenses, the Wyoming wind-production tax, and PTCs. The project costs are netted against system impacts of wind repowering, reflecting the change in NPC, emissions, non-NPC variable costs, and system fixed costs that are affected by, but not directly associated with, the wind repowering project.

**Figure 3.2 – Total-System Annual Revenue Requirement with Wind Repowering (\$ million)**



Before repowering, the reduction in wind energy output due to component failures on the existing wind resource equipment is assumed to reduce wind energy output for specific wind turbines until the time new equipment is installed. This contributes to a slight increase in revenue requirement in 2017 and 2018 (\$2 million to \$4 million, total system). All but the Dunlap facility, which is repowered toward the end of 2020, are repowered in 2019. Over the 2019-to-2020 time frame, project costs reflecting partial-year capital revenue requirement net of PTCs and system cost impacts cause slight changes to revenue requirement.

The wind repowering project reduces revenue requirement soon after the new equipment is placed in service in the 2019-to-2020 time frame. From 2021 through 2028, annual revenue requirement is reduced as PTC benefits increase with inflation and the new equipment continues to depreciate. On a total-system basis, annual revenue requirement is reduced by \$19 million in 2021. The reduction in annual revenue requirement increases to \$115 million by 2028. Revenue requirement increases once the PTCs expire toward the end of 2030. Annual revenue requirement is reduced over the 2037-through-2050 time frame when, as discussed previously, the incremental wind energy output associated with wind repowering increases substantially.

## Sensitivity Studies

### 40-Year Life Sensitivity

The 40-year life sensitivity quantifies how the net benefits of wind repowering are affected by the depreciable life of repowered facilities. PacifiCorp’s base analysis assumes that repowering will reset the 30-year depreciable life of the asset. Assuming the possibility that wind facilities with modern equipment might continue operating over a longer period, this sensitivity quantifies the economic impact if the depreciable life of new equipment on a repowered facility were reset at 40 years.

Table 3.3 summarizes the PVRR(d) results for the sensitivity assuming a 40-year life for new equipment. To assess the relative impact of the 40-year life, the PVRR(d) results were calculated through 2036 based on SO model and PaR results and are presented alongside the benchmark study in which wind repowering was evaluated with a 30-year life. Medium-natural-gas and medium-CO<sub>2</sub> price-policy assumptions were applied to this sensitivity.

**Table 3.3 – 40-Year-Life Sensitivity (Benefit)/Cost (\$ million)**

Model	Sensitivity PVRR(d)	Benchmark PVRR(d)	Change in PVRR(d)
SO Model	(\$60)	(\$22)	(\$38)
PaR Stochastic-Mean	(\$50)	(\$13)	(\$37)
PaR Risk-Adjusted	(\$52)	(\$15)	(\$37)

If the new equipment were depreciated over a 40-year life, reduced book depreciation would drive lower annual revenue requirement. In this sensitivity, PVRR(d) benefits increase by approximately \$37 million relative to the benchmark case assuming a 30-year life for the new equipment.

## New Wind and Transmission Sensitivity

The new-wind-and-transmission sensitivity quantifies how the net benefits of wind repowering are affected when combined with 1,180 MW of new Wyoming wind resources (860 MW of owned resources and 320 MW of contracted resources) and the Aeolus-to-Bridger/Anticline transmission project. Consistent with PacifiCorp’s CPCN applications for the new wind and transmission assets, this sensitivity assumes the new wind and transmission is operational by the end of October 2020.

Table 3.4 summarizes the PVRR(d) results for the sensitivity assuming wind repowering is implemented along with 1,180 MW of new Wyoming wind and the Aeolus-to-Bridger/Anticline transmission project. To assess the relative impact of the new wind and transmission, the PVRR(d) results were calculated through 2036 based on SO model and PaR results and are presented alongside the benchmark study in which wind repowering was evaluated as a stand-alone project. Medium-natural-gas and medium-CO<sub>2</sub> price-policy assumptions were applied to this sensitivity.

**Table 3.4 – New Wind and Transmission Sensitivity (Benefit)/Cost (\$ million)**

Model	Sensitivity PVRR(d)	Benchmark PVRR(d)	Change in PVRR(d)
SO Model	(\$114)	(\$22)	(\$91)
PaR Stochastic-Mean	(\$104)	(\$13)	(\$90)
PaR Risk-Adjusted	(\$116)	(\$15)	(\$101)

When the wind repowering project is combined with 1,180 MW of new Wyoming wind and the Aeolus-to-Bridger/Anticline transmission project, PVRR(d) benefits increase by between \$91 million to \$101 million relative to the benchmark case. This sensitivity shows that wind repowering benefits persist when combined with new wind and new transmission, and that the new wind and new transmission will provide significant incremental benefits for customers.

## Wind Repowering Capacity Sensitivity

The wind repowering capacity sensitivity builds on the new-wind-and-transmission sensitivity case by assessing how the net benefits of wind repowering are affected if the repowered facilities are able to operate at their full generating capability. This sensitivity assumes the additional



capacity and energy is combined with the new wind and new transmission included in the prior sensitivity. PacifiCorp’s base analysis assumes that the repowered wind facilities continue to operate within the limits of their existing large-generator interconnection agreements (LGIAs). The average incremental energy output is expected to increase by approximately 19.2 percent if the repowered facilities operate within their existing LGIA limits. If these limits are modified, the average incremental energy output rises to 20.8 percent. PacifiCorp is studying whether these LGIAs can be modified to increase incremental energy output from the repowered facilities, which would increase the net benefits of repowering.

Table 3.5 summarizes the PVRR(d) results for this sensitivity that assumes repowered wind facilities can operate at their full capacity. The increased energy and capacity assumed in this sensitivity is in addition to the new wind and transmission assumed in the prior sensitivity. To assess the relative impact of this assumption on revenue requirement, the PVRR(d) results were calculated through 2036 based on SO model and PaR results and are presented alongside the benchmark study assuming repowered wind resources operate within existing LGIA limits. Medium-natural-gas and medium-CO<sub>2</sub> price-policy assumptions were applied to this sensitivity.

**Table 3.5 – Increased Wind Repower Capacity Sensitivity (Benefit)/Cost (\$ million)**

Model	Sensitivity PVRR(d)	Benchmark PVRR(d)	Change in PVRR(d)
SO Model	(\$109)	(\$114)	\$4
PaR Stochastic-Mean	(\$106)	(\$104)	(\$2)
PaR Risk-Adjusted	(\$118)	(\$116)	(\$2)

If PacifiCorp is able to modify its LGIAs, the repowered wind facilities will be able to produce additional energy in those hours where wind energy output would otherwise have been curtailed to stay within current LGIA limits. If these LGIAs are modified, this study suggests there may be additional upside to customer benefits, but they are not likely to be substantial.

## Conclusion

PacifiCorp’s analysis supports repowering approximately 999 MW of existing wind resource capacity located in Wyoming, Oregon, and Washington. The repowered wind facilities will qualify for an additional ten years of federal PTCs, produce more energy, reset the 30-year depreciable life of the assets, and reduce run-rate operating costs. The economic analysis of the wind repowering opportunity demonstrates that net benefits, which include federal PTC benefits, NPC benefits, other system variable-cost benefits, and system fixed-cost benefits, more than outweigh net project costs.



## SECTION 4 – NEW WIND AND TRANSMISSION

### System Modeling Price-Policy Results

Table 4.1 summarizes the PVRR(d) results for each price-policy scenario. The PVRR(d) between cases with and without the new wind and transmission projects are shown from the SO model and from PaR, which was used to calculate both the stochastic-mean PVRR(d) and the risk-adjusted PVRR(d). The data that was used to calculate the PVRR(d) results shown in the table are provided as Attachment D.

**Table 4.1 – SO Model and PaR PVRR(d) (Benefit)/Cost of New Wind and Transmission (\$ million)**

Price-Policy Scenario	SO Model PVRR(d)	PaR Stochastic-Mean PVRR(d)	PaR Risk-Adjusted PVRR(d)
Low Gas, Zero CO <sub>2</sub>	\$121	\$77	\$74
Low Gas, Medium CO <sub>2</sub>	\$73	\$32	\$26
Low Gas, High CO <sub>2</sub>	(\$84)	(\$133)	(\$147)
Medium Gas, Zero CO <sub>2</sub>	(\$19)	(\$57)	(\$66)
Medium Gas, Medium CO <sub>2</sub>	(\$85)	(\$111)	(\$124)
Medium Gas, High CO <sub>2</sub>	(\$156)	(\$224)	(\$242)
High Gas, Zero CO <sub>2</sub>	(\$304)	(\$260)	(\$280)
High Gas, Medium CO <sub>2</sub>	(\$318)	(\$272)	(\$293)
High Gas, High CO <sub>2</sub>	(\$396)	(\$409)	(\$437)

Over a 20-year period, the new wind and transmission projects reduce customer costs in seven out of nine price-policy scenarios. This trend occurs in the PVRR(d) calculated from both the SO model and PaR. The only price-policy scenarios without net customer benefits are those assuming the lowest natural-gas prices when paired with either medium or zero-CO<sub>2</sub> price assumptions. Under the central price-policy scenario, assuming medium-natural-gas prices and medium-CO<sub>2</sub> prices, the PVRR(d) benefits range between \$85 million, when based upon SO model results, and \$124 million, when based upon PaR-risk-adjusted results. The PVRR(d) results show that the benefits of the Combined Projects increase with natural-gas prices and CO<sub>2</sub> prices, which increase NPC and other system variable cost benefits.

The PVRR(d) results presented in Table 4.1 do not reflect the potential value of RECs generated by the incremental energy output from the new Wyoming wind resources. Customer benefits for all price-policy scenarios would improve by approximately \$26 million for every dollar assigned to the incremental RECs that will be generated from the new wind resources through 2036. Beyond potential REC-revenue benefits, the economic analysis of the new wind and transmission does not reflect PacifiCorp's enhanced ability to comply with mandated reliability and performance standards and the opportunity for further increases to the transfer capability across the Aeolus-to-Bridger/Anticline Line with the construction of additional segments of the Energy Gateway Project.

## Model Differences

As is the case in the wind repowering economic analysis, the two models assess the system impacts of the new wind and transmission in different ways. The SO model is designed to dynamically assess system dispatch, with less granularity than PaR, while optimizing the selection of resources to the portfolio over time. PaR is able to dynamically assess system dispatch, with more granularity than the SO model and with consideration of stochastic risk variables; however, PaR does not modify the type, timing, size and location of resources in the portfolio in response to its more detailed assessment of system dispatch.

The two models are simply different, and both are useful in establishing a range of benefits from the new wind and transmission through the 20-year forecast period. Importantly, the PVRR(d) results from both models show customer benefits across all price-policy scenarios with consistent trends in the difference in PVRR(d) results between price-policy scenarios. The consistency in the trend of forecasted benefits between the two models, each having its own strengths, shows that the benefits from the new wind and transmission are robust across a range of price-policy assumptions and when analyzed using different modeling tools.

The risk-adjusted PVRR(d) results consistently show a slight increase in the benefits of the new wind and transmission when compared to the stochastic-mean PVRR(d) results. This indicates that the investments reduce the risk of high-cost, low-probability outcomes that can occur due to volatility in stochastic variables like load, wholesale-market prices, hydro generation, and thermal-unit outages.

## Annual Revenue Requirement Price-Policy Results

Table 4.2 summarizes the PVRR(d) results for each price-policy scenario calculated off of the change in annual nominal revenue requirement through 2050. The annual data over the period 2017 through 2050 that was used to calculate the PVRR(d) results shown in the table are provided as Attachment E.

**Table 4.2 – Nominal Revenue Requirement PVRR(d) (Benefit)/Cost of the New Wind and Transmission (\$ million)**

Price-Policy Scenario	Annual Revenue Requirement PVRR(d)
Low Gas, Zero CO <sub>2</sub>	\$174
Low Gas, Medium CO <sub>2</sub>	\$93
Low Gas, High CO <sub>2</sub>	(\$194)
Medium Gas, Zero CO <sub>2</sub>	(\$53)
Medium Gas, Medium CO <sub>2</sub>	(\$137)
Medium Gas, High CO <sub>2</sub>	(\$317)
High Gas, Zero CO <sub>2</sub>	(\$341)
High Gas, Medium CO <sub>2</sub>	(\$351)
High Gas, High CO <sub>2</sub>	(\$595)

When calculated through 2050, which covers the 30-year life of the new wind resources, the new wind and transmission reduce customer costs in seven out of nine price-policy scenarios. The only price-policy scenarios without net customer benefits are those assuming the lowest natural-gas prices when paired with either medium or zero-CO<sub>2</sub> price assumptions. The PVRR(d) results show

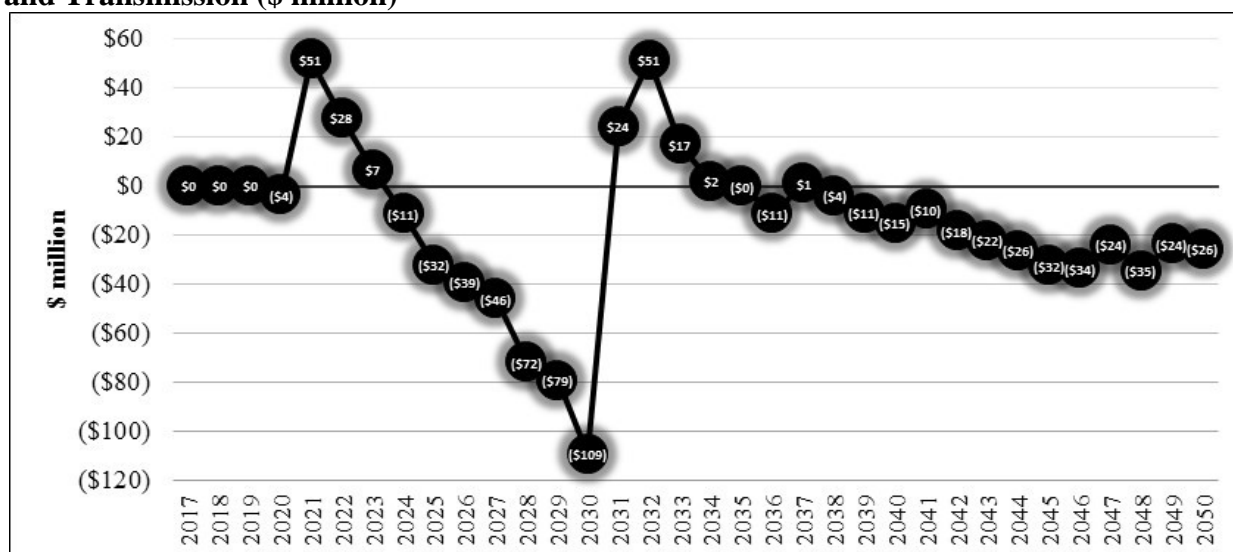
customer benefits under the price-policy scenario with low natural-gas prices and high-CO<sub>2</sub> prices, in all three of the medium-natural-gas price scenarios, and in all three of the high-natural-gas price scenarios. Under the central price-policy scenario, assuming medium-natural-gas prices and medium-CO<sub>2</sub> prices, the PVRR(d) benefit is \$137 million. Consistent with the PVRR(d) results calculated from the SO model and PaR through 2036, the PVRR(d) results show that the benefits of the new wind and transmission increase with natural-gas prices and CO<sub>2</sub> prices, which increase NPC and other system variable cost benefits.

The PVRR(d) calculated from estimated annual revenue requirement through 2050 reflects reduced incremental wind energy output beginning in 2042 after the PPAs for the 320 MW of QF resources end. Incremental energy output associated from the new wind resources is steady over the 2022-through-2041 period. Beyond 2041, energy output is approximately drops by nearly 27 percent once the QF PPAs terminate. This reduction in incremental wind energy output reduces NPC benefits and other system variable costs benefits over the last nine years of the PVRR(d) calculated off the change in nominal revenue requirement estimates through 2050. Consequently, the PVRR(d) calculated off the change in nominal revenue requirement through 2050 does not capture likely benefits associated with a potential extension of the QF Projects' PPAs or incremental procurement of additional Wyoming wind resources after the term of these PPAs end.

As in the case with the PVRR(d) results calculated from the SO model and PaR results through 2036, the PVRR(d) results presented in Table 4.2 do not reflect the potential value of RECs produced by the new wind resources. Customer benefits for all price-policy scenarios would improve by approximately \$34 million for every dollar assigned to the incremental RECs that will be generated from these resources through 2050.

Figure 4.1 shows the estimated change in annual nominal-revenue requirement due to the new wind and transmission for the medium-natural-gas and medium-CO<sub>2</sub>-price-policy scenario on a total-system basis. The annual revenue requirement shown in the figure reflects all costs for these investments, including capital revenue requirement (i.e., depreciation, return, income taxes, and property taxes) net of transmission revenue credits, operations and maintenance expenses, the Wyoming wind-production tax, incremental wind integration costs, and PTCs. The project costs are netted against system impacts of the new wind and transmission, reflecting the change in NPC, emissions, non-NPC variable costs, and system fixed costs that are affected by, but not directly associated with, these investments.

