Witness OCS-2D

BEFORE THE PUBLIC SERVICE COMMISSION OF UTAH

In the Matter of the Voluntary Request Of Rocky Mountain Power for Approval Of Resource Decision to Repower Wind Facilities	**)**	**Docket No. 17-035-39**

REDACTED DIRECT TESTIMONY OF

PHILIP HAYET

FOR THE

OFFICE OF CONSUMER SERVICES

SEPTEMBER 20, 2017

TABLE OF CONTENTS

I. INTRODUCTION

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is Philip Hayet. My business address is 570 Colonial Park Drive, Suite 305, Roswell, Georgia, 30075.

Q. PLEASE STATE YOUR OCCUPATION, EMPLOYMENT, AND ON WHOSE BEHALF YOU ARE TESTIFYING.

A. I am a utility regulatory consultant and Vice President of J. Kennedy and Associates, Inc. (Kennedy and Associates). I am appearing on behalf of the Office of Consumer Services ("Office").

Q. WHAT CONSULTING SERVICES ARE PROVIDED BY KENNEDY AND ASSOCIATES?

A. Kennedy and Associates provides consulting services related to electric utility system planning, energy cost recovery, revenue requirements, regulatory policy, and other regulatory matters.

Q. PLEASE SUMMARIZE YOUR QUALIFICATIONS AND APPEARANCES.

A. My qualifications and appearances are provided in Hayet Direct - Exhibit OCS-2.1. I have participated in numerous PacifiCorp and Rocky Mountain Power (or the "Company") cases involving power costs, acquisitions, and avoided costs over the past 15 years.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. The Company has proposed to repower nearly 1,000 MW of its wind power generation resources, and is seeking Commission approval to continue recovering the cost of its existing investment in the facilities that will be repowered, and to recover the costs of repowering based on its proposed ratemaking treatment. The Company states that its

decision to repower its wind resources will provide net benefits to customers by "increasing energy production, reducing operating costs, and requalifying the Company's existing wind resources for federal production tax credits ("PTCs"), which expire 10 years after a facility's original commercial operation date."[1] I have been asked by the Office to review the Company's proposed repowering decision to determine if it provides sufficient customer benefits to warrant the required capital investment. I present the results of my review in this testimony, including a discussion of modeling flaws that should be addressed, and additional analyses that should be performed.

Q. WHAT ARE YOUR FINDINGS AND RECOMMENDATIONS?

A. Based on my review of the Company's filing in this proceeding as well as documents available in the Company's IRP process, it appears there has been a very limited opportunity for stakeholders to provide feedback on the Company's proposed resource plans. It appears that at the March 2, 2017 IRP General Public Meeting, the Company notified parties for the first time that it was investigating the potential for repowering its wind resource. Then approximately one month later, the Company published its IRP report, which stated that the Company intended to implement the wind repowering project and pursue the necessary regulatory approvals. I have identified several issues in my investigation that I believe most likely will be raised by stakeholders in the forthcoming IRP review process, but should also be addressed now before the Commission approves the Company's repowering request. At this time, based on my review, I recommend that the Commission deny the Company's request because the Company has not proven in accordance with Utah Code Ann. § 54-17-402, that repowering its wind resources "will

[1] RMP Application for Approval of Resource Decision to Repower Wind Facilities, June 30, 2017,

most likely result in the "acquisition, production, and delivery" of electricity to its customers at the lowest reasonable cost and least risk possible.[2] The items that I believe require further consideration are:

- The impact of changes in the federal corporate tax rates that Congress is currently considering,
- Whether some of the repowering projects would have been found to be uneconomic, had the Company evaluated each project individually instead of as a portfolio,
- Whether the Company's 20-year economic analysis identified results that are significant enough to warrant the proposed capital investment,
- Whether the Company's 34-year economic analysis contain questionable modeling methodologies and assumptions,
- Whether the repowering results would remain robust enough, when the repowering projects are evaluated after the new wind/new transmission projects.

