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BEFORE THE PUBLIC SERVICE COMMISSION OF UTAH

Application of Rocky Mountain Power for Approval of a Significant Resource Decision and Request to Construct Wind Resources and Transmission Facilities	Docket No. 17-035-40

PREFILED RESPONSE TESTIMONY OF

NANCY L. KELLY

ON BEHALF OF

WESTERN RESOURCE ADVOCATES

April 17, 2018

I. INTRODUCTION AND SUMMARY

Q: Please state your name, employer, and present position.

A: My name is Nancy L. Kelly. I am employed by Western Resource Advocates (WRA) in its Clean Energy Program as a Senior Policy Advisor.

Q: Have you previously filed testimony in this docket?

A: Yes. On behalf of WRA, I filed direct testimony on December 5, 2017 and surrebuttal testimony on March 16, 2018.

Q: Please overview PacifiCorp's recent testimony filings.

A: PacifiCorp witnesses filed "Supplemental Direct and Rebuttal Testimony" on January 16, 2018 and "Second Supplemental Direct Testimony" on February 16, 2018. Additional testimony was filed February 23, 2018 correcting errors in the January and February results.

PacifiCorp's January 16 filing served two purposes. It described the initial results of the Company's 2017R request for proposals (RFP) and presented PacifiCorp's rebuttal to intervener direct testimony from December 6, 2018. The economic analysis used for the January filing included the actual resource costs of winning RFP bids, updated the load forecasts and natural gas price forecasts, and incorporated the reduction in PacifiCorp's corporate tax rate. The analysis used a new method for incorporating the benefits of the PTC. However, the January analysis did not include the results of transmission studies that were underway but not yet complete.

The February 16 filing includes these transmission results. The interconnection restudy process identified additional transmission capacity made available by the 140-mile-long Aeolus to Anticline line, and the system impact studies of connecting RFP 2017R resources identified additional transmission upgrade costs. Refreshed economic modeling which included the updated transmission information changed the winning wind resource selection, replacing one Company-owned resource with a larger Company-owned resource. The February 16 analysis used the same load forecast, price forecasts, and PTC methodology as the January filing.

The February 23 filing corrected a modeling error in the Planning and Risk modeling analysis that affected both the January 16 and February 16 results as incorporated in the testimonies of Ms. Cindy Crane and Mr. Rick Link.

Q: What is the purpose of your current testimony?

A: The purpose of this testimony is to provide my evaluation of the current economic case supporting the Combined Projects, elements of which are included in each of the three filings.[1]

Q: Do you continue to recommend the Commission approve the Combined Projects?

A: Yes. I do. The economic case has improved, and the results are more certain. My testimony supports PacifiCorp's request for approval of the "Wind Projects" as a

[1] The updated forecasts and treatment of PTC credits are addressed in the January filing. The results of the transmission studies and the impact on resource selection and System Optimizer net benefit results are included in the February 16 filing, and the PaR net benefit results are found in the February 23 corrections.

Significant Resource Decision under Utah Code Ann. § 54-17-301 and preapproval of the "Transmission Projects" under Utah Code Ann. § 54-17-401.

Q: Please summarize your testimony.

A: My testimony makes the following points:

- The economic case for the Combined Projects supports approval of the acquisition of 1,311 MW of new wind and the new transmission needed to access that wind and reliably operate it.
- Modeling sensitivities demonstrate that it is cheaper to replace transactions in the wholesale market and energy from existing resources with clean, renewable energy than it is to continue to operate the existing system, which includes the purchase of short-term market products.
- The acquisition of clean, renewable energy, beyond that included in the current filing, would assist PacifiCorp in meeting the challenges inherent in a transitioning industry and position its customers to continue to benefit from low cost, reliable, energy. The acquisition of renewable energy constitutes a robust resource decision given future industry uncertainties.
- Given the magnitude of the capital investment and the potential for mismatch in the stream of benefits and costs, WRA would support ratepayer protections.

Q: What do you recommend?

A: First, I recommend the Commission approve the updated final shortlist Wind Projects[2] as a Significant Resource Decision under Utah Code Ann. § 54-17-301, and preapprove the costs of the associated Transmission Projects[3] needed to access that wind and reliably operate it under Utah Code Ann. § 54-17-401. In my opinion, the Combined Projects meet the required standards that the decision will most likely result in the acquisition, production, and delivery of utility services at the lowest reasonable cost to retail customers while considering long-term and short-term impacts; risk; reliability; financial impacts on the utility, and other relevant factors.

Second, I recommend that in its Order, the Commission direct the Company to pursue the opportunities identified through its 2017S RFP. The solar sensitivity analysis in this docket demonstrates the benefit of replacing FOTs and market purchases with solar energy. This opportunity to provide additional benefits to customers while further hedging future risks should not be foregone.

II. The Economic Case Supports Approval of the Acquisition of the Combined Projects; Benefits have Increased and Uncertainties Have Been Reduced.

Economic Overview

Q: Please summarize the economic case made by the Company in support of the Combined Projects in its updated filings.