**Figure 4.1 – Total-System Change in Annual Revenue Requirement Due to the New Wind and Transmission (\$ million)**



In the initial year that the new wind and transmission assets come online, net system benefits offset partial-year capital revenue requirement. In 2021, the first full year the new wind and transmission are in service, the change in total-system nominal revenue requirement increases by \$51 million. This figure rapidly declines and crosses over from a net increase in nominal revenue requirement to a decrease in nominal revenue requirement beginning 2024—just four years after the first full year of operation. The net revenue requirement benefits persist and grow through 2030 as PTC benefits increase with inflation and the new equipment continues to depreciate. On a total-system basis, the change in annual revenue requirement is down by \$109 million in 2030—the last year the new wind resources produce PTCs. After the PTCs expire, annual revenue requirement increases. However, as the assets continue to depreciate, the new wind and transmission once again begin producing annual revenue requirement savings beginning 2036. These annual benefits persist through 2050.

## Sensitivity Studies

### 40-Year Life Sensitivity

The 40-year life sensitivity quantifies how the net benefits of the new wind and transmission are affected by the depreciable life assumed for the new wind resources. PacifiCorp’s base analysis assumes a 30-year depreciable life when calculating revenue requirement associated with the 860 MW of proxy benchmark wind resources included in the analysis. Considering that wind facilities with modern equipment might continue operating over a longer period, this sensitivity quantifies the economic impact if the depreciable life of these assets were reset at 40 years.

Table 4.3 summarizes the PVRR(d) results for the sensitivity assuming a 40-year life for the 860 MW of proxy benchmark wind resources. To assess the relative impact of the 40-year life, the PVRR(d) results were calculated through 2036 based on SO model and PaR results and are presented alongside the benchmark study in which the new wind and transmission were evaluated

assuming a 30-year life for these new wind facilities. Medium-natural-gas and medium-CO<sub>2</sub> price-policy assumptions were applied to this sensitivity.

**Table 4.3 – 40-Year-Life Sensitivity (Benefit)/Cost (\$ million)**

Model	Sensitivity PVRR(d)	Benchmark PVRR(d)	Change in PVRR(d)
SO Model	(\$106)	(\$85)	(\$21)
PaR Stochastic-Mean	(\$132)	(\$111)	(\$21)
PaR Risk-Adjusted	(\$145)	(\$124)	(\$21)

If the 860 MW of new wind assets are depreciated over a 40-year life, reduced book depreciation would drive lower annual revenue requirement. In this sensitivity, PVRR(d) benefits increase by approximately \$21 million relative to the benchmark case.

## Wind Repowering Sensitivity

The wind repowering sensitivity quantifies how the net benefits of the new wind and transmission are affected when paired with the wind repowering project. Consistent with PacifiCorp's wind repowering analysis, this sensitivity assumes approximately 999 MW of existing wind resource capacity is upgraded with modern equipment in the 2019-to-2020 time frame.

Table 4.4 summarizes the PVRR(d) results for the sensitivity assuming the new wind and transmission are implemented along with wind repowering of approximately 999 MW of existing wind capacity. To assess the relative impact of wind repowering on the new wind and transmission, the PVRR(d) results were calculated through 2036 based on SO model and PaR results and are presented alongside the benchmark study in which the new wind and transmission were evaluated without repowering. Medium-natural-gas and medium-CO<sub>2</sub> price-policy assumptions were applied to this sensitivity.

**Table 4.4 – Wind Repowering Sensitivity (Benefit)/Cost (\$ million)**

Model	Sensitivity PVRR(d)	Benchmark PVRR(d)	Change in PVRR(d)
SO Model	(\$114)	(\$85)	(\$29)
PaR Stochastic-Mean	(\$104)	(\$111)	\$8
PaR Risk-Adjusted	(\$116)	(\$124)	\$8

When the new wind and transmission are analyzed with the wind repowering project, PVRR(d) benefits increase by \$29 million when assessed with the SO model. PaR shows a slight \$8 million increase to the PVRR(d) relative to the benchmark.

The sensitivity does not capture any of the incremental benefits from the wind repowering project that will occur just beyond the 2036 period, which is the last year simulated in the SO model and PaR. Consequently, the PVRR(d) results from the SO model and PaR do not capture the significant increase in the benefits from repowering that is associated with increased incremental energy output that will occur beyond 2036.

As described in Section 3 of this informational update, the change in wind energy output between cases with and without repowering experiences a step change in the 2036-through-2040 time frame, when the wind facilities within the repowering project scope that were originally placed in-service during the 2006-through-2010 time frame would otherwise have hit the end of their

depreciable life. Before the 2036-through-2040 time frame, the period captured in the PVRR(d) results summarized in Table 4.4, the change in wind energy output from repowering reflects the incremental energy production that results from installing modern equipment on repowered wind assets. Beyond the 2036-through-2040 time frame, a period that is not captured in the PVRR(d) results reported in Table 4.4, the change in wind energy output between a case with and without repowering reflects the full energy output from the repowered wind facilities that would otherwise be retired (see Figure 3.1 in Section 3).

## Conclusion

PacifiCorp's analysis supports proceeding with its planned investments in the new wind and transmission included in the 2017 IRP preferred portfolio.

The new wind resources, which are enabled by the Aeolus-to-Bridger/Anticline transmission line will: (1) qualify for ten years of federal PTCs; (2) produce zero-fuel-cost energy that will lower NPC; (3) generate RECs, which can be sold in the market to create additional revenues that would lower net customer costs or otherwise be applied to meeting state renewable procurement targets; and (4) help to decarbonize PacifiCorp's resource portfolio, which mitigates long-term risk associated with potential future state and federal policies targeting CO<sub>2</sub> emissions reductions from the electric sector.

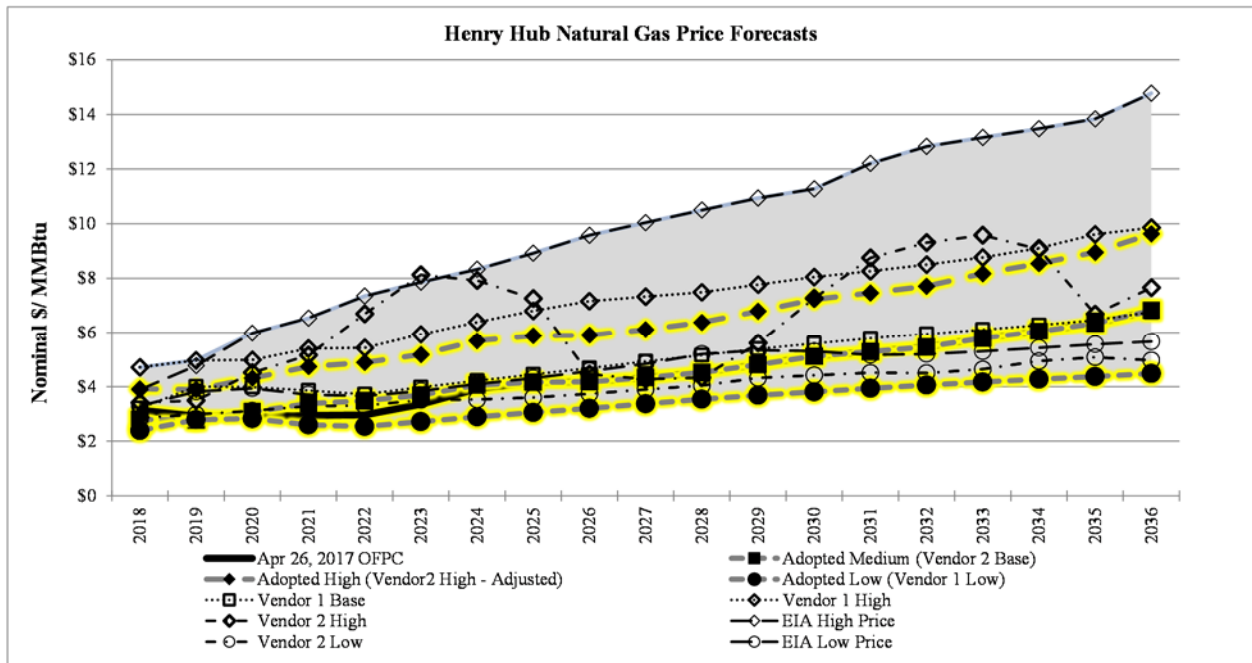
The Aeolus-to-Bridger/Anticline transmission line will: (1) relieve congestion on the current transmission system in eastern Wyoming; (2) enable the additional wind resource interconnections; (3) provide critical voltage support to the Wyoming transmission network; (4) improve overall reliability of the transmission system and enhance PacifiCorp's ability to comply with mandated reliability and performance standards; (5) reduce line losses; and (6), create an opportunity for further increases to the transfer capability across the Aeolus-to-Bridger/Anticline line with the construction of additional segments of the Energy Gateway project.

The updated economic analysis of the new wind and transmission in the 2017 IRP preferred portfolio demonstrates that net benefits more than outweigh net project costs.



# ATTACHMENT A – NOMINAL HENRY HUB NATURAL GAS PRICE FORECASTS (\$/MMBTU)

Year	Apr 26, 2017 OFPC	Adopted Medium (Vendor 2 Base)	Adopted High (Vendor 2 High - Adjusted)	Adopted Low (Vendor 1 Low)	Vendor 1 Base	Vendor 1 High	Vendor 2 High	EIA Low Price	EIA High Price	Vendor 2 Low	Lowest Price	Highest Price	Range
2018	\$3.14	\$2.80	\$3.92	\$2.39	\$3.21	\$4.71	\$3.41	\$3.29	\$3.89	\$2.85	\$2.39	\$4.71	\$2.32
2019	\$2.92	\$2.77	\$3.89	\$2.79	\$4.00	\$4.97	\$3.49	\$3.82	\$4.77	\$2.98	\$2.77	\$4.97	\$2.20
2020	\$2.92	\$3.08	\$4.32	\$2.83	\$3.99	\$4.98	\$4.51	\$3.94	\$5.98	\$3.12	\$2.83	\$5.98	\$3.15
2021	\$2.94	\$3.38	\$4.74	\$2.60	\$3.86	\$5.41	\$5.16	\$3.71	\$6.54	\$3.28	\$2.60	\$6.54	\$3.94
2022	\$2.97	\$3.48	\$4.89	\$2.54	\$3.72	\$5.43	\$6.69	\$3.66	\$7.35	\$3.31	\$2.54	\$7.35	\$4.81
2023	\$3.35	\$3.69	\$5.18	\$2.72	\$3.98	\$5.93	\$8.13	\$3.84	\$7.86	\$3.51	\$2.72	\$7.86	\$5.14
2024	\$3.92	\$4.06	\$5.69	\$2.89	\$4.22	\$6.39	\$7.92	\$4.10	\$8.33	\$3.53	\$2.89	\$8.33	\$5.44
2025	\$4.16	\$4.16	\$5.88	\$3.05	\$4.45	\$6.80	\$7.26	\$4.31	\$8.92	\$3.60	\$3.05	\$8.92	\$5.87
2026	\$4.18	\$4.18	\$5.90	\$3.20	\$4.68	\$7.16	\$4.46	\$4.57	\$9.58	\$3.74	\$3.20	\$9.58	\$6.38
2027	\$4.33	\$4.33	\$6.11	\$3.37	\$4.93	\$7.33	\$4.27	\$4.84	\$10.04	\$3.90	\$3.37	\$10.04	\$6.67
2028	\$4.52	\$4.52	\$6.38	\$3.54	\$5.16	\$7.49	\$4.33	\$5.20	\$10.50	\$4.04	\$3.54	\$10.50	\$6.96
2029	\$4.81	\$4.81	\$6.79	\$3.68	\$5.39	\$7.77	\$5.61	\$5.34	\$10.94	\$4.32	\$3.68	\$10.94	\$7.26
2030	\$5.12	\$5.12	\$7.23	\$3.81	\$5.59	\$8.05	\$7.27	\$5.30	\$11.28	\$4.42	\$3.81	\$11.28	\$7.47
2031	\$5.28	\$5.28	\$7.46	\$3.94	\$5.78	\$8.26	\$8.75	\$5.17	\$12.21	\$4.51	\$3.94	\$12.21	\$8.27
2032	\$5.46	\$5.46	\$7.71	\$4.06	\$5.95	\$8.50	\$9.31	\$5.20	\$12.83	\$4.50	\$4.06	\$12.83	\$8.77
2033	\$5.79	\$5.79	\$8.17	\$4.17	\$6.11	\$8.77	\$9.58	\$5.30	\$13.16	\$4.64	\$4.17	\$13.16	\$8.99
2034	\$6.05	\$6.05	\$8.54	\$4.27	\$6.28	\$9.11	\$9.07	\$5.43	\$13.48	\$4.94	\$4.27	\$13.48	\$9.21
2035	\$6.34	\$6.34	\$8.95	\$4.37	\$6.46	\$9.61	\$6.68	\$5.56	\$13.84	\$5.08	\$4.37	\$13.84	\$9.47
2036	\$6.82	\$6.82	\$9.63	\$4.48	\$6.76	\$9.86	\$7.66	\$5.66	\$14.78	\$4.97	\$4.48	\$14.78	\$10.30





# ATTACHMENT B – SYSTEM MODELING PRICE-POLICY DETAIL FOR WIND REPOWERING

## SO Model Annual Results (\$ million)

### Low Natural Gas, Zero CO2 Price-Policy Scenario

(Benefit)/Cost	PVRR(d)	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Cost of Project	\$134	\$10	\$10	\$10	\$11	\$11	\$12	\$12	\$12	\$12	\$13	\$13	\$13	\$13	\$14	\$14	\$14	\$15	\$15	\$15	\$16
Change in NPC	(\$107)	\$1	\$3	\$2	(\$9)	(\$11)	(\$11)	(\$12)	(\$12)	(\$13)	(\$13)	(\$14)	(\$17)	(\$18)	\$8	(\$3)	(\$25)	(\$29)	(\$24)	(\$22)	(\$21)
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 DSM	(\$12)	\$0	(\$0)	(\$1)	(\$1)	(\$1)	(\$1)	(\$2)	(\$2)	(\$2)	(\$2)	(\$2)	(\$3)	(\$1)	(\$1)	(\$1)	\$0	\$0	\$0	\$0	\$0
Change in System Fixed Cost	\$17	\$0	(\$0)	(\$0)	\$0	(\$0)	\$0	(\$0)	\$0	\$0	\$0	\$0	\$4	\$4	(\$35)	\$15	\$28	\$20	\$12	\$3	\$1
Net (Benefit)/Cost	\$33	\$12	\$13	\$12	\$1	(\$1)	(\$1)	(\$2)	(\$2)	(\$3)	(\$3)	(\$3)	(\$2)	(\$2)	(\$14)	\$25	\$17	\$6	\$3	(\$3)	(\$4)

### Low Natural Gas, Medium CO2 Price-Policy Scenario

(Benefit)/Cost	PVRR(d)	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Cost of Project	\$134	\$10	\$10	\$10	\$11	\$11	\$12	\$12	\$12	\$12	\$13	\$13	\$13	\$13	\$14	\$14	\$14	\$15	\$15	\$15	\$16
Change in NPC	(\$230)	\$1	\$2	\$1	(\$11)	(\$13)	(\$14)	(\$14)	(\$15)	(\$15)	(\$16)	(\$14)	(\$18)	(\$42)	(\$52)	(\$50)	(\$53)	(\$59)	(\$61)	(\$64)	(\$67)
Change in Emissions	\$14	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	(\$1)	(\$0)	(\$1)	(\$0)	(\$1)	\$5	\$5	\$6	\$7	\$7	\$9	\$9
Change in DSM	\$11	\$0	\$1	\$1	\$1	\$2	\$2	\$2	\$2	\$2	\$2	\$2	\$2	\$1	\$1	\$1	\$0	\$0	(\$0)	(\$2)	(\$2)
Change in System Fixed Cost	\$71	\$0	(\$0)	(\$0)	\$0	(\$0)	\$0	(\$0)	\$0	\$0	\$0	\$0	(\$3)	\$37	\$28	\$19	\$16	\$25	\$25	\$25	\$27
Net (Benefit)/Cost	(\$0)	\$12	\$13	\$13	\$1	(\$1)	(\$1)	(\$1)	(\$1)	(\$2)	(\$3)	\$0	(\$7)	\$9	(\$4)	(\$12)	(\$16)	(\$12)	(\$14)	(\$17)	(\$18)