As I mentioned, had there been an opportunity for additional stakeholder interaction earlier in the process these issues may have been addressed, and still should be addressed. Furthermore, I do not believe the Company has explained why it could not take additional time, such as between four and six months to collaborate further with stakeholders and to conduct additional analyses, and then refile a revised application. As Mr. Hemstreet stated in his testimony, the Company will generally complete all construction, "more than a year in advance of the December 31, 2020 deadline to achieve commercial operation."[3] Given this, I do not believe the analysis I have proposed would create a long enough delay to necessarily jeopardize the Company's opportunity to receive the full PTC benefits.

II. BACKGROUND

Q. WHAT LED TO THIS PROCEEDING BEING INITIATED?

[2] Utah Code Ann. Section 54-17-402.
[3] Timothy Hemstreet Direct Testimony, at line 550.

A. PacifiCorp determined in its 2017 IRP (filed April 4, 2017) that its preferred least-cost, least-risk expansion plan to reliably meet customer demand over a 20-year planning period would include repowering 905 MW of existing wind facilities located in Wyoming, Washington, and Oregon. After filing its 2017 IRP, PacifiCorp also determined that it would be economic to repower its 94 MW Goodnoe Hills wind facility in Washington. Including Goodnoe Hills, the total amount of wind repowering that PacifiCorp is proposing is 999 MW, at a capital cost of $1.13 billion. A significant driver of this decision is that after repowering the units they would re-qualify to receive additional production tax credits ('PTCs").[4] Originally, when first built between 2006 and 2010, the wind generators received PTCs over a ten-year period, ending between 2016 and 2020. By repowering the units between 2019 and 2020, and meeting certain Internal Revenue Service ("IRS") requirements, the Company can extend the PTCs by another 10 years.

Q. ARE THERE ANY REQUIREMENTS PACIFICORP MUST MEET TO REQUALIFY FOR THE PTCS AND ENSURE IT WILL RECEIVE 100% OF THE AVAILABLE PTC VALUE?

A. Yes, since Congress extended the availability of PTCs on December 18, 2015, developers were permitted two additional years to construct wind turbines and receive tax credits. This applied to repowering wind turbines, as well, if they met other requirements. After the tax law change, the IRS issued 'safe-harbor" guidance concerning what constituted beginning construction, how long projects could be under construction before having to be in service, and how many new dollars had to be spent on projects that were repowered. To receive

[4] PTCs are worth $24/MWH in 2017. After accounting for tax gross-up effects, the value of PTCs to customers increases to $38.68/MWh based on PacifiCorp's federal and state effective tax rate of 37.95%. In addition, the value of PTCs increases on an annual basis based on an inflation index. (Rick Link Direct Testimony, page 5).

the full value of the PTCs on the repowered units, developers had to spend at least 5% of the total repowering project cost by the end of 2016, construction had to be complete no more than 4 years later (by December 2020), and at least 80% of the total value of the project after repowering had to be spent on new construction at the project.

Q. HOW DID PACIFICORP MEET THE DECEMBER 2016 START DATE REQUIREMENT?

A. Sometime in 2016, PacifiCorp performed an evaluation and sought internal approval to make safe harbor equipment purchases, exceeding 5% of what it believed the total project cost ultimately would be. PacifiCorp received the necessary internal approval, and entered into contracts with the equipment vendors in December 2016.[5] In response to discovery, the Company notes that while the IRS issued specific guidance in May 2016 regarding the ability to renew production tax credits for repowered wind projects, its final decision to purchase equipment did not require the IRS' guidance being published.[6]

Q. HAVE YOU REVIEWED THE PROCESS BY WHICH STAKEHOLDERS WERE INFORMED OF PACIFICORP'S REPOWERING DECISION?

A. Yes, I have reviewed some of the publicly available documents from PacifiCorp's IRP website, the IRP Docket in Oregon (Docket No. LC-67), and the IRP Docket in Utah (17-035-16). Typically, the IRP is a collaborative stakeholder process in which interested parties discuss alternative resource plans, provide comments, and request studies to be performed. It does not appear there was much opportunity for that in this instance.