[2] TB Flats I & II (500 MW) and Ekola Flats (250 MW) to be developed under engineer, procure, and construction (EPC) agreements. Uinta (161 MW) to be developed under a build transfer agreement. Cedar Springs (400 MW) with 50% to be developed under a build transfer agreement and 50% as a PPA. In all 1,311 MW
[3] Transmission Projects include the new 140-mile long, 350 kV line.

A: Between June of 2017 and January/February of 2018, the economic case supporting approval of the Combined Projects as presented by Company witnesses in their recent testimony improved substantially. Significantly, the Combined Projects benefit customers under all nine price scenarios during the first 20 years. In the 34-year look, the Combined Projects benefit customers in all but two of the low-gas scenarios. Previously, benefits were positive in six of the nine scenarios, but were not positive in the low-gas scenarios in either the 20-year or 34-year analysis.

These updated results can be seen in Table 1 which reproduces the information from Tables 2SS and 3SS of Mr. Rick Link's corrected Second Supplemental Direct Testimony.

Table 1. (Benefit)/Cost of the Combined Projects ($ million)

	20-Year (Nominal PTC, Levelized Capital Costs)				34-Year (Nominal)
Price Policy Scenario	**SO Model PVRR (d)**	**PaR Stochastic Mean PVRR(d)**	**PaR Risk-Adjusted PVRR(d)**	**Stochastic Risk Reduction**	**Annual Revenue Requirement PVRR(d)**
Low Gas, Zero CO2	($185.00)	($150.00)	($156.00)	($6.00)	$184.00
Low Gas, Medium CO2	($208.00)	($179.00)	($188.00)	($9.00)	$127.00
Low Gas, High CO2	($370.00)	($337.00)	($355.00)	($18.00)	($147.00)
Medium Gas, Zero CO2	($377.00)	($319.00)	($334.00)	($15.00)	($92.00)
Medium Gas, Medium CO2	($405.00)	($357.00)	($386.00)	($29.00)	($167.00)
Medium Gas, High CO2	($489.00)	($448.00)	($469.00)	($21.00)	($304.00)
High Gas, Zero CO2	($699.00)	($568.00)	($596.00)	($28.00)	($448.00)
High Gas, Medium CO2	($716.00)	($603.00)	($633.00)	($30.00)	($499.00)
High Gas, High CO2	($781.00)	($694.00)	($728.00)	($34.00)	($635.00)

The magnitude of the increase in benefit estimates can be seen below in Table 2.

Table 2. (Benefit)/Cost of the Combined Projects ($ million)					
Difference between February Corrected Filed Results and June Filed Results					
	20-Year: June (levelized PTC); February (nominal PTC)				34-Year (Nominal)
Price Policy Scenario	**SO Model PVRR (d)**	**PaR Stochastic Mean PVRR(d)**	**PaR Risk-Adjusted PVRR(d)**	**Stochastic Risk Reduction**	**Annual Revenue Requirement PVRR(d)**
Low Gas, Zero CO2	($306.00)	($227.00)	($230.00)	($3.00)	$10.00
Low Gas, Medium CO2	($281.00)	($211.00)	($214.00)	($3.00)	$34.00
Low Gas, High CO2	($286.00)	($204.00)	($208.00)	($4.00)	$47.00
Medium Gas, Zero CO2	($358.00)	($262.00)	($268.00)	($6.00)	($39.00)
Medium Gas, Medium CO2	($320.00)	($246.00)	($262.00)	($16.00)	($30.00)
Medium Gas, High CO2	($333.00)	($224.00)	($227.00)	($3.00)	$13.00
High Gas, Zero CO2	($395.00)	($308.00)	($316.00)	($8.00)	($107.00)
High Gas, Medium CO2	($398.00)	($331.00)	($340.00)	($9.00)	($148.00)
High Gas, High CO2	($385.00)	($285.00)	($291.00)	($6.00)	($40.00)

*Negative values represent an increase in benefits; positive values represent a decline in benefits
Sources: Rick Link Second Supplemental Testimony Corrected Tables SS2 and SS 3; Rick Link Direct Testimony Table 2 and 3

In the case of the medium-natural-gas-price/medium-CO2-price scenario the estimate of net benefits resulting from a 20-year simulation of PacifiCorp's system using the System Optimizer model (SO) increased by $320 million from the June estimate. Benefits, as measured by the Planning and Risk model (PaR), increased to between $246 and $262 million. Estimates of benefits based on 34-year outlook using nominal costs and credits increased by $30 million.

Q: Please describe the changes made between the June and February filings and their directional effect on the benefit results.

A: Changes between the June results and the February results include the following.

- Proxy resource costs have been replaced with actual resource costs and the transmission cost analysis has been refined, reducing uncertainty.
- The size of the wind resource increased over 52% from 860 MW to 1,311 MW while the Combined Project cost increased 12.5% from $2 billion to $2.25 billion. As a result, the Combined Project per unit cost fell by 18% from $1,590/kW to $1,310/kW.

This appears to be a primary driver in the improved economics supporting acquisition of the Combined Projects.