### Low Natural Gas, High CO2 Price-Policy Scenario

(Benefit)/Cost	PVRR(d)	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Cost of Project	\$134	\$10	\$10	\$10	\$11	\$11	\$12	\$12	\$12	\$12	\$13	\$13	\$13	\$13	\$14	\$14	\$14	\$15	\$15	\$15	\$16
Change in NPC	(\$126)	\$1	\$3	\$2	(\$11)	(\$13)	(\$13)	(\$13)	(\$13)	(\$15)	(\$16)	(\$15)	(\$17)	(\$17)	(\$19)	(\$19)	(\$20)	(\$21)	(\$22)	(\$23)	(\$24)
Change in Emissions	(\$26)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	(\$0)	(\$1)	(\$4)	(\$5)	(\$7)	(\$6)	(\$7)	(\$8)	(\$8)	(\$8)	(\$8)	(\$7)
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 System Fixed Cost	(\$0)	\$0	(\$0)	(\$0)	\$0	(\$0)	\$0	(\$0)	\$0	\$0	\$0	\$0	(\$0)	\$0	(\$0)	\$0	(\$0)	\$0	\$0	\$0	(\$0)
Net (Benefit)/Cost	(\$18)	\$12	\$13	\$12	\$0	(\$1)	(\$1)	(\$2)	(\$1)	(\$3)	(\$4)	(\$6)	(\$9)	(\$10)	(\$11)	(\$12)	(\$14)	(\$14)	(\$15)	(\$15)	(\$15)

**SO Model Annual Results (\$ million)**

**OFPC Natural Gas, Zero CO2 Price-Policy Scenario**

(Benefit)/Cost	PVRR(d)	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Cost of Project	\$134	\$10	\$10	\$10	\$11	\$11	\$12	\$12	\$12	\$12	\$13	\$13	\$13	\$13	\$14	\$14	\$14	\$15	\$15	\$15	\$16
Change in NPC	(\$186)	\$2	\$3	\$2	(\$10)	(\$13)	(\$14)	(\$15)	(\$16)	(\$17)	(\$17)	(\$17)	(\$59)	(\$35)	(\$20)	(\$24)	(\$60)	(\$28)	(\$29)	(\$30)	(\$32)
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 DSM	(\$2)	\$0	(\$0)	(\$0)	\$0	\$0	\$0	\$0	\$0	(\$0)	(\$1)	(\$1)	(\$1)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$2)	(\$2)
Change in System Fixed Cost	\$21	\$0	(\$0)	(\$0)	\$0	(\$0)	\$0	(\$0)	\$0	\$0	\$0	\$0	\$60	(\$32)	(\$23)	(\$19)	\$63	\$1	\$1	\$1	\$2
Net (Benefit)/Cost	(\$33)	\$12	\$13	\$12	\$1	(\$1)	(\$2)	(\$3)	(\$4)	(\$5)	(\$5)	(\$5)	\$13	(\$54)	(\$29)	(\$29)	\$18	(\$13)	(\$14)	(\$15)	(\$16)

**Medium Natural Gas, Medium CO2 Price-Policy Scenario**

(Benefit)/Cost	PVRR(d)	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Cost of Project	\$134	\$10	\$10	\$10	\$11	\$11	\$12	\$12	\$12	\$12	\$13	\$13	\$13	\$13	\$14	\$14	\$14	\$15	\$15	\$15	\$16
Change in NPC	(\$293)	\$1	\$3	\$1	(\$12)	(\$15)	(\$19)	(\$21)	(\$23)	(\$24)	(\$25)	(\$26)	(\$30)	(\$31)	(\$48)	(\$82)	(\$109)	(\$66)	(\$70)	(\$22)	(\$99)
Change in Emissions	(\$15)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	(\$1)	(\$1)	(\$1)	(\$2)	(\$1)	(\$5)	(\$9)	(\$10)	(\$2)	(\$1)	(\$0)	(\$4)
Change in DSM	\$63	\$0	\$1	\$2	\$2	\$2	\$3	\$5	\$5	\$7	\$7	\$8	\$8	\$11	\$12	\$13	\$13	\$13	\$13	\$13	\$13
Change in System Fixed Cost	\$89	\$0	(\$0)	(\$0)	\$0	\$0	\$4	\$4	\$4	\$4	\$4	\$4	(\$15)	(\$16)	\$8	\$56	\$90	\$31	\$31	(\$23)	\$60
Net (Benefit)/Cost	(\$22)	\$12	\$14	\$13	\$1	(\$2)	(\$1)	(\$1)	(\$1)	(\$3)	(\$2)	(\$3)	(\$25)	(\$24)	(\$19)	(\$8)	(\$2)	(\$9)	(\$11)	(\$17)	(\$14)

**Medium Natural Gas, High CO2 Price-Policy Scenario**

(Benefit)/Cost	PVRR(d)	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Cost of Project	\$134	\$10	\$10	\$10	\$11	\$11	\$12	\$12	\$12	\$12	\$13	\$13	\$13	\$13	\$14	\$14	\$14	\$15	\$15	\$15	\$16
Change in NPC	(\$151)	\$1	\$3	\$2	(\$11)	(\$14)	(\$15)	(\$16)	(\$17)	(\$18)	(\$17)	(\$18)	(\$21)	(\$21)	(\$22)	(\$23)	(\$24)	(\$25)	(\$27)	(\$28)	(\$30)
Change in Emissions	(\$24)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	(\$1)	(\$3)	(\$4)	(\$4)	(\$5)	(\$6)	(\$6)	(\$7)	(\$7)	(\$7)	(\$8)	(\$7)
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 System Fixed Cost	(\$0)	\$0	(\$0)	(\$0)	\$0	(\$0)	\$0	(\$0)	\$0	(\$0)	\$0	\$0	\$0	\$0	\$0	\$0	(\$0)	\$0	\$0	\$0	(\$0)
Net (Benefit)/Cost	(\$41)	\$12	\$13	\$12	(\$0)	(\$3)	(\$3)	(\$4)	(\$5)	(\$6)	(\$7)	(\$9)	(\$12)	(\$13)	(\$14)	(\$15)	(\$16)	(\$18)	(\$19)	(\$21)	(\$22)

**SO Model Annual Results (\$ million)**

**High Natural Gas, Zero CO2 Price-Policy Scenario**

(Benefit)/Cost	PVRR(d)	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Cost of Project	\$134	\$10	\$10	\$10	\$11	\$11	\$12	\$12	\$12	\$12	\$13	\$13	\$13	\$13	\$14	\$14	\$14	\$15	\$15	\$15	\$16
Change in NPC	(\$277)	\$2	\$4	\$2	(\$14)	(\$19)	(\$21)	(\$22)	(\$24)	(\$25)	(\$25)	(\$26)	(\$29)	(\$29)	(\$31)	(\$18)	(\$33)	(\$89)	(\$82)	(\$133)	(\$81)
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 DSM	\$31	\$0	(\$0)	(\$0)	(\$0)	\$1	\$2	\$2	\$2	\$3	\$3	\$3	\$3	\$4	\$5	\$6	\$6	\$8	\$9	\$10	\$10
Change in System Fixed Cost	\$36	\$0	(\$0)	(\$0)	\$0	\$0	(\$0)	\$0	\$0	\$0	\$0	\$0	(\$1)	(\$5)	(\$6)	(\$19)	(\$7)	\$9	(\$4)	\$71	\$99
Net (Benefit)/Cost	(\$75)	\$12	\$14	\$13	(\$4)	(\$7)	(\$7)	(\$8)	(\$9)	(\$10)	(\$10)	(\$10)	(\$13)	(\$16)	(\$18)	(\$18)	(\$19)	(\$57)	(\$62)	(\$37)	\$44

**High Natural Gas, Medium CO2 Price-Policy Scenario**

(Benefit)/Cost	PVRR(d)	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Cost of Project	\$134	\$10	\$10	\$10	\$11	\$11	\$12	\$12	\$12	\$12	\$13	\$13	\$13	\$13	\$14	\$14	\$14	\$15	\$15	\$15	\$16
Change in NPC	(\$179)	\$2	\$4	\$3	(\$14)	(\$17)	(\$17)	(\$18)	(\$19)	(\$19)	(\$20)	(\$20)	(\$34)	(\$28)	(\$30)	(\$32)	(\$55)	(\$7)	(\$10)	(\$73)	\$8
Change in Emissions	\$4	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	(\$0)	(\$0)	(\$1)	(\$1)	(\$1)	(\$1)	(\$0)	(\$1)	\$4	\$5	\$5	\$8
Change in DSM	(\$70)	\$0	\$0	(\$1)	(\$2)	(\$3)	(\$4)	(\$4)	(\$5)	(\$6)	(\$6)	(\$7)	(\$9)	(\$9)	(\$12)	(\$14)	(\$15)	(\$17)	(\$18)	(\$19)	(\$22)
Change in System Fixed Cost	\$46	\$0	(\$0)	(\$0)	\$0	(\$0)	\$0	(\$0)	\$0	\$0	\$0	\$0	\$14	\$7	\$10	\$12	\$40	\$10	\$15	\$38	(\$22)
Net (Benefit)/Cost	(\$64)	\$12	\$14	\$12	(\$5)	(\$9)	(\$9)	(\$10)	(\$12)	(\$14)	(\$14)	(\$15)	(\$16)	(\$17)	(\$19)	(\$20)	(\$16)	\$6	\$6	(\$35)	(\$13)

**High Natural Gas, High CO2 Price-Policy Scenario**

(Benefit)/Cost	PVRR(d)	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Cost of Project	\$134	\$10	\$10	\$10	\$11	\$11	\$12	\$12	\$12	\$12	\$13	\$13	\$13	\$13	\$14	\$14	\$14	\$15	\$15	\$15	\$16
Change in NPC	(\$199)	\$2	\$4	\$2	(\$15)	(\$19)	(\$20)	(\$21)	(\$23)	(\$24)	(\$24)	(\$25)	(\$13)	(\$30)	(\$36)	(\$38)	(\$30)	(\$38)	(\$40)	(\$41)	(\$12)
Change in Emissions	(\$18)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	(\$1)	(\$2)	(\$2)	\$0	(\$4)	(\$3)	(\$2)	(\$5)	(\$5)	(\$4)	(\$5)	(\$21)
Change in DSM	\$9	\$0	\$0	\$0	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1
Change in System Fixed Cost	(\$28)	\$0	(\$0)	(\$0)	\$0	(\$0)	\$0	(\$0)	\$0	\$0	\$0	\$0	(\$18)	\$0	\$4	\$4	(\$2)	\$2	\$2	\$2	(\$87)
Net (Benefit)/Cost	(\$103)	\$12	\$14	\$13	(\$3)	(\$7)	(\$7)	(\$8)	(\$10)	(\$11)	(\$12)	(\$14)	(\$17)	(\$19)	(\$20)	(\$21)	(\$21)	(\$25)	(\$26)	(\$28)	(\$103)

**PaR Stochastic-Mean Results (\$ million)**

**Low Natural Gas, Zero CO2 Price-Policy Scenario**

(Benefit)/Cost	PVRR(d)	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Cost of Project	\$134	\$10	\$10	\$10	\$11	\$11	\$12	\$12	\$12	\$12	\$13	\$13	\$13	\$13	\$14	\$14	\$14	\$15	\$15	\$15	\$16
Change in NPC	(\$82)	\$1	\$2	\$0	(\$6)	(\$9)	(\$10)	(\$10)	(\$12)	(\$11)	(\$9)	(\$10)	(\$12)	(\$15)	\$13	\$6	(\$13)	(\$27)	(\$22)	(\$22)	(\$21)
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	(\$12)	\$0	\$0	\$0	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$1)	(\$0)	(\$9)	(\$9)	(\$9)	(\$0)	(\$0)	(\$0)	(\$0)
Change in DSM	(\$13)	\$0	(\$0)	(\$1)	(\$1)	(\$1)	(\$2)	(\$2)	(\$2)	(\$2)	(\$2)	(\$3)	(\$3)	(\$1)	(\$1)	(\$1)	\$0	\$0	\$0	(\$0)	(\$0)
Change in Deficiency	(\$1)	\$0	\$0	(\$0)	\$0	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	\$0	(\$0)	(\$0)	(\$0)	(\$0)	\$1	\$1	(\$1)	(\$2)	\$0	(\$1)
Change in System Fixed Cost	\$17	\$0	(\$0)	(\$0)	\$0	(\$0)	\$0	(\$0)	\$0	\$0	\$0	\$0	\$4	\$4	(\$35)	\$15	\$28	\$20	\$12	\$3	\$1
Net (Benefit)/Cost	\$43	\$11	\$12	\$10	\$4	\$1	\$0	(\$1)	(\$2)	(\$1)	\$1	(\$0)	\$2	\$1	(\$17)	\$25	\$21	\$6	\$2	(\$3)	(\$5)

**Low Natural Gas, Medium CO2 Price-Policy Scenario**

(Benefit)/Cost	PVRR(d)	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Cost of Project	\$134	\$10	\$10	\$10	\$11	\$11	\$12	\$12	\$12	\$12	\$13	\$13	\$13	\$13	\$14	\$14	\$14	\$15	\$15	\$15	\$16
Change in NPC	(\$222)	\$1	\$2	(\$1)	(\$9)	(\$12)	(\$13)	(\$13)	(\$16)	(\$15)	(\$13)	(\$12)	(\$15)	(\$45)	(\$53)	(\$51)	(\$49)	(\$56)	(\$58)	(\$62)	(\$64)
Change in Emissions	\$5	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	(\$1)	(\$1)	(\$1)	(\$2)	(\$6)	\$2	\$3	\$4	\$5	\$5	\$6	\$6
Change in VOM	\$9	\$0	\$0	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	\$8	\$3	\$3	\$3	\$3	\$3	\$2	\$2
Change in DSM	\$12	\$0	\$1	\$1	\$2	\$2	\$2	\$2	\$2	\$2	\$2	\$2	\$2	\$1	\$1	\$1	\$0	\$0	\$0	(\$2)	(\$2)
Change in Deficiency	(\$0)	\$0	\$0	(\$0)	\$0	(\$0)	(\$0)	(\$0)	(\$0)	\$0	(\$0)	(\$0)	(\$0)	(\$0)	\$1	\$1	(\$0)	\$0	(\$1)	\$1	(\$2)
Change in System Fixed Cost	\$71	\$0	(\$0)	(\$0)	\$0	(\$0)	\$0	(\$0)	\$0	\$0	\$0	\$0	(\$3)	\$37	\$28	\$19	\$16	\$25	\$25	\$25	\$27
Net (Benefit)/Cost	\$9	\$11	\$13	\$11	\$3	\$1	\$0	\$0	(\$2)	(\$2)	\$0	\$1	(\$5)	\$9	(\$4)	(\$9)	(\$12)	(\$8)	(\$12)	(\$14)	(\$18)

**Low Natural Gas, High CO2 Price-Policy Scenario**

(Benefit)/Cost	PVRR(d)	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Cost of Project	\$134	\$10	\$10	\$10	\$11	\$11	\$12	\$12	\$12	\$12	\$13	\$13	\$13	\$13	\$14	\$14	\$14	\$15	\$15	\$15	\$16
Change in NPC	(\$123)	\$1	\$2	\$0	(\$9)	(\$11)	(\$12)	(\$12)	(\$15)	(\$14)	(\$12)	(\$14)	(\$17)	(\$19)	(\$20)	(\$19)	(\$17)	(\$22)	(\$20)	(\$25)	(\$22)
Change in Emissions	(\$24)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	(\$2)	(\$3)	(\$4)	(\$6)	(\$4)	(\$10)	(\$5)	(\$6)	(\$3)	(\$7)	(\$2)	(\$8)
Change in VOM	(\$2)	\$0	\$0	\$0	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$1)	(\$1)
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	(\$3)	\$0	\$0	(\$0)	\$0	(\$0)	(\$0)	(\$0)	(\$0)	\$0	(\$0)	(\$0)	\$0	(\$0)	\$0	(\$1)	(\$0)	(\$1)	(\$3)	(\$2)	(\$0)
Change in System Fixed Cost	(\$0)	\$0	(\$0)	(\$0)	\$0	(\$0)	\$0	(\$0)	\$0	\$0	\$0	\$0	(\$0)	\$0	(\$0)	\$0	(\$0)	\$0	\$0	\$0	(\$0)
Net (Benefit)/Cost	(\$17)	\$11	\$12	\$11	\$2	(\$0)	(\$1)	(\$1)	(\$3)	(\$3)	(\$3)	(\$5)	(\$10)	(\$10)	(\$16)	(\$11)	(\$9)	(\$12)	(\$15)	(\$14)	(\$15)