Q. WHEN DID PACIFICORP REVEAL ITS REPOWERING PLANS?

[5] See PacifiCorp's January 13, 2017 Notice of Non-Competitive Procurement to the Commission, https://pscdocs.utah.gov/misc/17docs/1799901/291219RMPNotNonCompProcureGE1-13-2017.pdf.
[6] See OCS 1.60 (OCS Exhibit 2.2D).

A. It appears the Company did not inform stakeholders through the IRP process that it was considering repowering until it held its March 2, 2017 IRP General Public Meeting.[7] At the same meeting, the Company informed stakeholders that it was also considering adding 1,200 MW of new wind capacity in Wyoming and constructing a new transmission line segment between the Aeolus and Anticline substations in Wyoming.[8] These decisions were finalized and communicated to stakeholders in the Company's 2017 IRP Report and Action Plan that was released on April 4, 2017.[9] The curious thing about this timing is that PacifiCorp never mentioned these projects from the time it "kicked-off" its collaborative IRP stakeholder process on June 21, 2016, until its March 2, 2017 meeting, despite the fact that the Company knew that Congress had extended the PTCs in late 2015.

Q. WHY IS THIS RELEVANT?

A. The timing is relevant because the Company submitted a flurry of filings in June 2017 (Docket Nos. 17-035-23, 17-035-39 - this proceeding, and 17-035-40), all related to decisions it finalized in its April 2017 IRP Report, and all before the IRP has run its course and been acknowledged by this Commission. On top of that, the Company has recommended billions of dollars of investment that ratepayers could have to pay for, while emphasizing that these are time limited opportunities that have to be acted upon quickly. Not only will the Commission have a limited amount of time to determine if the Company has sufficiently proven that the over $1 billion repowering projects are in the public

[7] Oregon Public Utility Commission, Docket LC 67, Oregon Citizens Utility Board Comments filed June 23, 2017, at page 4, http://edocs.puc.state.or.us/efdocs/HAC/lc67hac11433.pdf.

[8] PacifiCorp 2017 IRP General Public Meeting Presentation, March 2-3, 2017, pg. 41, http://www.pacificorp.com/content/dam/pacificorp/doc/Energy_Sources/Integrated_Resource_Plan/2017_IRP/PacifiCorp_2017_IRP_PIM08_03-01-17_Final_Presentation.pdf

[9] The Company filed further notice on April 17, 2017, of its intent to request approval of a solicitation process that would seek up to 1,270 MW of new wind resources contingent on PacifiCorp constructing the new transmission line in Wyoming. https://pscdocs.utah.gov/electric/17docs/1703523/293450RMPNotice4-17-2017.pdf

interest, but next the Commission will have to turn its attention to determine if the $2 billion new wind/new transmission projects are prudent. To reach these decisions, I believe the Commission will have to be convinced that sufficient analyses have been performed, and compelling evidence provided to support the Company's decision. This is especially important in this instance, because the Company does not have a specific capacity need until 2029. Therefore, these are purely economic decisions, particularly the repowering decision.

Q. HASN'T THE COMPANY ARGUED THERE ARE CERTAIN ADDITIONAL BENEFITS SUCH AS TURBINE RELIABILITY IMPROVEMENTS, TRANSMISSION RELIABILITY BENEFITS, RENEWABLE ENERGY CREDITS ("REC"), REDUCTIONS IN O&M, ETC., THAT SUPPORT THE DECISION TO REPOWER THE UNITS?

A. Yes, and while I do not agree with all of the Company's suggested benefits, I agree there may be some small additional benefits associated with the repowering projects. However, I believe these so called additional benefits, should be given very little weight in any decision the Commission makes. The Company most likely would not have given any consideration to repowering its wind turbine units en masse, had the PTCs not been extended, especially in this environment of low gas prices, and uncertainty regarding CO_2 policy. Ms. Donna Ramas also addresses RECs in her testimony.