- The value of production tax credits (PTCs) are credited in the year they are forecast to occur rather than spread over the life of the facility as they were in the June analysis. All else constant, this increases estimated benefits and is a second significant contributor to the improved benefit analysis.
- Load, natural gas price forecasts, and carbon price forecasts declined, with the carbon price forecasts declining significantly.[4] All else held constant, each of these changes would reduce the measured net benefit.
- Finally, the decline in the corporate tax rate resulting from passage of the Tax Cut and Jobs Act has been incorporated. This change reduced the after-tax benefit of the PTC and reduced the net benefit of the Combined Projects.

Q: Please identify the issues that you believe are central to the economic case supporting the Combined Projects.

A: The major drivers of the economic results are key issues. These include the correct treatment of PTCs and capital costs (nominal versus levelized) in evaluating the benefits of the Combined Projects, the likelihood that current estimates of natural gas prices appropriately capture future risk, and the likelihood that current estimates of potential CO2 costs appropriately capture the potential for carbon regulation to impose costs on fossil-fuel generation. In addition, I believe the potential tightening of the REC market

[4] System energy declined by 2.2% in 2021 growing to a reduction of 6.3% by 2036. System peak fell by 4.1 % in 2021 growing to a reduction of 7.2% by 2036. (Source: Supplemental Direct and Rebuttal Testimony of Rick T. Link at 423-427). The details of the changes made to natural-gas-price forecasts and CO2-price forecasts are discussed below.

resulting from increases to state RPSs is a factor that should be considered. Finally, the ability of the Combined Projects to hedge against a changing planning environment is central to my evaluation.

Treatment of Production Tax Credits and Capital Costs

Q: Please explain the issue associated with the nominal treatment of PTCs in the 20-year SO and PaR modeling.

As noted above, between the June filing and January filing, PacifiCorp changed how it treats PTCs in the 20-year modeling of system benefits using the SO and PaR models. In its June filing PacifiCorp used real-levelized capital costs and real-levelized PTCs in its Present Value Revenue Requirement (PVRR) calculation. In the January and February analyses, PacifiCorp treated PTCs nominally – it included these credits in the year they are forecast to occur, instead of spreading the value of the credits over the life of the facilities. This has the effect of moving the credits forward in time which reduces the discount on the benefit they provide. All things equal, treating PTCs nominally increases the measured benefit of the Combined Projects.

The issue I evaluated is whether the change in modeling methodology is appropriate, and, if not, what the appropriate remedy should be.

Q: What is real levelization and what is its purpose?

A: Real levelization is an IRP technique PacifiCorp employs to compare resources with differing in-service dates and lives without making end-effects adjustments.[5] It is used to

[5] Real levelization is not the only technique to address end-effects. Many utilities address this by modeling a generic resource in later years.

make resources with differing asset lives comparable both within and between portfolio options.[6]

The word "levelized" is defined as an "amount or quantity divided into equal portions."[7] In conducting its IRP, PacifiCorp "levelizes" the stream of capital costs associated with a specific resource by discounting these costs to the present and then spreading that value over the expected life of the facility. "Real" levelization refers to the fact that this constant is inflated forward at the assumed rate of inflation.

Appendix J of the 2003 IRP explains the real-levelization calculation and its purpose. With regard to the calculation, PacifiCorp says:

- The present value of the nominal revenue requirement serves as a starting point.
- A "real" discount rate is then calculated by removing the inflation component from the discount rate.
- This real discount rate is used to calculate a levelized payment from the present value of the nominal revenue requirement – hence the name "real levelized."
- The effects of inflation are added back in by escalating the real levelized payment each year by the inflation rate.
- The present value of the escalated real levelized revenue requirements is equal to the present value of the nominal revenue requirements.

With regard to its purpose, PacifiCorp says:

> The IRP financial analysis covers a 20-year forecast period. During this forecast period, the IRP is comparing the alternative resources available to determine the best overall solution to match resources with projected load. Because many of the potential resources have long economic lives of various lengths, which extend

[6] The method appears to have been developed to make comparable the evaluation of coal plants with 40-year lives to natural-gas plants with 25-year lives. The concern appears to have been that if nominal values were used, the IRP would select shorter-lived resources because the high front-end costs of longer-lived resources would not capture the benefit of their depreciated value in years extending beyond the planning horizon. Levelization was introduced to address this "mismatch." (PacifiCorp, "Integrated Resource Plan 2003: Assuring a bright future for our Customers," pp. 351-357.)

[7] Business Dictionary - http://www.businessdictionary.com/definition/levelized.html

> beyond the analysis period, the appropriate methodologies must be used to capture the comparative costs of such capital-intensive investments.
>
> Nominal capital revenue requirements consist of larger values in the earlier years and decline as ratebase is reduced by asset depreciation. If the asset's life extends beyond the analysis period, the front-end loading will cause an over valuation of the comparative revenue requirements. An end-effects adjustment could be made, but the value of those end-effects can be difficult to determine.
>
> An alternative methodology which is being used in the IRP, is to utilize a real levelized capital revenue requirement in the analyses. This eliminates the need for an end-effect adjustment, and provides a reasonable approach for comparing the revenue requirement of capital resources against each other and also against market purchase resources.[8]

Q: In this documentation, did PacifiCorp encourage wide use of its levelizing technique?