**PaR Stochastic-Mean Results (\$ million)**

**OFPC Natural Gas, Zero CO2 Price-Policy Scenario**

(Benefit)/Cost	PVRR(d)	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Cost of Project	\$134	\$10	\$10	\$10	\$11	\$11	\$12	\$12	\$12	\$12	\$13	\$13	\$13	\$13	\$14	\$14	\$14	\$15	\$15	\$15	\$16
Change in NPC	(\$176)	\$1	\$2	(\$0)	(\$8)	(\$11)	(\$13)	(\$14)	(\$17)	(\$16)	(\$13)	(\$15)	(\$61)	(\$32)	(\$23)	(\$24)	(\$51)	(\$25)	(\$25)	(\$28)	(\$28)
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	(\$2)	\$0	\$0	\$0	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	\$4	(\$4)	(\$1)	(\$0)	(\$1)	(\$0)	(\$0)	(\$0)	(\$0)
Change in DSM	(\$2)	\$0	(\$0)	(\$0)	\$0	\$0	\$0	\$0	\$0	(\$0)	(\$1)	(\$1)	(\$1)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$2)	(\$2)
Change in Deficiency	\$1	\$0	\$0	\$0	(\$0)	\$0	\$0	\$0	(\$0)	(\$0)	\$0	\$0	\$0	\$1	\$1	\$1	\$0	(\$2)	\$2	(\$1)	\$1
Change in System Fixed Cost	\$21	\$0	(\$0)	(\$0)	\$0	(\$0)	\$0	(\$0)	\$0	\$0	\$0	\$0	\$60	(\$32)	(\$23)	(\$19)	\$63	\$1	\$1	\$1	\$2
Net (Benefit)/Cost	(\$24)	\$11	\$12	\$10	\$3	\$0	(\$1)	(\$2)	(\$5)	(\$4)	(\$1)	(\$3)	\$14	(\$54)	(\$32)	(\$28)	\$25	(\$13)	(\$8)	(\$15)	(\$12)

**Medium Natural Gas, Medium CO2 Price-Policy Scenario**

(Benefit)/Cost	PVRR(d)	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Cost of Project	\$134	\$10	\$10	\$10	\$11	\$11	\$12	\$12	\$12	\$12	\$13	\$13	\$13	\$13	\$14	\$14	\$14	\$15	\$15	\$15	\$16
Change in NPC	(\$273)	\$1	\$2	(\$1)	(\$10)	(\$14)	(\$18)	(\$19)	(\$24)	(\$23)	(\$21)	(\$24)	(\$29)	(\$31)	(\$46)	(\$74)	(\$97)	(\$65)	(\$65)	(\$24)	(\$82)
Change in Emissions	(\$17)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	(\$2)	(\$1)	(\$2)	(\$2)	(\$2)	(\$5)	(\$7)	(\$9)	(\$3)	(\$4)	(\$0)	(\$10)
Change in VOM	(\$14)	\$0	\$0	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$1)	(\$9)	(\$9)	(\$10)	(\$1)	(\$1)	(\$0)	(\$3)
Change in DSM	\$68	\$0	\$1	\$2	\$2	\$2	\$3	\$5	\$6	\$7	\$7	\$8	\$9	\$11	\$13	\$14	\$14	\$14	\$14	\$14	\$14
Change in Deficiency	\$0	\$0	\$0	\$0	(\$0)	\$0	(\$0)	\$0	\$0	\$0	\$0	(\$0)	\$0	\$1	\$1	\$1	(\$0)	(\$2)	(\$1)	\$0	(\$1)
Change in System Fixed Cost	\$89	\$0	(\$0)	(\$0)	\$0	\$0	\$4	\$4	\$4	\$4	\$4	\$4	(\$15)	(\$16)	\$8	\$56	\$90	\$31	\$31	(\$23)	\$60
Net (Benefit)/Cost	(\$13)	\$10	\$13	\$11	\$3	(\$0)	\$1	\$1	(\$2)	(\$1)	\$2	\$0	(\$24)	(\$23)	(\$24)	(\$6)	\$1	(\$10)	(\$10)	(\$18)	(\$5)

**Medium Natural Gas, High CO2 Price-Policy Scenario**

(Benefit)/Cost	PVRR(d)	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Cost of Project	\$134	\$10	\$10	\$10	\$11	\$11	\$12	\$12	\$12	\$12	\$13	\$13	\$13	\$13	\$14	\$14	\$14	\$15	\$15	\$15	\$16
Change in NPC	(\$142)	\$1	\$2	\$0	(\$9)	(\$13)	(\$14)	(\$14)	(\$18)	(\$16)	(\$14)	(\$16)	(\$18)	(\$23)	(\$23)	(\$22)	(\$21)	(\$24)	(\$23)	(\$29)	(\$27)
Change in Emissions	(\$23)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	(\$2)	(\$3)	(\$4)	(\$6)	(\$2)	(\$10)	(\$5)	(\$6)	(\$5)	(\$8)	(\$4)	(\$5)
Change in VOM	(\$1)	\$0	\$0	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)
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	(\$2)	(\$0)	\$0	(\$0)	(\$0)	\$0	\$0	(\$0)	\$0	\$0	\$0	(\$0)	(\$0)	\$0	\$0	(\$0)	(\$0)	(\$2)	(\$1)	(\$1)	(\$1)
Change in System Fixed Cost	(\$0)	\$0	(\$0)	(\$0)	\$0	(\$0)	\$0	(\$0)	\$0	(\$0)	\$0	\$0	\$0	\$0	\$0	\$0	(\$0)	\$0	\$0	\$0	(\$0)
Net (Benefit)/Cost	(\$35)	\$11	\$12	\$11	\$2	(\$1)	(\$2)	(\$3)	(\$6)	(\$5)	(\$4)	(\$7)	(\$11)	(\$12)	(\$19)	(\$13)	(\$12)	(\$17)	(\$17)	(\$19)	(\$19)

**PaR Stochastic-Mean Results (\$ million)**

**High Natural Gas, Zero CO2 Price-Policy Scenario**

(Benefit)/Cost	PVRR(d)	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Cost of Project	\$134	\$10	\$10	\$10	\$11	\$11	\$12	\$12	\$12	\$12	\$13	\$13	\$13	\$13	\$14	\$14	\$14	\$15	\$15	\$15	\$16
Change in NPC	(\$236)	\$1	\$2	\$0	(\$11)	(\$16)	(\$19)	(\$19)	(\$23)	(\$22)	(\$19)	(\$22)	(\$22)	(\$27)	(\$32)	(\$15)	(\$27)	(\$74)	(\$64)	(\$111)	(\$63)
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	(\$6)	\$0	\$0	\$0	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$5)	(\$5)	(\$6)	(\$1)
Change in DSM	\$33	\$0	(\$0)	(\$0)	(\$0)	\$1	\$2	\$3	\$2	\$3	\$3	\$3	\$4	\$5	\$5	\$6	\$7	\$8	\$10	\$11	\$11
Change in Deficiency	(\$1)	(\$0)	(\$0)	(\$0)	\$0	\$0	(\$0)	\$0	(\$0)	\$0	(\$0)	(\$0)	\$0	(\$0)	\$0	\$1	\$0	(\$2)	\$2	(\$1)	(\$3)
Change in System Fixed Cost	\$36	\$0	(\$0)	(\$0)	\$0	\$0	\$0	(\$0)	\$0	\$0	\$0	\$0	(\$1)	(\$5)	(\$6)	(\$19)	(\$7)	\$9	(\$4)	\$71	\$99
Net (Benefit)/Cost	(\$40)	\$11	\$13	\$10	(\$1)	(\$4)	(\$5)	(\$5)	(\$9)	(\$6)	(\$4)	(\$6)	(\$6)	(\$14)	(\$18)	(\$14)	(\$13)	(\$49)	(\$47)	(\$21)	\$59

**High Natural Gas, Medium CO2 Price-Policy Scenario**

(Benefit)/Cost	PVRR(d)	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Cost of Project	\$134	\$10	\$10	\$10	\$11	\$11	\$12	\$12	\$12	\$12	\$13	\$13	\$13	\$13	\$14	\$14	\$14	\$15	\$15	\$15	\$16
Change in NPC	(\$154)	\$1	\$2	\$0	(\$11)	(\$14)	(\$16)	(\$16)	(\$19)	(\$17)	(\$14)	(\$16)	(\$31)	(\$25)	(\$32)	(\$27)	(\$44)	(\$8)	(\$8)	(\$55)	\$18
Change in Emissions	\$5	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	(\$1)	(\$1)	(\$1)	(\$1)	(\$1)	(\$1)	(\$0)	(\$1)	\$6	\$5	\$3	\$10
Change in VOM	\$6	\$0	\$0	\$0	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	\$5	\$5	\$4	\$6
Change in DSM	(\$74)	\$0	\$0	(\$1)	(\$2)	(\$4)	(\$4)	(\$4)	(\$5)	(\$7)	(\$7)	(\$8)	(\$9)	(\$10)	(\$12)	(\$14)	(\$16)	(\$18)	(\$19)	(\$20)	(\$23)
Change in Deficiency	\$3	(\$0)	(\$0)	(\$0)	\$0	\$0	(\$0)	(\$0)	(\$0)	\$0	(\$0)	(\$0)	(\$0)	\$0	\$0	\$1	\$0	\$1	\$2	\$6	\$3
Change in System Fixed Cost	\$46	\$0	(\$0)	(\$0)	\$0	(\$0)	\$0	(\$0)	\$0	\$0	\$0	\$0	\$14	\$7	\$10	\$12	\$40	\$10	\$15	\$38	(\$22)
Net (Benefit)/Cost	(\$34)	\$11	\$13	\$10	(\$2)	(\$6)	(\$8)	(\$8)	(\$13)	(\$12)	(\$9)	(\$12)	(\$14)	(\$15)	(\$21)	(\$16)	(\$6)	\$11	\$16	(\$9)	\$7

**High Natural Gas, High CO2 Price-Policy Scenario**

(Benefit)/Cost	PVRR(d)	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Cost of Project	\$134	\$10	\$10	\$10	\$11	\$11	\$12	\$12	\$12	\$12	\$13	\$13	\$13	\$13	\$14	\$14	\$14	\$15	\$15	\$15	\$16
Change in NPC	(\$175)	\$1	\$2	\$0	(\$12)	(\$16)	(\$18)	(\$18)	(\$22)	(\$21)	(\$18)	(\$20)	(\$13)	(\$26)	(\$37)	(\$30)	(\$24)	(\$29)	(\$31)	(\$32)	(\$21)
Change in Emissions	(\$18)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	(\$1)	(\$2)	(\$4)	(\$0)	(\$6)	(\$6)	(\$5)	(\$3)	(\$3)	(\$5)	(\$6)	(\$7)
Change in VOM	(\$2)	\$0	\$0	\$0	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	\$0	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$3)
Change in DSM	\$9	\$0	\$0	\$0	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1
Change in Deficiency	(\$1)	\$0	(\$0)	(\$0)	\$0	\$0	(\$0)	\$0	(\$1)	\$0	\$0	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$1)	(\$2)	\$0	\$1	\$1
Change in System Fixed Cost	(\$28)	\$0	(\$0)	(\$0)	\$0	(\$0)	\$0	(\$0)	\$0	\$0	\$0	\$0	(\$18)	\$0	\$4	\$4	(\$2)	\$2	\$2	\$2	(\$87)
Net (Benefit)/Cost	(\$80)	\$11	\$13	\$11	\$0	(\$4)	(\$6)	(\$5)	(\$10)	(\$9)	(\$7)	(\$10)	(\$16)	(\$18)	(\$24)	(\$16)	(\$15)	(\$17)	(\$17)	(\$19)	(\$100)