III. REVIEW OF THE COMPANY'S ECONOMIC EVALUATION

Q. WHAT ANALYSIS DID THE COMPANY PERFORM TO CONSIDER THE BENEFITS OF REPOWERING ITS WIND RESOURCES?

A. Mr. Link's testimony discusses the evaluation the Company performed. Essentially, the Company created a series of expansion plans, and developed estimates of production costs and capital revenue requirements to determine if customers would incur lower present value revenue requirements ("NPVRR") with or without the repower units. Mr. Link referred to the main analysis he performed as the Price-Policy Scenarios. The Price-Policy scenarios included nine pairs of runs, each with different combinations of natural gas and CO_2 prices, and each pair with and without the repowered units. The Company developed a low, medium and high forecast for both natural gas and CO_2. Given the correlation between natural gas prices and wholesale market prices, the Company developed a different wholesale market price forecast for each natural gas forecast case. Additional sensitivity analyses were also performed.

Q. DID THE COMPANY IDENTIFY ANY PRICE-POLICY SCENARIO THAT IT BELIEVED WOULD BE MORE LIKELY TO OCCUR IN THE FUTURE THAN THE OTHERS?

A. No, it did not. While it is becoming increasingly clear that there are ample supplies of natural gas in this country to suggest that natural gas prices will remain low for a long time to come, and while it does not appear that CO_2 policies are likely to be implemented anytime soon, the Company assumed that the high gas/high CO_2 scenario would be as equally likely to occur as the low gas/low CO_2 scenario.

Q. WHAT STEPS WERE PERFORMED TO DEVELOP REVENUE REQUIREMENT RESULTS?

A. For any scenario, the Company first developed an optimal expansion plan using the System Optimizer ("SO") Model for both the "with" and "without" repowering cases. Based on

the expansion plan developed, the company determined capital revenue requirements for the capital projects associated with that case, and used an economic carrying charge approach to levelize the fixed costs. The SO model also developed estimates of net power costs for each case with and without the repowering projects over the 20-year period of 2017 to 2036. Then the net power costs and the capital revenue requirements for each case were summed together, and an NPVRR value for each case was determined. For each pair of cases with and without repowering, the case that had a lower NPVRR result was determined to be more economic.

Q. DID THE COMPANY PROVIDE ANY OTHER NPVRR RESULTS FOR THE PRICE POLICY SCENARIOS?

A. Yes, in addition to the SO model, the Company developed similar results using its Planning and Risk ("PaR") model, which is used to derive more detailed production costs, and to perform a probabilistic assessment of a sample of randomly changing variables including load, wholesale energy prices, natural gas prices, hydro generation, and thermal unit outages. The same expansion plan that was first determined in the SO model, was used in the PaR analysis. Therefore, identical capital revenue requirement results for each case were used in both the SO analysis and the PaR analysis. Both the SO and the PaR model analyses were performed for the same planning horizon, 2017 – 2036. The only difference between the SO and PaR results related to the net power costs that were derived.

Q. DIDN'T PACIFICORP ALSO PRESENT NPVRR RESULTS OVER THE 2017 – 2050 TIME PERIOD AS WELL?

A. Yes, it did. After completing its SO and PaR analyses, in which detailed expansion plan and production cost analyses were performed over the 2017 to 2036 period, the Company

performed a simplistic analysis in an attempt to fill in net power costs during the 2037 to 2050 period. To do that, the Company assumed that production cost results that occurred during the 2028 to 2036 period could be manipulated and then stand in as a replacement for production cost results that would have resulted had the Company developed an optimal expansion plan and detailed production cost results based on SO and PaR modeling analyses. Mr. Link referred to this analysis as extending system cost impacts out through 2050.

Q. HOW DID THE COMPANY CREATE THE RESULTS IT USED FOR 2037 TO 2050?

A. First, system net benefits of repowering were calculated each year over the 2028 to 2036 period. System net benefits were calculated as the difference in net power costs plus capital revenue requirements in the with versus the without PaR repowered cases, and then that difference was divided by the incremental energy output from wind repowering to derive an annual system benefit on a dollar-per-MWh basis. Over the 2028 to 2036 period, the annual incremental energy difference was about 550 GWh per year. Next, the system benefit per MWh was levelized and then escalated out to derive what the Company assumed was a reasonable estimate of the annual system benefit over the 2037 to 2050 period. Finally, the extended system benefits per MWh over the 2028 to 2036 period were multiplied by the annual incremental energy difference that the Company assumed would occur due to repowering during the 2037 to 2050 period, which was around 3,300 GWh per year.