A: No. It limited its application saying, "real levelized revenue requirement may not fit all analysis situations and would not be suitable for calculating the cost impact to customer rates or for negotiating long-term electricity sale agreements."[9]

Q: Please explain the impact on the benefits calculation of treating PTC values nominally versus continuing to levelize them.

The benefit of the Combined Projects is measured as the difference in the PVRR of two system simulations, one with the Combined Projects, and one without.

In the PVRR calculation, the 20-year stream of resources credits and costs simulated by the planning models is converted into a single number by discounting those credits and costs to the present – the PVRR for the portfolio. Credits and costs hitting earlier in the planning period will be discounted less than credits or costs occurring later and will have a larger impact on the PVRR. So, credits that occur early will lower the PVRR more

[8] IRP 2003, p. 357.
[9] Id., pp. 352-353.

than if the same credits were incurred later in the planning period, while costs that are incurred early will increase the PVRR more than if they had been incurred later.

When nominal values are used, PTC values occur in the year in which they are expected to be generated and the capital costs are reflected in the year in which they are expected to be booked. With real levelization, credits and costs are moved out in time, and the discounted benefit or cost is reduced.

Since the Wind Projects will generate PTCs over the first ten years of operation, treating PTCs nominally moves the full value of the credits into the first ten years, which is when they will be realized. This reduces the discount on the credit, lowers the PVRR of the portfolio run that includes the Combined Projects, and thus increases the measured benefits.

Q: What is PacifiCorp's explanation for its decision to use nominal PTCs instead of continuing to levelize these credits as it had previously?

A: Mr. Link addresses this issue in his January testimony. He testifies that this approach better reflects how the federal PTC benefits will flow through to customers, aligns the treatment of federal PTC benefits in the 2036 analysis with the nominal revenue 2050 revenue requirement results, and ensures the 2017R RFP bid selections more accurately reflect the differences in how BTA and benchmark-EPC bids are expected to impact customer rates.[10]

Q: Do you agree with Mr. Link's explanation?

[10] Supplemental Direct and Rebuttal Testimony of Rick T. Link, January 15, 2018, at 537-547.

A: I do, except that it is not appropriate to nominalize PTCs while levelizing capital costs. Credits are an offset to capital costs and they should therefore be treated comparably. Either costs and credits should both be levelized as they are in the IRP or neither should be levelized and nominal values should be used for both.

Q: Do you think it is necessary to maintain consistency with IRP modeling conventions for this analysis, and therefore levelize these costs?

A: No. Given that this is an approval docket for a selected resource, not an IRP in which resources with differing lives are being compared as part of alternative portfolios, I do not believe it is necessary, or even appropriate, to use real-levelized values.

Q: What do you suggest?

A: I believe the better approach is to use nominal values for both PTCs and capital costs. This better aligns with the rate impact on customers and would address Mr. Link's expressed concerns.

Q: Have you estimated the impact on net benefits?

A: Yes. Table 3 displays these results. Table 3 was constructed by reducing benefits by an estimated $77 million for all 20-year price scenarios.[11] This reflects the impact of using nominal values for capital costs. As can be seen, the Combined Projects continue to benefit customers under all nine price scenarios when considering the first 20 years of operation. In the case of the medium-natural-gas-price/medium-CO2-price scenario the estimate of net benefits resulting from a 20-year simulation of PacifiCorp's system using

[11] To the extent necessary, WRA will update this estimate once we receive the response to WRA 4.1.

the System Optimizer model results in benefits of $328 million. Benefits, as measured by the Planning and Risk model, range between $280 and $309 million.

Table 3.	(Benefit)/Cost of the Combined Projects ($ million)				
	20-Year (Nominal PTC, Nominal Capital Costs)				34-Year (Nominal)
Price Policy Scenario	SO Model PVRR (d)	PaR Stochastic Mean PVRR(d)	PaR Risk-Adjusted PVRR(d)	Stochastic Risk Reduction	Annual Revenue Requirement PVRR(d)
Low Gas, Zero CO2	($108.00)	($73.00)	($79.00)	($6.00)	$184.00
Low Gas, Medium CO2	($131.00)	($102.00)	($111.00)	($9.00)	$127.00
Low Gas, High CO2	($293.00)	($260.00)	($278.00)	($18.00)	($147.00)
Medium Gas, Zero CO2	($300.00)	($242.00)	($257.00)	($15.00)	($92.00)
Medium Gas, Medium CO2	($328.00)	($280.00)	($309.00)	($29.00)	($167.00)
Medium Gas, High CO2	($412.00)	($371.00)	($392.00)	($21.00)	($304.00)
High Gas, Zero CO2	($622.00)	($491.00)	($519.00)	($28.00)	($448.00)
High Gas, Medium CO2	($639.00)	($526.00)	($556.00)	($30.00)	($499.00)
High Gas, High CO2	($704.00)	($617.00)	($651.00)	($34.00)	($635.00)

Q: Do you have a recommendation for the Commission?