# ATTACHMENT C – ANNUAL REVENUE REQUIREMENT PRICE-POLICY DETAIL FOR WIND REPOWERING

**Estimated Annual Revenue Requirement Results (\$ million)**

Low Natural Gas, Zero CO2 Price-Policy Scenario																																				
(Benefit)/Cost	PVRR(d)	2017	2018	2019	2020	2021	2022	2023	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	
<b>Project Net Costs</b>																																				
Capital Recovery	\$936	(\$1)	(\$2)	\$21	\$116	\$120	\$109	\$100	\$92	\$87	\$84	\$81	\$78	\$75	\$72	\$70	\$65	\$59	\$62	\$49	\$42	\$51	\$62	\$78	\$85	\$88	\$92	\$92	\$93	\$94	\$96	\$102	\$107	\$77	\$11	
O&M	\$81	\$0	\$0	\$1	\$4	\$4	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$2	\$5	\$14	\$28	\$29	\$32	\$33	\$34	\$34	\$35	\$36	\$37	\$38	\$30	\$3	
Wind Tax	\$6	(\$0)	(\$0)	(\$0)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$1	\$2	\$2	\$2	\$2	\$2	\$2	\$2	\$2	\$2	\$1	\$0	
PTCs	(\$822)	\$2	\$4	(\$23)	(\$109)	(\$132)	(\$132)	(\$137)	(\$137)	(\$142)	(\$147)	(\$147)	(\$157)	(\$123)	(\$20)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Net Project Cost	\$200	\$1	\$1	(\$1)	\$11	(\$8)	(\$22)	(\$36)	(\$43)	(\$54)	(\$62)	(\$65)	(\$78)	(\$47)	\$53	\$72	\$66	\$60	\$63	\$50	\$44	\$57	\$76	\$108	\$116	\$122	\$127	\$128	\$129	\$131	\$134	\$141	\$147	\$108	\$14	
<b>System Impacts</b>																																				
NPC	(\$260)	\$1	\$2	\$0	(\$6)	(\$9)	(\$10)	(\$10)	(\$12)	(\$11)	(\$9)	(\$10)	(\$12)	(\$15)	\$13	\$6	(\$13)	(\$27)	(\$22)	(\$22)	(\$21)	(\$25)	(\$39)	(\$73)	(\$76)	(\$86)	(\$87)	(\$89)	(\$91)	(\$93)	(\$95)	(\$98)	(\$91)	(\$61)	(\$10)	
Emissions	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Other Variable Costs	(\$89)	\$0	(\$0)	(\$1)	(\$1)	(\$2)	(\$2)	(\$3)	(\$3)	(\$3)	(\$3)	(\$3)	(\$3)	(\$1)	(\$10)	(\$10)	(\$9)	(\$1)	(\$2)	\$0	(\$1)	(\$9)	(\$14)	(\$26)	(\$27)	(\$30)	(\$31)	(\$32)	(\$33)	(\$33)	(\$34)	(\$35)	(\$32)	(\$22)	(\$3)	
System Fixed Costs	\$108	\$0	(\$0)	(\$0)	\$0	(\$0)	\$0	(\$0)	\$0	\$0	\$0	\$0	\$4	\$4	(\$35)	\$15	\$28	\$20	\$12	\$3	\$1	\$13	\$20	\$38	\$39	\$44	\$45	\$46	\$47	\$48	\$49	\$50	\$47	\$32	\$5	
Net System Impacts	(\$241)	\$1	\$2	(\$0)	(\$7)	(\$11)	(\$12)	(\$15)	(\$13)	(\$11)	(\$13)	(\$11)	(\$13)	(\$11)	(\$13)	(\$31)	\$11	\$6	(\$8)	(\$13)	(\$18)	(\$21)	(\$21)	(\$32)	(\$62)	(\$64)	(\$72)	(\$74)	(\$75)	(\$79)	(\$80)	(\$82)	(\$77)	(\$52)	(\$8)	
Net (Benefit)/Cost	(\$41)	\$2	\$3	(\$2)	\$4	(\$18)	(\$34)	(\$49)	(\$57)	(\$67)	(\$74)	(\$79)	(\$90)	(\$60)	\$22	\$82	\$72	\$52	\$50	\$32	\$24	\$36	\$43	\$46	\$52	\$50	\$54	\$53	\$52	\$53	\$53	\$58	\$70	\$56	\$5	
<b>Low Natural Gas, Medium CO2 Price-Policy Scenario</b>																																				
(Benefit)/Cost	PVRR(d)	2017	2018	2019	2020	2021	2022	2023	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	
<b>Project Net Costs</b>																																				
Capital Recovery	\$936	(\$1)	(\$2)	\$21	\$116	\$120	\$109	\$100	\$92	\$87	\$84	\$81	\$78	\$75	\$72	\$70	\$65	\$59	\$62	\$49	\$42	\$51	\$62	\$78	\$85	\$88	\$92	\$92	\$93	\$94	\$96	\$102	\$107	\$77	\$11	
O&M	\$81	\$0	\$0	\$1	\$4	\$4	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$2	\$5	\$14	\$28	\$29	\$32	\$33	\$34	\$34	\$35	\$36	\$37	\$38	\$30	\$3	
Wind Tax	\$6	(\$0)	(\$0)	(\$0)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$1	\$2	\$2	\$2	\$2	\$2	\$2	\$2	\$2	\$2	\$2	\$1	\$0	
PTCs	(\$822)	\$2	\$4	(\$23)	(\$109)	(\$132)	(\$132)	(\$137)	(\$137)	(\$142)	(\$147)	(\$147)	(\$157)	(\$123)	(\$20)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Net Project Cost	\$200	\$1	\$1	(\$1)	\$11	(\$8)	(\$22)	(\$36)	(\$43)	(\$54)	(\$62)	(\$65)	(\$78)	(\$47)	\$53	\$72	\$66	\$60	\$63	\$50	\$44	\$57	\$76	\$108	\$116	\$122	\$127	\$128	\$129	\$131	\$134	\$141	\$147	\$108	\$14	
<b>System Impacts</b>																																				
NPC	(\$935)	\$1	\$2	(\$1)	(\$9)	(\$12)	(\$13)	(\$13)	(\$16)	(\$15)	(\$13)	(\$12)	(\$15)	(\$45)	(\$53)	(\$51)	(\$49)	(\$56)	(\$58)	(\$62)	(\$64)	(\$100)	(\$155)	(\$293)	(\$305)	(\$343)	(\$350)	(\$358)	(\$366)	(\$374)	(\$382)	(\$391)	(\$365)	(\$246)	(\$38)	
Emissions	\$36	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	(\$1)	(\$1)	(\$1)	(\$2)	(\$6)	\$2	\$3	\$4	\$5	\$5	\$6	\$6	\$4	\$7	\$13	\$13	\$15	\$15	\$16	\$16	\$16	\$17	\$17	\$16	\$11	\$2	
Other Variable Costs	\$71	\$0	\$1	\$1	\$2	\$2	\$1	\$2	\$2	\$2	\$2	\$2	\$1	\$9	\$6	\$6	\$3	\$3	\$1	\$1	(\$2)	\$7	\$11	\$20	\$21	\$24	\$24	\$25	\$26	\$26	\$27	\$27	\$25	\$17	\$3	
System Fixed Costs	\$383	\$0	(\$0)	(\$0)	\$0	(\$0)	\$0	(\$0)	\$0	\$0	\$0	\$0	(\$3)	\$37	\$28	\$19	\$16	\$25	\$25	\$25	\$27	\$44	\$68	\$128	\$134	\$150	\$153	\$157	\$160	\$164	\$168	\$171	\$160	\$108	\$17	
Net System Impacts	(\$445)	\$1	\$2	\$1	(\$8)	(\$11)	(\$12)	(\$12)	(\$14)	(\$14)	(\$12)	(\$12)	(\$18)	(\$5)	(\$18)	(\$23)	(\$26)	(\$23)	(\$27)	(\$30)	(\$34)	(\$45)	(\$69)	(\$131)	(\$137)	(\$154)	(\$157)	(\$161)	(\$164)	(\$168)	(\$171)	(\$175)	(\$164)	(\$110)	(\$17)	
Net (Benefit)/Cost	(\$245)	\$2	\$4	(\$1)	\$4	(\$18)	(\$34)	(\$48)	(\$57)	(\$68)	(\$75)	(\$77)	(\$96)	(\$52)	\$35	\$48	\$40	\$37	\$36	\$21	\$11	\$12	\$7	(\$24)	(\$21)	(\$31)	(\$30)	(\$32)	(\$35)	(\$36)	(\$38)	(\$35)	(\$17)	(\$3)	(\$4)	
<b>Low Natural Gas, High CO2 Price-Policy Scenario</b>																																				
(Benefit)/Cost	PVRR(d)	2017	2018	2019	2020	2021	2022	2023	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	
<b>Project Net Costs</b>																																				
Capital Recovery	\$936	(\$1)	(\$2)	\$21	\$116	\$120	\$109	\$100	\$92	\$87	\$84	\$81	\$78	\$75	\$72	\$70	\$65	\$59	\$62	\$49	\$42	\$51	\$62	\$78	\$85	\$88	\$92	\$92	\$93	\$94	\$96	\$102	\$107	\$77	\$11	
O&M	\$81	\$0	\$0	\$1	\$4	\$4	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$2	\$5	\$14	\$28	\$29	\$32	\$33	\$34	\$34	\$35	\$36	\$37	\$38	\$30	\$3	
Wind Tax	\$6	(\$0)	(\$0)	(\$0)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$1	\$2	\$2	\$2	\$2	\$2	\$2	\$2	\$2	\$2	\$2	\$1	\$0		
PTCs	(\$822)	\$2	\$4	(\$23)	(\$109)	(\$132)	(\$132)	(\$137)	(\$137)	(\$142)	(\$147)	(\$147)	(\$157)	(\$123)	(\$20)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Net Project Cost	\$200	\$1	\$1	(\$1)	\$11	(\$8)	(\$22)	(\$36)	(\$43)	(\$54)	(\$62)	(\$65)	(\$78)	(\$47)	\$53	\$72	\$66	\$60	\$63	\$50	\$44	\$57	\$76	\$108	\$116	\$122	\$127	\$128	\$129	\$131	\$134	\$141	\$147	\$108	\$14	
<b>System Impacts</b>																																				
NPC	(\$414)	\$1	\$2	\$0	(\$9)	(\$11)	(\$12)	(\$12)	(\$15)	(\$14)	(\$12)	(\$14)	(\$17)	(\$19)	(\$20)	(\$19)	(\$17)	(\$22)	(\$20)	(\$25)	(\$22)	(\$41)	(\$63)	(\$119)	(\$125)	(\$140)	(\$143)	(\$146)	(\$149)	(\$153)	(\$156)	(\$199)	(\$149)	(\$100)	(\$16)	
Emissions	(\$109)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	(\$2)	(\$3)	(\$4)	(\$6)	(\$4)	(\$6)	(\$4)	(\$5)	(\$6)	(\$3)	(\$7)	(\$2)	(\$8)	(\$12)	(\$18)	(\$35)	(\$36)	(\$41)	(\$42)	(\$43)	(\$44)	(\$45)	(\$46)	(\$47)	(\$44)	(\$29)	(\$5)	
Other Variable Costs	(\$21)	\$0	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)
System Fixed Costs	(\$0)	\$0	(\$0)	(\$0)	\$0	(\$0)	\$0	(\$0)	\$0	\$0	\$0	\$0	(\$0)	\$0	(\$0)	\$0	(\$0)	\$0	\$0	\$0	\$0	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)
Net System Impacts	(\$544)	\$1	\$2	\$0	(\$9)	(\$11)	(\$12)	(\$12)	(\$15)	(\$16)	(\$15)	(\$18)	(\$23)	(\$23)	(\$30)	(\$25)	(\$24)	(\$27)	(\$30)	(\$30)	(\$31)	(\$55)	(\$85)	(\$161)	(\$168)	(\$189)	(\$193)	(\$197)	(\$201)	(\$206)	(\$210)	(\$215)	(\$201)	(\$136)	(\$21)	
Net (Benefit)/Cost	(\$344)	\$2	\$3	(\$1)	\$3	(\$19)	(\$34)	(\$49)	(\$58)	(\$69)	(\$77)	(\$84)	(\$102)	(\$71)	\$23	\$46	\$42	\$33	\$33	\$21	\$13	\$2	(\$9)	(\$53)	(\$52)	(\$66)	(\$65)	(\$69)	(\$72)	(\$74)	(\$77)	(\$75)	(\$54)	(\$28)	(\$8)	

Estimated Annual Revenue Requirement Results (\$ million)

OFPC Natural Gas, Zero CO2 Price-Policy Scenario

(Benefit)/Cost	PVRR(d)	2017	2018	2019	2020	2021	2022	2023	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	
<i>Project Net Costs</i>																																				
Capital Recovery	\$936	(\$1)	(\$2)	\$21	\$116	\$120	\$109	\$100	\$92	\$87	\$84	\$81	\$78	\$75	\$72	\$70	\$65	\$59	\$62	\$49	\$42	\$51	\$62	\$78	\$85	\$88	\$92	\$92	\$93	\$94	\$96	\$102	\$107	\$77	\$11	
O&M	\$81	\$0	\$0	\$1	\$4	\$4	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$2	\$5	\$14	\$28	\$29	\$32	\$33	\$34	\$34	\$35	\$36	\$37	\$38	\$30	\$3	
Wind Tax	\$6	(\$0)	(\$0)	(\$0)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$1	\$2	\$2	\$2	\$2	\$2	\$2	\$2	\$2	\$2	\$2	\$1	\$0	\$0	
PTCs	(\$822)	\$2	\$4	(\$23)	(\$109)	(\$132)	(\$132)	(\$137)	(\$137)	(\$142)	(\$147)	(\$147)	(\$157)	(\$123)	(\$20)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Net Project Cost	\$200	\$1	\$1	(\$1)	\$11	(\$8)	(\$22)	(\$36)	(\$43)	(\$54)	(\$62)	(\$65)	(\$78)	(\$47)	\$53	\$72	\$66	\$60	\$63	\$50	\$44	\$57	\$76	\$108	\$116	\$122	\$127	\$128	\$129	\$131	\$134	\$141	\$147	\$108	\$14	
<i>System Impacts</i>																																				
NPC	(\$689)	\$1	\$2	(\$0)	(\$8)	(\$11)	(\$13)	(\$14)	(\$17)	(\$16)	(\$13)	(\$15)	(\$61)	(\$32)	(\$23)	(\$24)	(\$51)	(\$25)	(\$25)	(\$28)	(\$28)	(\$72)	(\$111)	(\$210)	(\$219)	(\$246)	(\$251)	(\$257)	(\$263)	(\$269)	(\$275)	(\$281)	(\$262)	(\$177)	(\$28)	
Emissions	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Other Variable Costs	(\$13)	(\$0)	(\$0)	(\$0)	\$0	\$0	\$0	\$0	(\$0)	(\$1)	(\$1)	\$3	(\$4)	\$0	\$1	(\$1)	(\$2)	\$1	(\$4)	(\$2)	(\$1)	(\$2)	(\$4)	(\$4)	(\$5)	(\$5)	(\$5)	(\$5)	(\$6)	(\$6)	(\$6)	(\$6)	(\$5)	(\$5)	(\$4)	(\$1)
System Fixed Costs	\$140	\$0	(\$0)	(\$0)	\$0	(\$0)	\$0	(\$0)	\$0	\$0	\$0	\$0	\$60	(\$32)	(\$23)	(\$19)	\$63	\$1	\$1	\$1	\$2	\$17	\$26	\$49	\$51	\$57	\$58	\$59	\$61	\$62	\$63	\$65	\$61	\$41	\$6	
Net System Impacts	(\$562)	\$1	\$2	(\$0)	(\$8)	(\$11)	(\$13)	(\$14)	(\$17)	(\$16)	(\$14)	(\$16)	\$1	(\$67)	(\$46)	(\$42)	\$10	(\$27)	(\$23)	(\$30)	(\$28)	(\$57)	(\$88)	(\$166)	(\$173)	(\$194)	(\$198)	(\$203)	(\$207)	(\$212)	(\$217)	(\$221)	(\$207)	(\$139)	(\$22)	
Net (Benefit)/Cost	(\$362)	\$2	\$3	(\$2)	\$3	(\$19)	(\$35)	(\$50)	(\$70)	(\$76)	(\$81)	(\$77)	(\$115)	\$7	\$29	\$76	\$33	\$40	\$20	\$16	\$0	(\$12)	(\$58)	(\$57)	(\$72)	(\$71)	(\$75)	(\$78)	(\$81)	(\$83)	(\$81)	(\$60)	(\$32)	(\$8)		

Medium Natural Gas, Medium CO2 Price-Policy Scenario

(Benefit)/Cost	PVRR(d)	2017	2018	2019	2020	2021	2022	2023	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	
<i>Project Net Costs</i>																																				
Capital Recovery	\$936	(\$1)	(\$2)	\$21	\$116	\$120	\$109	\$100	\$92	\$87	\$84	\$81	\$78	\$75	\$72	\$70	\$65	\$59	\$62	\$49	\$42	\$51	\$62	\$78	\$85	\$88	\$92	\$92	\$93	\$94	\$96	\$102	\$107	\$77	\$11	
O&M	\$81	\$0	\$0	\$1	\$4	\$4	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$2	\$5	\$14	\$28	\$29	\$32	\$33	\$34	\$34	\$35	\$36	\$37	\$38	\$30	\$3	
Wind Tax	\$6	(\$0)	(\$0)	(\$0)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$1	\$2	\$2	\$2	\$2	\$2	\$2	\$2	\$2	\$2	\$2	\$1	\$0	\$0	
PTCs	(\$822)	\$2	\$4	(\$23)	(\$109)	(\$132)	(\$132)	(\$137)	(\$137)	(\$142)	(\$147)	(\$147)	(\$157)	(\$123)	(\$20)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Net Project Cost	\$200	\$1	\$1	(\$1)	\$11	(\$8)	(\$22)	(\$36)	(\$43)	(\$54)	(\$62)	(\$65)	(\$78)	(\$47)	\$53	\$72	\$66	\$60	\$63	\$50	\$44	\$57	\$76	\$108	\$116	\$122	\$127	\$128	\$129	\$131	\$134	\$141	\$147	\$108	\$14	
<i>System Impacts</i>																																				
NPC	(\$1,101)	\$1	\$2	(\$1)	(\$10)	(\$14)	(\$18)	(\$19)	(\$24)	(\$23)	(\$21)	(\$24)	(\$29)	(\$31)	(\$46)	(\$74)	(\$97)	(\$65)	(\$65)	(\$24)	(\$82)	(\$116)	(\$179)	(\$340)	(\$354)	(\$398)	(\$406)	(\$415)	(\$425)	(\$434)	(\$444)	(\$454)	(\$423)	(\$286)	(\$44)	
Emissions	(\$84)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	(\$2)	(\$1)	(\$2)	(\$2)	(\$5)	(\$7)	(\$9)	(\$3)	(\$4)	(\$0)	(\$10)	(\$9)	(\$14)	(\$27)	(\$28)	(\$32)	(\$33)	(\$33)	(\$34)	(\$35)	(\$36)	(\$36)	(\$34)	(\$32)	(\$34)	(\$30)	
Other Variable Costs	\$186	\$0	\$1	\$2	\$2	\$3	\$5	\$6	\$7	\$8	\$9	\$11	\$4	\$6	\$4	\$12	\$12	\$14	\$11	\$19	\$29	\$54	\$56	\$63	\$65	\$66	\$68	\$69	\$71	\$72	\$67	\$45	\$7	\$0		
System Fixed Costs	\$439	(\$0)	(\$0)	(\$0)	\$0	\$4	\$4	\$4	\$4	\$4	\$4	(\$15)	(\$16)	\$8	\$56	\$90	\$31	\$31	(\$23)	\$60	\$49	\$76	\$144	\$150	\$188	\$172	\$176	\$180	\$184	\$188	\$192	\$179	\$121	\$40		
Net System Impacts	(\$559)	\$1	\$2	\$1	(\$8)	(\$11)	(\$11)	(\$11)	(\$14)	(\$14)	(\$11)	(\$13)	(\$37)	(\$37)	(\$38)	(\$20)	(\$13)	(\$25)	(\$25)	(\$33)	(\$21)	(\$58)	(\$89)	(\$169)	(\$177)	(\$198)	(\$203)	(\$207)	(\$212)	(\$216)	(\$221)	(\$226)	(\$211)	(\$142)	(\$22)	
Net (Benefit)/Cost	(\$359)	\$2	\$4	(\$1)	\$3	(\$19)	(\$33)	(\$47)	(\$57)	(\$67)	(\$73)	(\$78)	(\$115)	(\$84)	\$15	\$51	\$53	\$35	\$38	\$17	\$24	(\$1)	(\$14)	(\$62)	(\$61)	(\$76)	(\$75)	(\$79)	(\$82)	(\$85)	(\$87)	(\$85)	(\$64)	(\$35)	(\$9)	

Medium Natural Gas, High CO2 Price-Policy Scenario

(Benefit)/Cost	PVRR(d)	2017	2018	2019	2020	2021	2022	2023	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	
<i>Project Net Costs</i>																																				
Capital Recovery	\$936	(\$1)	(\$2)	\$21	\$116	\$120	\$109	\$100	\$92	\$87	\$84	\$81	\$78	\$75	\$72	\$70	\$65	\$59	\$62	\$49	\$42	\$51	\$62	\$78	\$85	\$88	\$92	\$92	\$93	\$94	\$96	\$102	\$107	\$77	\$11	
O&M	\$81	\$0	\$0	\$1	\$4	\$4	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$2	\$5	\$14	\$28	\$29	\$32	\$33	\$34	\$34	\$35	\$36	\$37	\$38	\$30	\$3	
Wind Tax	\$6	(\$0)	(\$0)	(\$0)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$1	\$2	\$2	\$2	\$2	\$2	\$2	\$2	\$2	\$2	\$2	\$1	\$0	\$0	
PTCs	(\$822)	\$2	\$4	(\$23)	(\$109)	(\$132)	(\$132)	(\$137)	(\$137)	(\$142)	(\$147)	(\$147)	(\$157)	(\$123)	(\$20)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Net Project Cost	\$200	\$1	\$1	(\$1)	\$11	(\$8)	(\$22)	(\$36)	(\$43)	(\$54)	(\$62)	(\$65)	(\$78)	(\$47)	\$53	\$72	\$66	\$60	\$63	\$50	\$44	\$57	\$76	\$108	\$116	\$122	\$127	\$128	\$129	\$131	\$134	\$141	\$147	\$108	\$14	
<i>System Impacts</i>																																				
NPC	(\$480)	\$1	\$2	\$0	(\$9)	(\$13)	(\$14)	(\$14)	(\$18)	(\$16)	(\$14)	(\$16)	(\$18)	(\$23)	(\$23)	(\$22)	(\$21)	(\$24)	(\$23)	(\$29)	(\$27)	(\$47)	(\$73)	(\$139)	(\$144)	(\$162)	(\$166)	(\$169)	(\$173)	(\$177)	(\$181)	(\$185)	(\$173)	(\$116)	(\$18)	
Emissions	(\$107)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	(\$2)	(\$3)	(\$4)	(\$6)	(\$2)	(\$10)	(\$5)	(\$6)	(\$5)	(\$8)	(\$4)	(\$5)	(\$12)	(\$18)	(\$34)	(\$36)	(\$40)	(\$41)	(\$42)	(\$43)	(\$44)	(\$45)	(\$46)	(\$43)	(\$29)	(\$5)	
Other Variable Costs	(\$15)	\$0	\$0	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	\$0	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$1)	(\$1)	(\$1)	(\$2)	(\$2)	(\$3)	(\$5)	(\$5)	(\$6)	(\$6)	(\$6)	(\$6)	(\$6)	(\$6)	(\$6)	(\$6)	(\$6)	(\$6)	(\$6)	
System Fixed Costs	(\$0)	\$0	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	\$0	\$0	\$0	(\$0)	(\$0)	\$0	\$0	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)
Net System Impacts	(\$602)	\$1	\$2	\$0	(\$9)	(\$13)	(\$14)	(\$15)	(\$18)	(\$18)	(\$16)	(\$20)	(\$24)	(\$26)	(\$33)	(\$28)	(\$27)	(\$32)	(\$32)	(\$34)	(\$34)	(\$61)	(\$94)	(\$178)	(\$185)	(\$208)	(\$213)	(\$217)	(\$222)	(\$227)	(\$232)	(\$237)	(\$222)	(\$150)	(\$23)	
Net (Benefit)/Cost	(\$401)	\$2	\$3	(\$1)	\$2	(\$20)	(\$36)	(\$51)	(\$61)	(\$71)	(\$79)	(\$86)	(\$105)	(\$73)	\$20	\$44	\$39	\$29	\$31	\$16	\$10	(\$4)	(\$18)	(\$70)	(\$70)	(\$86)	(\$85)	(\$89)	(\$93)	(\$96)	(\$99)	(\$97)	(\$75)	(\$42)	(\$10)	

Estimated Annual Revenue Requirement Results (\$ million)

High Natural Gas, Zero CO2 Price-Policy Scenario																																				
(Benefit)/Cost	PVRR(d)	2017	2018	2019	2020	2021	2022	2023	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	
<b>Project Net Costs</b>																																				
Capital Recovery	\$936	(\$1)	(\$2)	\$21	\$116	\$120	\$109	\$100	\$92	\$87	\$84	\$81	\$78	\$75	\$72	\$70	\$65	\$59	\$62	\$49	\$42	\$51	\$62	\$78	\$85	\$88	\$92	\$92	\$93	\$94	\$96	\$102	\$107	\$77	\$11	
O&M	\$81	\$0	\$0	\$1	\$4	\$4	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$2	\$5	\$14	\$28	\$29	\$32	\$33	\$34	\$34	\$35	\$36	\$37	\$38	\$30	\$3	
Wind Tax	\$6	(\$0)	(\$0)	(\$0)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
PTCs	(\$822)	\$2	\$4	(\$23)	(\$109)	(\$132)	(\$132)	(\$137)	(\$137)	(\$142)	(\$147)	(\$147)	(\$157)	(\$123)	(\$20)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
Net Project Cost	\$200	\$1	\$1	(\$1)	\$11	(\$8)	(\$22)	(\$36)	(\$43)	(\$54)	(\$62)	(\$65)	(\$78)	(\$47)	\$53	\$72	\$66	\$60	\$63	\$50	\$44	\$57	\$76	\$108	\$116	\$122	\$127	\$128	\$129	\$131	\$134	\$141	\$147	\$108	\$14	
<b>System Impacts</b>																																				
NPC	(\$895)	\$1	\$2	\$0	(\$11)	(\$16)	(\$19)	(\$19)	(\$23)	(\$22)	(\$19)	(\$22)	(\$22)	(\$27)	(\$32)	(\$15)	(\$27)	(\$74)	(\$64)	(\$111)	(\$63)	(\$93)	(\$143)	(\$270)	(\$282)	(\$316)	(\$323)	(\$330)	(\$338)	(\$345)	(\$353)	(\$361)	(\$337)	(\$227)	(\$35)	
Emissions	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
Other Variable Costs	\$99	(\$0)	(\$0)	(\$0)	(\$0)	\$1	\$2	\$3	\$2	\$3	\$3	\$3	\$3	\$4	\$6	\$7	\$7	\$1	\$7	\$4	\$7	\$10	\$16	\$30	\$31	\$35	\$36	\$37	\$38	\$38	\$39	\$40	\$37	\$25	\$4	
System Fixed Costs	\$196	\$0	(\$0)	(\$0)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	(\$1)	(\$5)	(\$6)	(\$19)	(\$7)	\$9	(\$4)	\$71	\$99	\$22	\$35	\$66	\$68	\$77	\$78	\$80	\$82	\$84	\$86	\$87	\$82	\$55	\$9	
Net System Impacts	(\$600)	\$1	\$2	(\$0)	(\$12)	(\$15)	(\$17)	(\$16)	(\$21)	(\$19)	(\$16)	(\$19)	(\$19)	(\$27)	(\$32)	(\$28)	(\$27)	(\$63)	(\$62)	(\$37)	\$43	(\$60)	(\$92)	(\$175)	(\$182)	(\$204)	(\$209)	(\$214)	(\$218)	(\$222)	(\$228)	(\$233)	(\$218)	(\$147)	(\$23)	
Net (Benefit)/Cost	(\$400)	\$3	\$4	(\$2)	(\$0)	(\$23)	(\$39)	(\$53)	(\$64)	(\$72)	(\$78)	(\$84)	(\$97)	(\$75)	\$21	\$44	\$39	(\$3)	\$1	\$14	\$88	(\$3)	(\$16)	(\$67)	(\$66)	(\$82)	(\$82)	(\$86)	(\$89)	(\$92)	(\$95)	(\$93)	(\$71)	(\$39)	(\$9)	
<b>High Natural Gas, Medium CO2 Price-Policy Scenario</b>																																				
(Benefit)/Cost	PVRR(d)	2017	2018	2019	2020	2021	2022	2023	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	
<b>Project Net Costs</b>																																				
Capital Recovery	\$936	(\$1)	(\$2)	\$21	\$116	\$120	\$109	\$100	\$92	\$87	\$84	\$81	\$78	\$75	\$72	\$70	\$65	\$59	\$62	\$49	\$42	\$51	\$62	\$78	\$85	\$88	\$92	\$92	\$93	\$94	\$96	\$102	\$107	\$77	\$11	
O&M	\$81	\$0	\$0	\$1	\$4	\$4	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$2	\$5	\$14	\$28	\$29	\$32	\$33	\$34	\$34	\$35	\$36	\$37	\$38	\$30	\$3	
Wind Tax	\$6	(\$0)	(\$0)	(\$0)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
PTCs	(\$822)	\$2	\$4	(\$23)	(\$109)	(\$132)	(\$132)	(\$137)	(\$137)	(\$142)	(\$147)	(\$147)	(\$157)	(\$123)	(\$20)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Net Project Cost	\$200	\$1	\$1	(\$1)	\$11	(\$8)	(\$22)	(\$36)	(\$43)	(\$54)	(\$62)	(\$65)	(\$78)	(\$47)	\$53	\$72	\$66	\$60	\$63	\$50	\$44	\$57	\$76	\$108	\$116	\$122	\$127	\$128	\$129	\$131	\$134	\$141	\$147	\$108	\$14	
<b>System Impacts</b>																																				
NPC	(\$517)	\$1	\$2	\$0	(\$11)	(\$14)	(\$16)	(\$16)	(\$19)	(\$17)	(\$14)	(\$16)	(\$31)	(\$25)	(\$32)	(\$27)	(\$44)	(\$8)	(\$8)	(\$55)	\$18	(\$51)	(\$79)	(\$149)	(\$155)	(\$174)	(\$178)	(\$182)	(\$186)	(\$190)	(\$194)	(\$199)	(\$186)	(\$125)	(\$19)	
Emissions	\$30	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	(\$1)	(\$1)	(\$1)	(\$1)	(\$1)	(\$1)	(\$0)	(\$1)	\$6	\$5	\$3	\$10	\$4	\$5	\$10	\$11	\$12	\$13	\$13	\$13	\$14	\$14	\$13	\$9	\$1		
Other Variable Costs	(\$245)	(\$0)	\$0	(\$1)	(\$2)	(\$4)	(\$4)	(\$4)	(\$6)	(\$7)	(\$7)	(\$8)	(\$10)	(\$10)	(\$12)	(\$14)	(\$16)	(\$12)	(\$12)	(\$10)	(\$14)	(\$25)	(\$39)	(\$74)	(\$77)	(\$86)	(\$88)	(\$90)	(\$92)	(\$94)	(\$96)	(\$98)	(\$92)	(\$62)	(\$10)	
System Fixed Costs	\$258	\$0	(\$0)	(\$0)	\$0	(\$0)	\$0	(\$0)	\$0	\$0	\$0	\$0	\$14	\$7	\$10	\$12	\$40	\$10	\$15	\$38	(\$22)	\$30	\$46	\$87	\$91	\$102	\$104	\$106	\$109	\$111	\$113	\$116	\$108	\$73	\$11	
Net System Impacts	(\$474)	\$1	\$2	(\$1)	(\$13)	(\$18)	(\$20)	(\$20)	(\$25)	(\$24)	(\$22)	(\$25)	(\$28)	(\$29)	(\$35)	(\$30)	(\$21)	(\$4)	\$1	(\$25)	(\$8)	(\$43)	(\$66)	(\$125)	(\$131)	(\$147)	(\$150)	(\$153)	(\$157)	(\$160)	(\$164)	(\$167)	(\$156)	(\$105)	(\$16)	
Net (Benefit)/Cost	(\$274)	\$3	\$4	(\$2)	(\$2)	(\$25)	(\$42)	(\$56)	(\$68)	(\$78)	(\$84)	(\$91)	(\$106)	(\$76)	\$18	\$42	\$45	\$56	\$64	\$26	\$36	\$14	\$10	(\$18)	(\$15)	(\$24)	(\$23)	(\$25)	(\$27)	(\$29)	(\$30)	(\$27)	(\$10)	\$2	(\$3)	
<b>High Natural Gas, High CO2 Price-Policy Scenario</b>																																				
(Benefit)/Cost	PVRR(d)	2017	2018	2019	2020	2021	2022	2023	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	
<b>Project Net Costs</b>																																				
Capital Recovery	\$936	(\$1)	(\$2)	\$21	\$116	\$120	\$109	\$100	\$92	\$87	\$84	\$81	\$78	\$75	\$72	\$70	\$65	\$59	\$62	\$49	\$42	\$51	\$62	\$78	\$85	\$88	\$92	\$92	\$93	\$94	\$96	\$102	\$107	\$77	\$11	
O&M	\$81	\$0	\$0	\$1	\$4	\$4	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$2	\$5	\$14	\$28	\$29	\$32	\$33	\$34	\$34	\$35	\$36	\$37	\$38	\$30	\$3	
Wind Tax	\$6	(\$0)	(\$0)	(\$0)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
PTCs	(\$822)	\$2	\$4	(\$23)	(\$109)	(\$132)	(\$132)	(\$137)	(\$137)	(\$142)	(\$147)	(\$147)	(\$157)	(\$123)	(\$20)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Net Project Cost	\$200	\$1	\$1	(\$1)	\$11	(\$8)	(\$22)	(\$36)	(\$43)	(\$54)	(\$62)	(\$65)	(\$78)	(\$47)	\$53	\$72	\$66	\$60	\$63	\$50	\$44	\$57	\$76	\$108	\$116	\$122	\$127	\$128	\$129	\$131	\$134	\$141	\$147	\$108	\$14	
<b>System Impacts</b>																																				
NPC	(\$565)	\$1	\$2	\$0	(\$12)	(\$16)	(\$18)	(\$18)	(\$22)	(\$21)	(\$18)	(\$20)	(\$13)	(\$26)	(\$37)	(\$30)	(\$24)	(\$29)	(\$31)	(\$32)	(\$21)	(\$55)	(\$84)	(\$160)	(\$167)	(\$187)	(\$191)	(\$196)	(\$200)	(\$204)	(\$209)	(\$214)	(\$199)	(\$135)	(\$21)	
Emissions	(\$82)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	(\$1)	(\$2)	(\$4)	(\$0)	(\$6)	(\$5)	(\$3)	(\$3)	(\$5)	(\$6)	(\$7)	(\$9)	(\$9)	(\$14)	(\$26)	(\$27)	(\$31)	(\$31)	(\$32)	(\$33)	(\$33)	(\$34)	(\$35)	(\$33)	(\$22)	(\$3)	
Other Variable Costs	\$14	\$0	\$0	(\$0)	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	
System Fixed Costs	(\$156)	\$0	(\$0)	(\$0)	\$0	(\$0)	\$0	(\$0)	\$0	\$0	\$0	\$0	(\$18)	\$0	\$4	\$4	(\$2)	\$2	\$2	\$2	(\$87)	(\$18)	(\$28)	(\$52)	(\$55)	(\$61)	(\$63)	(\$64)	(\$66)	(\$67)	(\$69)	(\$70)	(\$65)	(\$44)	(\$7)	
Net System Impacts	(\$789)	\$1	\$2	\$0	(\$11)	(\$15)	(\$17)	(\$17)	(\$22)	(\$21)	(\$19)	(\$23)	(\$30)	(\$31)	(\$38)	(\$30)	(\$29)	(\$31)	(\$32)	(\$35)	(\$116)	(\$81)	(\$124)	(\$236)	(\$246)	(\$276)	(\$282)	(\$288)	(\$295)	(\$301)	(\$308)	(\$315)	(\$294)	(\$198)	(\$31)	
Net (Benefit)/Cost	(\$589)	\$3	\$4	(\$1)	\$0	(\$23)	(\$39)	(\$53)	(\$65)	(\$75)	(\$81)	(\$89)	(\$108)	(\$79)	\$15	\$42	\$37	\$29	\$31	\$16	(\$71)	(\$24)	(\$49)	(\$128)	(\$130)	(\$154)	(\$155)	(\$160)	(\$165)	(\$170)	(\$174)	(\$174)	(\$147)	(\$91)	(\$17)	



# ATTACHMENT D – SYSTEM MODELING PRICE-POLICY DETAIL FOR NEW WIND AND TRANSMISSION

## SO Model Annual Results (\$ million)

### Low Natural Gas, Zero CO2 Price-Policy Scenario

(Benefit)/Cost	PVRR(d)	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Cost of Projects	\$1,174	\$0	\$0	\$0	\$17	\$103	\$129	\$133	\$140	\$144	\$147	\$151	\$167	\$171	\$172	\$181	\$185	\$186	\$187	\$190	\$198
Change in NPC	(\$311)	\$0	\$0	\$1	(\$14)	(\$48)	(\$49)	(\$51)	(\$48)	(\$48)	(\$46)	(\$47)	(\$40)	(\$42)	(\$25)	(\$20)	(\$22)	(\$29)	(\$28)	(\$27)	(\$22)
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 DSM	(\$70)	\$0	(\$0)	(\$1)	(\$2)	(\$4)	(\$6)	(\$7)	(\$8)	(\$9)	(\$9)	(\$10)	(\$12)	(\$10)	(\$10)	(\$11)	(\$11)	(\$11)	(\$11)	(\$11)	(\$11)
Change in System Fixed Cost	(\$672)	\$0	\$0	\$0	(\$0)	(\$31)	(\$57)	(\$59)	(\$64)	(\$67)	(\$68)	(\$70)	(\$87)	(\$90)	(\$132)	(\$116)	(\$150)	(\$159)	(\$167)	(\$143)	(\$153)
Net (Benefit)/Cost	\$121	\$0	\$0	(\$0)	\$0	\$20	\$17	\$16	\$19	\$20	\$24	\$23	\$28	\$30	\$5	\$33	\$1	(\$13)	(\$19)	\$8	\$11