A: Yes. To address the disparate treatment of PTCs and capital costs in PacifiCorp's updated analyses, I recommend the Commission base its approval decision on benefit estimates that treat both PTCs and capital costs nominally. Even assuming that levelization may be appropriate for IRP purposes, because this is an approval docket for a particular resource, using a levelization technique intended to provide comparability among different alternative *portfolios* is neither necessary nor appropriate. The use of nominal values for both would treat PTCs and capital costs comparably, would better align with the rate impact on customers, and would address Mr. Link's expressed concerns with using levelized PTCs.

Natural Gas Price Forecasts

Q: Please explain why natural gas price forecasts are an issue in this case.

A: Natural-gas-price forecasts are an issue because the size of the benefits of the Combined Projects is directly related to future natural gas prices. The Wind Projects generate zero-fuel-cost energy but have a substantial capital cost that is not typically levelized in ratemaking. One of the key benefits of investing in wind energy is to avoid the cost of burning fuel, or acquiring fuel-burning resources. So, as future natural gas prices increase, the investment in wind becomes a better deal. But if future natural gas prices stay very low over the life of the wind plants, all else equal, the large capital investment becomes less advantageous from a strictly economic perspective. [12] This pattern can be seen in the benefit tables. As natural gas prices rise, so do the associated benefits of the Combined Projects. Measured benefits are lowest in the low-gas scenario that includes no CO2 price. The issue specific to this case is whether natural gas prices (in combination with CO2 prices) will be low enough over the life of the wind facilities to not justify the Combined Project's capital cost.

Q: Please describe how PacifiCorp's natural-gas-price forecast has changed since the June filing.

A: Mr. Link's January Supplemental Direct Testimony describes these changes. Between April 2017 and December 30, 2017, natural gas price forecasts declined.[13] Relative to the natural gas price forecasts used in the June filing, the nominal levelized price for Henry Hub declined by approximately 3%. The nominal levelized price in the low scenario declined by approximately 7% and the nominal levelized price in the high

[12] While natural gas resources have lower capital costs than a wind facility, the actual cost to operate the plant over its life is not known, since it depends on future prices that are not knowable. If natural gas prices rise higher than expected at the time the decision to build a gas plant was made, the facility's costs will be higher than expected. If they turn out to be lower than forecast when the decision to build a gas plant is made, the plant will turn out to have been a good deal.

[13] The forecast used for the June 2017 filing was dated April, 26, 2017. The January and February filings used a forecast completed December 30, 2017.

scenario declined by approximately 4%. The decline in the low-price scenario was primarily the result of a decline in the forward market.[14]

Q: Have you reviewed PacifiCorp's updated natural gas price forecasts?

A: Yes. PacifiCorp's updated natural gas price forecasts are presented in Confidential Exhibit RMP_(RTL-3SD) attached to Mr. Link's January testimony. The exhibit is confidential because it includes the vendor's names. Table 4 below displays the updated forecast with the vendor's names removed.[15]

Table 4. Henry Hub Natural Gas Price Forecasts ($/MMBtu)

	December 30, 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
2018	$2.85	$2.85	$3.89	$2.74	$3.31	$3.89	$3.31	$3.24	$3.83	$2.56
2019	$2.81	$3.18	$4.33	$2.60	$3.43	$4.63	$3.39	$3.75	$4.71	$2.73
2020	$2.82	$3.13	$4.26	$2.47	$3.46	$4.65	$4.39	$3.86	$5.90	$2.87
2021	$2.85	$3.12	$4.25	$2.33	$3.44	$4.49	$5.01	$3.62	$6.44	$2.97
2022	$2.89	$3.31	$4.51	$2.32	$3.57	$5.12	$6.48	$3.56	$7.24	$2.92
2023	$2.93	$3.58	$4.88	$2.54	$3.71	$5.42	$7.57	$3.71	$7.74	$3.11
2024	$3.49	$4.00	$5.45	$2.71	$3.80	$5.91	$7.64	$3.94	$8.19	$3.11
2025	$4.09	$4.14	$5.64	$2.87	$4.07	$6.35	$7.00	$4.14	$8.76	$3.16
2026	$4.15	$4.15	$5.65	$3.03	$4.41	$6.74	$4.29	$4.37	$9.41	$3.28
2027	$4.29	$4.29	$5.85	$3.04	$4.64	$6.97	$4.10	$4.63	$9.86	$3.43
2028	$4.49	$4.49	$6.11	$3.20	$4.87	$7.12	$4.15	$4.96	$10.30	$3.55
2029	$4.80	$4.80	$6.54	$3.36	$5.11	$7.26	$5.37	$5.08	$10.72	$3.80
2030	$5.10	$5.10	$6.95	$3.49	$5.31	$7.52	$6.94	$5.03	$11.02	$3.88
2031	$5.35	$5.35	$7.29	$3.61	$5.50	$7.77	$8.34	$4.89	$11.89	$3.95
2032	$5.51	$5.51	$7.51	$3.72	$5.60	$7.95	$8.84	$4.90	$12.45	$3.92
2033	$5.79	$5.79	$7.88	$3.75	$5.76	$8.08	$9.08	$4.97	$12.71	$4.03
2034	$6.08	$6.08	$8.28	$3.84	$5.90	$8.33	$8.58	$5.07	$12.96	$4.29
2035	$6.30	$6.30	$8.58	$3.93	$6.05	$8.64	$6.68	$5.15	$13.24	$4.41
2036	$6.70	$6.70	$9.12	$4.01	$6.21	$9.10	$7.21	$5.21	$14.06	$4.29
Avg	$4.38	$4.52	$6.16	$3.13	$4.64	$6.63	$6.23	$4.43	$9.55	$3.49

Q: In your Direct Testimony, filed December 6, you stated that PacifiCorp's natural-gas price forecasts appeared conservative. Is this still your position?

[14] Link, Supplemental Direct and Rebuttal Testimony at 443-477.
[15] It is in the same format as Exhibit RMP_(RTL-2) attached to Mr. Link's Direct Testimony.

A: Yes, it is. The relationships I had identified in the April 2017 forecast are unchanged in the current forecast.

- PacifiCorp's OFPC is lower than Vendor Two's Base with which it is blended; it is lower than Vendor One's Base, and it is lower than EIA's Low.
- PacifiCorp's Adopted Low is the lowest of all the natural gas price forecasts.
- PacifiCorp's Adopted High is lower than the Vendor High from which it is derived; it is lower than Vendor One's High, and it is significantly lower than the EIA High.

As with its April 2017 forecast, for the current vintage of natural gas prices, PacifiCorp's natural gas price forecasts appear not only reasonable, they appear conservative.

Q. How do you respond to the concern that because natural gas price forecasts have been trending downward, they will continue to decline, and therefore the likelihood of low gas prices is greater than the likelihood of high natural gas prices?

A: Given that the largest economic risks occur in the case of low natural gas prices (with zero to low CO2 prices), I understand the concern. However, I believe there is an asymmetry in the likelihood that the downward trend in natural gas prices will continue, as opposed to remaining flat, or even turning upward. Natural gas prices are currently low as compared with historical prices, so the risk in the trend of natural gas prices may be in the upward direction; i.e. prices are closer to a floor than to a ceiling. The problem with looking to the past to predict the future, as one does when referencing a trend as predictive of the future, is that the trend will eventually end. The planning environment will change in response to multiple unknowns, and then current prices will reflect the then current planning environment.[16] The impact on future natural gas prices of the rapid transition the electric industry is undergoing is simply not knowable today.

I would also emphasize again that the risk of lower and higher gas prices is asymmetrical. If gas prices are predicted to be $3.00, they can only be, at most, $3.00 too high. On the other hand, the upside of the equation is boundless. Prices in the past have reached $12.00 or more.

Q: Do you have a recommendation for the Commission?

A: Yes. I recommend the Commission accept the updated natural gas price forecast and the results it generates as "reasonable" given the information that is currently available, and given the conservative nature of the forecast compared with other forecasts of its vintage.

Carbon Prices

Q: Please explain why carbon price forecasts are an issue in this case.

A: One of the significant benefits of investing in new wind energy is its lack of carbon emissions and other pollutants (as well as its zero-cost fuel). If a price on carbon dioxide emissions is implemented at some future date, burning fossil-fuel to generate power will impose additional costs on customers. Generating power with wind energy avoids that unknown cost. CO2 price forecasts are an issue in this case because assumed CO2 price forecasts contribute to the magnitude of the potential benefits of the projects.

[16] Drivers of changes to the planning environment include technological change, climate change, institutional change, political change, and other unknowns. Each of these have uncertain effects on the planning environment and therefore on the costs and benefits of different resource alternatives.

Q: Please describe how PacifiCorp's carbon-price forecast changed between the June filing and the January update.

A: Carbon price forecasts were significantly reduced in both magnitude and time.

- The low remains at zero – meaning a CO2 price is never implemented, at least not prior to 2050.
- The medium CO2 price forecast is moved back in time by five years from 2025 to 2030, and the forecast price in 2036 is reduced by roughly 40%, declining from approximately $13/Ton to under $8/Ton. The five-year delay reflects a 50% decline in the time a CO2 tax is in place in the 20-year forecast and a 20% decline in the time a CO2 tax is in place in the 34-year forecast.
- The high forecast is moved back by one year from 2025 to 2026. It increases to a high of $19.23 in 2036, a decline of roughly 50%.

Q: What explanation does PacifiCorp provide for this dramatic reduction in CO2 price forecasts?

A: Mr. Link states that PacifiCorp's approach is to develop "low and high CO2 price assumptions" and that these price assumptions were "updated after reviewing the range in more recent forecasts developed by" its vendors.[17] I suspect the vendors lowered their price assumptions based on a perceived change in the political and regulatory environment and the anticipated replacement or weakening of the Clean Power Plan by EPA.

[17] Link, Supplemental Direct and Rebuttal at 479 to 495.

Q: What do you make of Mr. Link's statement that the Company develops low and high CO2 price projections?

A: I think this helps explain in part why PacifiCorp's "medium" CO2 price forecast is so low. The estimates on which it is based are estimates of "low" CO2 prices, not medium forecasts. This means that PacifiCorp does not have a true medium price-policy scenario. The medium-natural-gas-price/medium-CO2 price policy scenario is in fact a medium-natural-gas-price/low-CO2 price scenario.