### Low Natural Gas, Medium CO2 Price-Policy Scenario

(Benefit)/Cost	PVRR(d)	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Cost of Projects	\$1,174	\$0	\$0	\$0	\$17	\$103	\$129	\$133	\$140	\$144	\$147	\$151	\$167	\$171	\$172	\$181	\$185	\$186	\$187	\$190	\$198
Change in NPC	(\$511)	\$0	\$0	\$0	(\$16)	(\$49)	(\$52)	(\$55)	(\$52)	(\$54)	(\$53)	(\$54)	(\$49)	(\$53)	(\$69)	(\$64)	(\$70)	(\$100)	(\$106)	(\$158)	(\$136)
Change in Emissions	(\$29)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	(\$4)	(\$5)	(\$5)	(\$5)	(\$9)	(\$2)	(\$1)	(\$2)	(\$5)	(\$9)	(\$13)	(\$16)
Change in DSM	(\$26)	\$0	(\$0)	(\$0)	(\$0)	(\$1)	(\$2)	(\$2)	(\$2)	(\$2)	(\$2)	(\$4)	(\$4)	(\$4)	(\$4)	(\$6)	(\$6)	(\$6)	(\$6)	(\$6)	(\$6)
Change in System Fixed Cost	(\$536)	\$0	\$0	\$0	(\$0)	(\$31)	(\$57)	(\$59)	(\$64)	(\$67)	(\$68)	(\$70)	(\$88)	(\$88)	(\$98)	(\$90)	(\$115)	(\$90)	(\$89)	(\$61)	(\$59)
Net (Benefit)/Cost	\$73	\$0	\$0	\$0	\$1	\$21	\$19	\$18	\$22	\$17	\$19	\$18	\$21	\$17	(\$1)	\$19	(\$8)	(\$14)	(\$23)	(\$48)	(\$19)

### Low Natural Gas, High CO2 Price-Policy Scenario

(Benefit)/Cost	PVRR(d)	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Cost of Projects	\$1,174	\$0	\$0	\$0	\$17	\$103	\$129	\$133	\$140	\$144	\$147	\$151	\$167	\$171	\$172	\$181	\$185	\$186	\$187	\$190	\$198
Change in NPC	(\$361)	\$0	\$0	\$0	(\$16)	(\$52)	(\$55)	(\$57)	(\$51)	(\$56)	(\$54)	(\$44)	(\$17)	(\$16)	(\$26)	(\$35)	(\$60)	(\$9)	(\$24)	(\$87)	(\$101)
Change in Emissions	(\$239)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	(\$4)	(\$12)	(\$33)	(\$56)	(\$64)	(\$71)	(\$88)	(\$95)	(\$39)	(\$60)	(\$40)	(\$65)
Change in DSM	(\$6)	\$0	\$0	\$0	\$0	(\$1)	(\$1)	(\$1)	(\$1)	(\$1)	(\$1)	(\$1)	(\$1)	(\$1)	(\$1)	(\$1)	(\$1)	(\$1)	(\$1)	(\$1)	(\$1)
Change in System Fixed Cost	(\$651)	\$0	\$0	\$0	(\$0)	(\$31)	(\$57)	(\$59)	(\$64)	(\$67)	(\$68)	(\$70)	(\$102)	(\$105)	(\$125)	(\$99)	(\$88)	(\$188)	(\$161)	(\$179)	(\$77)
Net (Benefit)/Cost	(\$84)	\$0	\$0	\$0	\$1	\$20	\$17	\$17	\$23	\$17	\$11	\$2	(\$10)	(\$15)	(\$50)	(\$42)	(\$58)	(\$50)	(\$59)	(\$117)	(\$48)

**SO Model Annual Results (\$ million)**

**OFPC Natural Gas, Zero CO2 Price-Policy Scenario**

(Benefit)/Cost	PVRR(d)	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Cost of Projects	\$1,174	\$0	\$0	\$0	\$17	\$103	\$129	\$133	\$140	\$144	\$147	\$151	\$167	\$171	\$172	\$181	\$185	\$186	\$187	\$190	\$198
Change in NPC	(\$492)	\$0	\$0	\$0	(\$17)	(\$57)	(\$62)	(\$64)	(\$65)	(\$64)	(\$61)	(\$63)	(\$57)	(\$81)	(\$56)	(\$74)	(\$106)	(\$67)	(\$75)	\$29	(\$95)
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 DSM	\$16	\$0	\$0	\$0	\$1	\$1	\$1	\$2	\$2	\$2	\$2	\$2	\$2	\$2	\$3	\$3	\$3	\$3	\$3	\$1	\$4
Change in System Fixed Cost	(\$717)	\$0	\$0	\$0	(\$0)	(\$31)	(\$57)	(\$59)	(\$64)	(\$67)	(\$68)	(\$70)	(\$107)	(\$120)	(\$173)	(\$122)	(\$80)	(\$143)	(\$142)	(\$266)	(\$172)
Net (Benefit)/Cost	(\$19)	\$0	\$0	\$0	\$1	\$15	\$12	\$12	\$13	\$15	\$20	\$20	\$5	(\$27)	(\$54)	(\$13)	\$1	(\$20)	(\$27)	(\$46)	(\$66)

**Medium Natural Gas, Medium CO2 Price-Policy Scenario**

(Benefit)/Cost	PVRR(d)	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Cost of Projects	\$1,174	\$0	\$0	\$0	\$17	\$103	\$129	\$133	\$140	\$144	\$147	\$151	\$167	\$171	\$172	\$181	\$185	\$186	\$187	\$190	\$198
Change in NPC	(\$615)	\$0	\$0	\$0	(\$16)	(\$56)	(\$64)	(\$67)	(\$67)	(\$65)	(\$62)	(\$65)	(\$58)	(\$73)	(\$56)	(\$105)	(\$138)	(\$137)	(\$149)	(\$148)	(\$82)
Change in Emissions	(\$46)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	(\$9)	(\$10)	(\$11)	(\$10)	(\$7)	(\$8)	(\$11)	(\$13)	(\$8)	(\$8)	(\$9)	(\$8)
Change in DSM	\$27	\$0	\$0	\$0	\$0	\$0	\$2	\$2	\$2	\$2	\$3	\$3	\$5	\$6	\$7	\$7	\$7	\$7	\$7	\$7	\$7
Change in System Fixed Cost	(\$626)	\$0	\$0	\$0	(\$0)	(\$31)	(\$57)	(\$60)	(\$64)	(\$67)	(\$68)	(\$71)	(\$107)	(\$110)	(\$178)	(\$120)	(\$54)	(\$92)	(\$91)	(\$99)	(\$184)
Net (Benefit)/Cost	(\$85)	\$0	\$0	\$0	\$1	\$16	\$9	\$9	\$10	\$5	\$9	\$7	(\$5)	(\$14)	(\$64)	(\$48)	(\$14)	(\$43)	(\$54)	(\$60)	(\$69)

**Medium Natural Gas, High CO2 Price-Policy Scenario**

(Benefit)/Cost	PVRR(d)	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Cost of Projects	\$1,174	\$0	\$0	\$0	\$17	\$103	\$129	\$133	\$140	\$144	\$147	\$151	\$167	\$171	\$172	\$181	\$185	\$186	\$187	\$190	\$198
Change in NPC	(\$454)	\$0	\$0	\$1	(\$16)	(\$55)	(\$62)	(\$64)	(\$64)	(\$62)	(\$60)	(\$68)	(\$48)	(\$66)	(\$35)	(\$24)	(\$33)	(\$97)	(\$107)	(\$26)	(\$67)
Change in Emissions	(\$208)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	(\$11)	(\$22)	(\$23)	(\$38)	(\$50)	(\$48)	(\$60)	(\$55)	(\$43)	(\$48)	(\$80)	(\$82)
Change in DSM	(\$40)	\$0	\$0	(\$1)	(\$1)	(\$2)	(\$2)	(\$3)	(\$3)	(\$4)	(\$4)	(\$4)	(\$5)	(\$5)	(\$6)	(\$7)	(\$8)	(\$9)	(\$11)	(\$13)	(\$16)
Change in System Fixed Cost	(\$628)	\$0	\$0	\$0	(\$0)	(\$31)	(\$57)	(\$59)	(\$64)	(\$67)	(\$68)	(\$70)	(\$90)	(\$85)	(\$131)	(\$137)	(\$139)	(\$133)	(\$131)	(\$102)	(\$99)
Net (Benefit)/Cost	(\$156)	\$0	\$0	(\$0)	\$0	\$15	\$8	\$7	\$9	(\$0)	(\$6)	(\$14)	(\$15)	(\$34)	(\$47)	(\$47)	(\$50)	(\$96)	(\$109)	(\$31)	(\$65)

**SO Model Annual Results (\$ million)**

**High Natural Gas, Zero CO2 Price-Policy Scenario**

(Benefit)/Cost	PVRR(d)	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Cost of Projects	\$1,174	\$0	\$0	\$0	\$17	\$103	\$129	\$133	\$140	\$144	\$147	\$151	\$167	\$171	\$172	\$181	\$185	\$186	\$187	\$190	\$198
Change in NPC	(\$775)	\$0	\$0	\$0	(\$22)	(\$74)	(\$91)	(\$87)	(\$94)	(\$92)	(\$88)	(\$91)	(\$89)	\$21	(\$123)	(\$104)	(\$129)	(\$198)	(\$202)	(\$132)	(\$168)
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 DSM	\$13	\$0	(\$0)	(\$0)	(\$0)	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$0	\$1	\$2	\$2	\$2	\$4	\$5	\$7	\$7
Change in System Fixed Cost	(\$716)	\$0	\$0	\$0	(\$0)	(\$31)	(\$57)	(\$67)	(\$71)	(\$74)	(\$76)	(\$78)	(\$94)	(\$226)	(\$104)	(\$132)	(\$115)	(\$115)	(\$127)	(\$167)	(\$149)
Net (Benefit)/Cost	(\$304)	\$0	\$0	\$0	(\$6)	(\$2)	(\$18)	(\$19)	(\$25)	(\$22)	(\$16)	(\$17)	(\$15)	(\$32)	(\$53)	(\$53)	(\$57)	(\$122)	(\$137)	(\$101)	(\$113)

**High Natural Gas, Medium CO2 Price-Policy Scenario**

(Benefit)/Cost	PVRR(d)	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Cost of Projects	\$1,174	\$0	\$0	\$0	\$17	\$103	\$129	\$133	\$140	\$144	\$147	\$151	\$167	\$171	\$172	\$181	\$185	\$186	\$187	\$190	\$198
Change in NPC	(\$804)	\$0	\$0	\$1	(\$21)	(\$72)	(\$88)	(\$90)	(\$97)	(\$94)	(\$90)	(\$92)	(\$90)	(\$102)	(\$129)	(\$86)	(\$166)	(\$121)	(\$143)	(\$156)	(\$170)
Change in Emissions	(\$31)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	(\$4)	(\$5)	(\$6)	(\$5)	(\$6)	(\$7)	(\$4)	(\$10)	(\$8)	(\$9)	(\$7)	(\$10)
Change in DSM	(\$61)	\$0	(\$0)	(\$1)	(\$2)	(\$4)	(\$4)	(\$4)	(\$5)	(\$6)	(\$6)	(\$7)	(\$8)	(\$9)	(\$10)	(\$12)	(\$13)	(\$13)	(\$13)	(\$13)	(\$13)
Change in System Fixed Cost	(\$597)	\$0	\$0	\$0	(\$0)	(\$31)	(\$57)	(\$59)	(\$64)	(\$67)	(\$68)	(\$70)	(\$87)	(\$86)	(\$88)	(\$145)	(\$56)	(\$138)	(\$127)	(\$125)	(\$126)
Net (Benefit)/Cost	(\$318)	\$0	\$0	(\$0)	(\$7)	(\$4)	(\$20)	(\$20)	(\$26)	(\$27)	(\$22)	(\$25)	(\$23)	(\$31)	(\$61)	(\$66)	(\$61)	(\$93)	(\$105)	(\$111)	(\$121)

**High Natural Gas, High CO2 Price-Policy Scenario**

(Benefit)/Cost	PVRR(d)	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Cost of Projects	\$1,174	\$0	\$0	\$0	\$17	\$103	\$129	\$133	\$140	\$144	\$147	\$151	\$167	\$171	\$172	\$181	\$185	\$186	\$187	\$190	\$198
Change in NPC	(\$605)	\$0	\$0	\$0	(\$23)	(\$76)	(\$92)	(\$93)	(\$98)	(\$97)	(\$93)	(\$85)	\$7	(\$87)	(\$78)	(\$49)	(\$78)	(\$63)	(\$60)	(\$58)	(\$117)
Change in Emissions	(\$122)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	(\$5)	(\$11)	(\$28)	(\$11)	(\$41)	(\$35)	(\$33)	(\$37)	(\$28)	(\$23)	(\$31)	(\$36)
Change in DSM	(\$18)	\$0	\$0	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$2)	(\$2)	(\$2)	(\$3)	(\$4)	(\$4)	(\$4)	(\$4)	(\$4)	(\$4)	(\$4)	(\$4)	(\$4)
Change in System Fixed Cost	(\$826)	\$0	\$0	\$0	(\$0)	(\$31)	(\$57)	(\$59)	(\$64)	(\$67)	(\$68)	(\$70)	(\$197)	(\$88)	(\$126)	(\$188)	(\$141)	(\$196)	(\$214)	(\$219)	(\$264)
Net (Benefit)/Cost	(\$396)	\$0	\$0	\$0	(\$6)	(\$4)	(\$20)	(\$20)	(\$24)	(\$27)	(\$27)	(\$35)	(\$37)	(\$48)	(\$70)	(\$94)	(\$75)	(\$105)	(\$115)	(\$122)	(\$223)

**PaR Stochastic-Mean Results (\$ million)**

**Low Natural Gas, Zero CO2 Price-Policy Scenario**

(Benefit)/Cost	PVRR(d)	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Cost of Projects	\$1,174	\$0	\$0	\$0	\$17	\$103	\$129	\$133	\$140	\$144	\$147	\$151	\$167	\$171	\$172	\$181	\$185	\$186	\$187	\$190	\$198
Change in NPC	(\$340)	\$0	\$0	\$1	(\$15)	(\$54)	(\$55)	(\$54)	(\$50)	(\$53)	(\$50)	(\$51)	(\$44)	(\$44)	(\$22)	(\$18)	(\$19)	(\$38)	(\$36)	(\$32)	(\$31)
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	(\$19)	\$0	\$0	\$0	(\$0)	(\$1)	(\$1)	(\$1)	(\$2)	(\$2)	(\$2)	(\$2)	(\$1)	(\$1)	(\$9)	(\$10)	(\$10)	(\$1)	(\$0)	(\$0)	(\$1)
Change in DSM	(\$76)	\$0	(\$0)	(\$1)	(\$2)	(\$5)	(\$6)	(\$7)	(\$9)	(\$9)	(\$10)	(\$11)	(\$12)	(\$11)	(\$11)	(\$12)	(\$12)	(\$12)	(\$12)	(\$12)	(\$13)
Change in Deficiency	(\$2)	\$0	\$0	(\$0)	\$0	\$0	\$0	(\$0)	\$0	(\$0)	\$0	\$0	(\$0)	(\$0)	(\$0)	(\$1)	\$0	\$0	(\$3)	(\$1)	(\$2)
Change in System Fixed Cost	(\$660)	\$0	\$0	\$0	(\$0)	(\$31)	(\$56)	(\$58)	(\$63)	(\$65)	(\$66)	(\$69)	(\$85)	(\$87)	(\$130)	(\$114)	(\$147)	(\$157)	(\$165)	(\$141)	(\$151)
Net (Benefit)/Cost	\$77	\$0	(\$0)	(\$1)	(\$1)	\$12	\$11	\$12	\$17	\$15	\$19	\$19	\$25	\$28	(\$0)	\$26	(\$4)	(\$21)	(\$30)	\$3	\$1

**Low Natural Gas, Medium CO2 Price-Policy Scenario**

(Benefit)/Cost	PVRR(d)	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Cost of Projects	\$1,174	\$0	\$0	\$0	\$17	\$103	\$129	\$133	\$140	\$144	\$147	\$151	\$167	\$171	\$172	\$181	\$185	\$186	\$187	\$190	\$198
Change in NPC	(\$536)	\$0	\$0	\$0	(\$17)	(\$57)	(\$58)	(\$57)	(\$53)	(\$60)	(\$57)	(\$58)	(\$51)	(\$54)	(\$66)	(\$64)	(\$67)	(\$103)	(\$112)	(\$156)	(\$144)
Change in Emissions	(\$40)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	(\$5)	(\$6)	(\$7)	(\$10)	(\$11)	(\$2)	(\$2)	(\$4)	(\$9)	(\$11)	(\$19)	(\$22)
Change in VOM	(\$15)	\$0	\$0	\$0	(\$0)	(\$1)	(\$1)	(\$1)	(\$2)	(\$1)	(\$1)	(\$1)	(\$1)	(\$2)	(\$7)	(\$6)	(\$7)	\$1	\$0	(\$1)	(\$1)
Change in DSM	(\$28)	\$0	(\$0)	(\$0)	(\$0)	(\$2)	(\$2)	(\$2)	(\$2)	(\$3)	(\$4)	(\$4)	(\$4)	(\$4)	(\$5)	(\$6)	(\$6)	(\$6)	(\$6)	(\$6)	(\$7)
Change in Deficiency	(\$0)	\$0	\$0	\$0	\$0	\$0	(\$0)	(\$0)	\$0	(\$0)	\$0	(\$0)	(\$0)	(\$0)	\$0	\$1	\$0	\$1	\$0	(\$0)	(\$3)
Change in System Fixed Cost	(\$523)	\$0	\$0	\$0	(\$0)	(\$31)	(\$55)	(\$58)	(\$63)	(\$65)	(\$66)	(\$69)	(\$85)	(\$86)	(\$95)	(\$87)	(\$113)	(\$88)	(\$87)	(\$58)	(\$57)
Net (Benefit)/Cost	\$32	\$0	(\$0)	(\$0)	(\$0)	\$13	\$13	\$15	\$20	\$10	\$13	\$11	\$15	\$14	(\$3)	\$15	(\$12)	(\$18)	(\$27)	(\$50)	(\$35)