Q: Do you accept the reduced CO2 assumptions as reasonable?

A: I do not. The current regulatory environment is dynamic, highly uncertain, and has the potential to boomerang, advancing carbon regulation more rapidly than anticipated even in the April 2017 price forecast. EPA is required to regulate CO2 as a pollutant. While the timing and stringency of future CO2 regulation might be an issue, it would be naïve to assume that CO2 regulation will not be part of our future.

Q: What is your overall evaluation of carbon price estimates included in the analysis?

A: I think the risk of carbon regulation is significantly greater than captured in the analysis of the Company.

Q: Do you have a recommendation for the Commission?

A: Yes. I recommend that in coming to its decision to approve the Combined Projects, the Commission recognize that the benefit results do not adequately capture the likelihood that carbon regulation will impose costs on fossil-fuel generation. Therefore, the benefit results undervalue the potential economic benefit of the Wind Projects. If carbon regulations are imposed prior to 2030, or if the cost to comply is higher than currently forecast, the opportunity cost of having forgone acquiring this 1,311 MW of new wind resource with the substantial benefit of the PTC will be much greater.

Transmission Need

Q: In your direct testimony you questioned the need for the Aeolus to Anticline line suggesting the early retirement of the Dave Johnson plant might be a better option and informing the Commission that studies were underway. Do you have updated information?

A: Yes. According to PacifiCorp in its response to OCS 16.8, PacifiCorp completed its analysis in November 2017. Studies indicate that up to 1,169 MW of new wind can be integrated in southeast Wyoming with the retirement of the Dave Johnston plant, but a number of 230 kV transmission upgrades would be needed, exceeding the cost of the new line.

Q: How does the size of the capacity made available by retiring the Dave Johnston plant compare with the size of the new capacity made available by the Transmission Projects in this application?

A: The interconnection restudy process identified 240 MW of additional transmission capacity made available by the 140-mile-long Aeolus to Anticline line over what was previously estimated for a total transmission capacity of 1,510 MW. This provides 341 MW more capacity than retiring Dave Johnson.

Q: Based on this information, what do you recommend?

A: I recommend the Commission preapprove the costs of the Transmission Projects as an integral component of the Wind Projects.

Likelihood that the Combined Projects Will Provide Economic Benefits

Q: In your direct testimony you characterized the Company's economic case as conservative and stated that you thought the projects have a high likelihood of generating benefits in excess of those measured. Is this still your opinion?

A: Yes, for the following reasons.

- PacifiCorp's natural-gas-price forecasts are conservative for the vintage, and I believe future natural gas prices are as likely to rise as they are to fall.
- PacifiCorp's CO2 price forecasts are unreasonably low. The "medium" forecast represents a true "low," and the "high" does not capture the dynamic regulatory environment.
- The net benefit results do not include potential REC revenues. Given the number of state initiatives being introduced to expand state RPS requirements, it appears likely that REC markets will tighten and the Wind Projects will provide additional value in the form of REC benefits. Mr. Link testifies that customer benefits would improve by approximately $43 million for every dollar assigned to the incremental RECs that will be generated through 2050.[18]

[18] Second Supplemental Direct Testimony of Rick T. Link, February 16, 2018, p. 18, at 359.

- The net benefit results do not include the expected reduction in reduced O&M costs associated with larger-turbine equipment. Mr. Link testifies this would increase benefits an estimated $31 million across all price-policy scenarios.[19]
- The Wind Projects reduce the current capacity need by approximately 207 MW, up from 175 MW in the June application. As I explained more fully in my surrebuttal testimony filed March 16, reduced reliance on short-term market purchases is beneficial and hedges against the risk of high wholesale market prices.[20]
- As discussed in more detail in both my direct and surrebuttal testimony, the Combined Projects provide an effective hedge against a changing planning environment – a value that is not captured in the stochastic risk analysis.

Q: Do you have a recommendation for the Commission?

A: Yes. I recommend that in coming to its decision to approve the Combined Projects, the Commission recognize the conservative nature of the benefits results and the likelihood that customer benefits will exceed the measured benefits.

III. Sensitivity Analysis Supports Development of Additional Renewable Resources

Q: What sensitivity analysis did PacifiCorp undertake that demonstrates the benefit of acquiring additional renewable energy?

A: PacifiCorp undertook two renewable resource sensitivities that demonstrate the benefit of acquiring renewable energy in addition to pursuing the Combined Projects. PacifiCorp conducted a solar sensitivity to evaluate the benefit to customers from pursuing PPAs

[19] Id., at 367.
[20] Surrebuttal Testimony of Nancy Kelly March, 16, 2018, at 110-217.

offered in the recent solar RFP both with and without the Wind Projects, and a Wind Repowering sensitivity. The sensitivities demonstrate significant benefits to customers from pursuing all options.

Q: Please describe PacifiCorp's wind sensitivities and their results.

A: PacifiCorp provided benefit results from two solar sensitivities, one in which it considered solar resources in lieu of the Combined Projects and one in which it allowed its IRP models to select the optimal combination of wind and solar. The sensitivity used the resource selection and cost characteristics from the updated final 2017R RFP shortlist and the best-and-final pricing supplied by solar bidders February 1, 2018. Only two price-policy scenarios were evaluated: medium-natural-gas-price/medium-CO2-price and low-natural-gas-price/zero-CO2 price.

In the solar only case, the SO model selected 1,222 MW of solar PPA bids in the low/zero scenario and 1,419 MW of solar PPA bids in the medium/medium scenario. Benefits ranged from $139 million to $343 million but were lower than the unadjusted Combined-Project benchmark.

Under medium price policy assumptions, in the case where the bids from both the wind and solar RFPs were made available to the SO model, it continued to select 1,311 MW of Wind Projects as well as 1,419 MW of solar PPA bids. In the low/zero scenario, the SO model selected the 1,311 MW of Wind Projects and 1,042 MW of solar PPA bids.

These results demonstrate the benefit to PacifiCorp customers from acquiring solar resources located in Utah. Customer benefits were higher with the solar resources than with the Combined Projects alone. Benefits range from a low of $250 million to high of $647 million.

Q: Please describe PacifiCorp's Wind Repowering sensitivity and its results.

A: PacifiCorp evaluated a sensitivity that included both the Combined Projects and the Repowered Wind Projects and compared them to a benchmark comprised of just the Combined Projects. The sensitivity was modeled assuming a low/zero price/policy scenario and a medium/medium price/policy scenario. The additional benefits from undertaking both ranged between $131 million and $204 million.

Q: Would you like to comment on the results of these studies?

A: Yes. These sensitivities were modeled with conservative natural gas price forecasts and, in my opinion, unrealistically low CO2 price assumptions. Despite these conservative forecasts, the SO model selected significant levels of renewable resources with significant benefits to customers. The sensitivity results demonstrate that wind and solar resources are cost effective in displacing FOTS and existing fossil-fuel generation. It is cheaper to replace transactions in the wholesale market and energy from existing resources with clean, renewable energy than it is to continue to operate the existing system.

Q: Would you like to comment on the hedging benefits of renewable resources, generally?

A: Yes. As I discussed in both my direct and surrebuttal testimony, one of the great advantages of acquiring renewable energy is the hedging benefit it provides against a changing planning environment. Investment in renewable energy represents a hedge against the risks of high and fluctuating natural gas and wholesale market prices and, significantly, the possibility that carbon regulation may be imposed sooner rather than later with unexpectedly high prices on fossil-fuel generation as the industry moves to quickly adapt. Because renewable energy is capital intensive and is fuel-free, its costs are mostly known at the time the decision to invest is made. This differs from fuel-based resources like combined-cycle-combustion-turbine gas plants. While the capital cost of a gas plant is understood at the time the investment is made, the actual cost to customers over the life of the facility depends on the price of fuel which can be much higher than expected at the time the investment decision is made. This is not the case with renewable energy. At the time of the investment, the life-cycle cost is well understood – it represents a hedge against an unknowable future.

Q: Do you have a recommendation related to the solar sensitivity?

A: Yes. I recommend that in its approval order, the Commission direct the Company to pursue the opportunities identified through its 2017S RFP. The solar sensitivity analysis in this docket demonstrates the benefit of replacing FOTs and market purchases with solar energy. This opportunity to provide additional benefits to customers while further hedging future risks should not be foregone.

IV. Ratepayer Protections Are Reasonable

Q: Would you like to comment on whether ratepayer protections are reasonable in this case?

A: Yes. I think the circumstances of this case support rate-payer protections. The modeling demonstrates the benefits of making substantial capital investments in renewable energy, but these investments are not without rate impacts and do not necessarily have the same stream of benefits as costs. To better address the potential for mismatch, WRA would support consideration of protections.

V. Recommendations

Q: Please list your recommendations.

A: First, I recommend the Commission approve the updated final shortlist Wind Projects as a Significant Resource Decision under Utah Code Ann. § 54-17-301, and preapprove the costs of the associated Transmission Projects needed to access that wind and reliably operate it under Utah Code Ann. § 54-17-401. In my opinion, the Combined Projects meet the required standards that the decision will most likely result in the acquisition, production, and delivery of utility services at the lowest reasonable cost to retail customers while considering long-term and short-term impacts; risk; reliability; financial impacts on the utility, and other relevant factors.

With regard to the Combined Projects I specifically recommend that the Commission:

- base its approval decision on benefit estimates that treat both PTCs and capital costs nominally;
- accept the updated natural gas price forecasts and the results they generate as "reasonable" given the information that is currently available, and given the conservative nature of the forecast compared with other forecasts of its vintage;
- recognize that the benefit results do not adequately capture the likelihood that carbon regulation will impose costs on fossil-fuel generation;

- preapprove the costs of the Transmission Projects as an integral component of the Wind Projects; and
- recognize the likelihood that customer benefits will exceed the measured benefits;

Second, I recommend that in its Order approving the application, the Commission direct the Company to pursue the solar development opportunities identified through PacifiCorp's 2017S RFP. The opportunity to provide additional benefits to customers while further hedging future risks should not be foregone.

Q: Does this conclude your testimony?

A: Yes. It does.