**Low Natural Gas, High CO2 Price-Policy Scenario**

(Benefit)/Cost	PVRR(d)	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Cost of Projects	\$1,174	\$0	\$0	\$0	\$17	\$103	\$129	\$133	\$140	\$144	\$147	\$151	\$167	\$171	\$172	\$181	\$185	\$186	\$187	\$190	\$198
Change in NPC	(\$446)	\$0	\$0	\$0	(\$17)	(\$57)	(\$58)	(\$58)	(\$54)	(\$61)	(\$60)	(\$58)	(\$44)	(\$39)	(\$51)	(\$62)	(\$83)	(\$23)	(\$43)	(\$85)	(\$102)
Change in Emissions	(\$195)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	(\$8)	(\$18)	(\$31)	(\$42)	(\$49)	(\$50)	(\$61)	(\$71)	(\$31)	(\$44)	(\$38)	(\$71)
Change in VOM	(\$18)	\$0	\$0	\$0	(\$0)	(\$1)	(\$1)	(\$1)	(\$2)	(\$1)	(\$1)	(\$1)	(\$2)	(\$2)	(\$4)	(\$3)	(\$4)	(\$2)	(\$3)	(\$12)	(\$6)
Change in DSM	(\$7)	\$0	\$0	\$0	\$0	(\$1)	(\$1)	(\$1)	(\$1)	(\$1)	(\$1)	(\$1)	(\$1)	(\$1)	(\$1)	(\$1)	(\$1)	(\$1)	(\$1)	(\$1)	(\$3)
Change in Deficiency	(\$3)	\$0	\$0	\$0	\$0	\$0	(\$0)	(\$0)	\$0	\$0	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$2)	(\$1)	\$0	(\$5)	\$2	(\$2)
Change in System Fixed Cost	(\$638)	\$0	\$0	\$0	(\$0)	(\$31)	(\$55)	(\$58)	(\$62)	(\$65)	(\$66)	(\$68)	(\$100)	(\$103)	(\$123)	(\$97)	(\$85)	(\$185)	(\$159)	(\$176)	(\$75)
Net (Benefit)/Cost	(\$133)	\$0	\$0	\$0	(\$0)	\$14	\$13	\$15	\$21	\$8	\$1	(\$9)	(\$22)	(\$23)	(\$56)	(\$45)	(\$61)	(\$55)	(\$67)	(\$120)	(\$60)



**PaR Stochastic-Mean Results (\$ million)**

**OFPC Natural Gas, Zero CO2 Price-Policy Scenario**

(Benefit)/Cost	PVRR(d)	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Cost of Projects	\$1,174	\$0	\$0	\$0	\$17	\$103	\$129	\$133	\$140	\$144	\$147	\$151	\$167	\$171	\$172	\$181	\$185	\$186	\$187	\$190	\$198
Change in NPC	(\$519)	\$0	\$0	(\$0)	(\$17)	(\$60)	(\$63)	(\$66)	(\$69)	(\$75)	(\$70)	(\$72)	(\$66)	(\$82)	(\$56)	(\$72)	(\$98)	(\$73)	(\$77)	\$27	(\$94)
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	(\$25)	\$0	\$0	(\$0)	(\$0)	(\$1)	(\$2)	(\$2)	(\$2)	(\$2)	(\$2)	(\$2)	(\$1)	(\$5)	(\$9)	(\$10)	(\$11)	(\$2)	(\$2)	(\$0)	(\$3)
Change in DSM	\$17	\$0	\$0	\$0	\$1	\$1	\$1	\$2	\$2	\$2	\$2	\$2	\$2	\$2	\$3	\$3	\$3	\$3	\$3	\$2	\$4
Change in Deficiency	\$0	\$0	\$0	(\$0)	(\$0)	\$0	\$0	(\$0)	\$0	\$0	\$0	\$0	(\$0)	\$1	\$1	\$0	\$0	(\$1)	(\$1)	(\$0)	\$1
Change in System Fixed Cost	(\$704)	\$0	\$0	\$0	(\$0)	(\$31)	(\$55)	(\$58)	(\$63)	(\$65)	(\$66)	(\$69)	(\$104)	(\$117)	(\$171)	(\$120)	(\$78)	(\$140)	(\$140)	(\$264)	(\$170)
Net (Benefit)/Cost	(\$57)	\$0	\$0	\$0	\$0	\$12	\$10	\$9	\$9	\$4	\$10	\$10	(\$3)	(\$30)	(\$60)	(\$17)	\$1	(\$26)	(\$30)	(\$46)	(\$64)

**Medium Natural Gas, Medium CO2 Price-Policy Scenario**

(Benefit)/Cost	PVRR(d)	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Cost of Projects	\$1,174	\$0	\$0	\$0	\$17	\$103	\$129	\$133	\$140	\$144	\$147	\$151	\$167	\$171	\$172	\$181	\$185	\$186	\$187	\$190	\$198
Change in NPC	(\$625)	\$0	(\$0)	(\$0)	(\$18)	(\$63)	(\$67)	(\$69)	(\$69)	(\$74)	(\$69)	(\$71)	(\$66)	(\$72)	(\$54)	(\$99)	(\$132)	(\$135)	(\$143)	(\$135)	(\$66)
Change in Emissions	(\$51)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	(\$6)	(\$7)	(\$8)	(\$9)	(\$8)	(\$9)	(\$12)	(\$16)	(\$13)	(\$15)	(\$17)	(\$14)
Change in VOM	(\$27)	\$0	\$0	(\$0)	(\$0)	(\$1)	(\$2)	(\$2)	(\$2)	(\$2)	(\$2)	(\$2)	(\$1)	(\$2)	(\$10)	(\$10)	(\$11)	(\$3)	(\$4)	(\$4)	(\$3)
Change in DSM	\$29	\$0	\$0	\$0	\$0	\$0	\$0	\$2	\$2	\$2	\$2	\$3	\$4	\$5	\$6	\$7	\$7	\$7	\$7	\$7	\$8
Change in Deficiency	\$1	\$0	\$0	(\$0)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	(\$0)	(\$0)	(\$0)	\$1	\$0
Change in System Fixed Cost	(\$613)	\$0	\$0	\$0	(\$0)	(\$31)	(\$56)	(\$58)	(\$63)	(\$65)	(\$67)	(\$69)	(\$105)	(\$108)	(\$175)	(\$117)	(\$52)	(\$89)	(\$88)	(\$97)	(\$182)
Net (Benefit)/Cost	(\$111)	\$0	\$0	\$0	(\$1)	\$8	\$5	\$6	\$8	(\$2)	\$4	\$3	(\$11)	(\$14)	(\$69)	(\$51)	(\$18)	(\$47)	(\$56)	(\$53)	(\$59)

**Medium Natural Gas, High CO2 Price-Policy Scenario**

(Benefit)/Cost	PVRR(d)	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Cost of Projects	\$1,174	\$0	\$0	\$0	\$17	\$103	\$129	\$133	\$140	\$144	\$147	\$151	\$167	\$171	\$172	\$181	\$185	\$186	\$187	\$190	\$198
Change in NPC	(\$495)	\$0	\$0	\$0	(\$17)	(\$62)	(\$66)	(\$66)	(\$66)	(\$71)	(\$68)	(\$71)	(\$56)	(\$66)	(\$47)	(\$43)	(\$41)	(\$92)	(\$101)	(\$27)	(\$76)
Change in Emissions	(\$219)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	(\$9)	(\$18)	(\$28)	(\$43)	(\$60)	(\$50)	(\$51)	(\$60)	(\$53)	(\$58)	(\$85)	(\$78)
Change in VOM	(\$21)	\$0	\$0	\$0	(\$0)	(\$1)	(\$2)	(\$2)	(\$2)	(\$2)	(\$2)	(\$2)	(\$2)	(\$2)	(\$2)	(\$2)	(\$2)	(\$10)	(\$10)	(\$3)	(\$3)
Change in DSM	(\$43)	\$0	\$0	(\$1)	(\$1)	(\$2)	(\$2)	(\$3)	(\$3)	(\$4)	(\$4)	(\$4)	(\$5)	(\$6)	(\$6)	(\$7)	(\$8)	(\$9)	(\$11)	(\$14)	(\$17)
Change in Deficiency	(\$5)	\$0	\$0	(\$0)	\$0	\$0	\$0	\$0	(\$0)	\$0	\$0	\$0	(\$0)	\$0	\$0	(\$1)	(\$1)	(\$3)	(\$3)	(\$8)	(\$2)
Change in System Fixed Cost	(\$615)	\$0	\$0	\$0	(\$0)	(\$31)	(\$55)	(\$58)	(\$63)	(\$65)	(\$66)	(\$68)	(\$88)	(\$83)	(\$129)	(\$134)	(\$137)	(\$131)	(\$129)	(\$100)	(\$97)
Net (Benefit)/Cost	(\$224)	\$0	\$0	(\$0)	(\$1)	\$7	\$4	\$4	\$5	(\$7)	(\$11)	(\$22)	(\$26)	(\$44)	(\$62)	(\$58)	(\$63)	(\$111)	(\$125)	(\$47)	(\$74)

**PaR Stochastic-Mean Results (\$ million)**

**High Natural Gas, Zero CO2 Price-Policy Scenario**

(Benefit)/Cost	PVRR(d)	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Cost of Projects	\$1,174	\$0	\$0	\$0	\$17	\$103	\$129	\$133	\$140	\$144	\$147	\$151	\$167	\$171	\$172	\$181	\$185	\$186	\$187	\$190	\$198
Change in NPC	(\$724)	\$0	\$0	\$0	(\$22)	(\$78)	(\$88)	(\$83)	(\$82)	(\$89)	(\$84)	(\$87)	(\$80)	\$2	(\$112)	(\$93)	(\$115)	(\$172)	(\$175)	(\$120)	(\$147)
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	(\$21)	\$0	\$0	(\$0)	(\$0)	(\$1)	(\$2)	(\$2)	(\$2)	(\$2)	(\$2)	(\$2)	(\$2)	(\$0)	(\$2)	(\$2)	(\$2)	(\$8)	(\$8)	(\$7)	(\$7)
Change in DSM	\$13	\$0	(\$0)	(\$0)	(\$0)	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$2	\$2	\$2	\$3	\$4	\$6	\$7	\$7
Change in Deficiency	\$1	\$0	\$0	\$0	\$0	\$0	\$1	(\$0)	\$0	\$1	\$0	\$0	\$0	\$0	\$1	\$1	(\$0)	(\$1)	\$2	(\$3)	(\$3)
Change in System Fixed Cost	(\$703)	\$0	\$0	\$0	(\$0)	(\$31)	(\$55)	(\$65)	(\$70)	(\$73)	(\$74)	(\$76)	(\$92)	(\$224)	(\$101)	(\$130)	(\$113)	(\$112)	(\$125)	(\$164)	(\$147)
Net (Benefit)/Cost	(\$260)	\$0	(\$0)	(\$0)	(\$6)	(\$6)	(\$15)	(\$16)	(\$14)	(\$18)	(\$12)	(\$14)	(\$6)	(\$49)	(\$41)	(\$41)	(\$43)	(\$102)	(\$113)	(\$97)	(\$98)

**High Natural Gas, Medium CO2 Price-Policy Scenario**

(Benefit)/Cost	PVRR(d)	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Cost of Projects	\$1,174	\$0	\$0	\$0	\$17	\$103	\$129	\$133	\$140	\$144	\$147	\$151	\$167	\$171	\$172	\$181	\$185	\$186	\$187	\$190	\$198
Change in NPC	(\$740)	\$0	\$0	\$0	(\$21)	(\$76)	(\$85)	(\$83)	(\$82)	(\$88)	(\$83)	(\$85)	(\$79)	(\$92)	(\$121)	(\$75)	(\$145)	(\$117)	(\$131)	(\$134)	(\$149)
Change in Emissions	(\$44)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	(\$6)	(\$7)	(\$8)	(\$7)	(\$8)	(\$8)	(\$6)	(\$12)	(\$11)	(\$12)	(\$14)	(\$16)
Change in VOM	(\$15)	\$0	\$0	\$0	(\$0)	(\$1)	(\$2)	(\$2)	(\$2)	(\$2)	(\$2)	(\$2)	(\$2)	(\$2)	(\$2)	(\$2)	(\$2)	(\$2)	(\$2)	(\$2)	(\$3)
Change in DSM	(\$65)	\$0	(\$0)	(\$1)	(\$3)	(\$4)	(\$4)	(\$4)	(\$6)	(\$6)	(\$7)	(\$8)	(\$9)	(\$9)	(\$11)	(\$12)	(\$14)	(\$14)	(\$14)	(\$14)	(\$14)
Change in Deficiency	\$2	\$0	\$0	\$0	\$0	\$0	\$0	(\$0)	\$0	\$1	\$0	\$1	\$1	\$1	\$0	\$1	(\$1)	(\$1)	(\$1)	(\$0)	(\$1)
Change in System Fixed Cost	(\$584)	\$0	\$0	\$0	(\$0)	(\$31)	(\$55)	(\$58)	(\$63)	(\$65)	(\$66)	(\$68)	(\$85)	(\$83)	(\$86)	(\$142)	(\$54)	(\$135)	(\$125)	(\$122)	(\$124)
Net (Benefit)/Cost	(\$272)	\$0	(\$0)	(\$1)	(\$7)	(\$9)	(\$17)	(\$14)	(\$13)	(\$23)	(\$18)	(\$20)	(\$15)	(\$22)	(\$55)	(\$56)	(\$42)	(\$94)	(\$99)	(\$96)	(\$109)

**High Natural Gas, High CO2 Price-Policy Scenario**

(Benefit)/Cost	PVRR(d)	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Cost of Projects	\$1,174	\$0	\$0	\$0	\$17	\$103	\$129	\$133	\$140	\$144	\$147	\$151	\$167	\$171	\$172	\$181	\$185	\$186	\$187	\$190	\$198
Change in NPC	(\$585)	\$0	\$0	\$0	(\$22)	(\$78)	(\$87)	(\$85)	(\$84)	(\$91)	(\$87)	(\$91)	\$3	(\$84)	(\$81)	(\$50)	(\$78)	(\$68)	(\$63)	(\$55)	(\$103)
Change in Emissions	(\$151)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	(\$8)	(\$16)	(\$25)	(\$10)	(\$46)	(\$43)	(\$43)	(\$48)	(\$35)	(\$33)	(\$35)	(\$54)
Change in VOM	(\$14)	\$0	\$0	\$0	(\$0)	(\$1)	(\$2)	(\$2)	(\$2)	(\$2)	(\$2)	(\$2)	(\$1)	(\$2)	(\$2)	(\$2)	(\$2)	(\$2)	(\$1)	(\$1)	(\$5)
Change in DSM	(\$19)	\$0	\$0	(\$0)	(\$0)	(\$0)	(\$0)	(\$0)	(\$2)	(\$2)	(\$2)	(\$3)	(\$4)	(\$4)	(\$4)	(\$4)	(\$4)	(\$4)	(\$4)	(\$4)	(\$4)
Change in Deficiency	(\$1)	\$0	\$0	\$0	\$0	\$0	\$0	(\$0)	\$0	\$1	\$0	\$0	\$0	\$0	\$0	(\$2)	(\$1)	(\$4)	(\$2)	(\$1)	\$1
Change in System Fixed Cost	(\$813)	\$0	\$0	\$0	(\$0)	(\$31)	(\$55)	(\$58)	(\$63)	(\$65)	(\$66)	(\$68)	(\$195)	(\$86)	(\$124)	(\$186)	(\$139)	(\$194)	(\$212)	(\$217)	(\$262)
Net (Benefit)/Cost	(\$409)	\$0	\$0	(\$0)	(\$6)	(\$7)	(\$16)	(\$12)	(\$11)	(\$24)	(\$27)	(\$38)	(\$38)	(\$50)	(\$81)	(\$106)	(\$88)	(\$119)	(\$130)	(\$123)	(\$229)







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Dated July 28, 2017.

A handwritten signature in black ink that reads "Katie Savarin". The signature is written in a cursive style with a horizontal line underneath it.

Katie Savarin  
Coordinator, Regulatory Operations