Q. WHY DIDN'T THE COMPANY PERFORM EXPANSION PLAN AND PRODUCTION COST MODELING ANALYSIS FOR THE 2037 TO 2050 PERIOD,

AND WHY DID IT CHOOSE TO USE RESULTS FROM THE NINE-YEAR PERIOD OF 2028 TO 2036 AS THE BASIS FOR EXTENDING RESULTS TO THE FOURTEEN YEAR PERIOD OF 2037 TO 2050?

A. The Company desired to capture benefits all the way to 2050, yet it was concerned about modeling run-time issues arising from performing optimal expansion plan studies covering that many years. To derive the production cost results through 2050 and to avoid the run-time penalty, the Company developed its benefit extension methodology. The choice of using results from the nine-year period of 2028 to 2036 was somewhat, but not completely, arbitrary in that the Company wanted to use system benefits after Dave Johnston is scheduled to retire (2027), and continuing to the end of the 2036 modeling period. During that period, the Company expects that congestion will be reduced due to the Dave Johnston retirement.

Q. IS IT TYPICAL FOR EXTENSION TECHNIQUES TO BE USED IN MODELING STUDIES?

A. It is not unusual, as long as it can be demonstrated that the results produced are reasonable.

Q. DO YOU BELIEVE THE COMPANY HAS DEMONSTRATED THAT ITS EXTENDED RESULTS OVER THE 2037 TO 2050 PERIOD ARE REASONABLE?

A. No, I do not. I believe the extended results to 2050 are questionable, and I do not believe the Company has sufficiently demonstrated the reasonableness of its modeling approach, nor the results themselves. I will explain my concerns about this further below, but in the meantime, I provide a comparison of the Company's NPVRR results for each of the 3 analyses it performed. This is a condensed set of results compared to Mr. Link's Tables 2 and 3. While Mr. Link provides results for each of the nine scenarios, across each of the

three modeling approaches, I just show the range of results from low to high NPVRR. The low-end results stem from the low gas, zero CO_2 case, and the high-end results stem from the high gas, high CO_2 case. I also include PacifiCorp's results that were in the middle of the range, the medium gas, medium CO_2 case.

Table 1
Comparison of PacifiCorp's NPVRR Analyses (Millions of Dollars)

REPOWER (Positive is a Benefit)	SO to 2036	PaR to 2036	PaR to 2050
Low-end (Low Gas, Zero CO_2)	33	43	(41)
Middle of Range (Med Gas, Med CO_2)	(22)	(13)	(359)
High-end (High Gas, High CO_2)	(103)	(80)	(589)

Q. WHAT ARE YOUR OBSERVATIONS FROM THIS TABLE?

A. First, I would note that there is no surprise that the SO to 2036 results are different than the PaR to 2036 results, as each model has a different purpose. The SO production costs are derived using a dispatch process that is low in detail, while the PaR model evaluates results in a more detailed manner and over a range of input assumptions. The fact that the results could be 20 to 30% different is not surprising. Given that the PaR model utilizes a more detailed production cost modeling approach and examines a range of assumptions, it is likely the more reliable result. Also, the SO and PaR results move in the same direction, which should be expected.

Second, the SO and PaR results to 2036 indicate that based on a $1 billion investment, customers may experience a dis-benefit if gas prices and CO_2 costs remain low, and may experience only a modest $80 million benefit if gas prices and CO_2 costs reach the highest level that the Company studied. If gas prices and CO_2 costs are in the

moderate range for the entire study period, the PaR to 2036 results are not much better than just break-even ($13 million benefit).

Third, as mentioned, I believe the PaR results, as extended by the Company to 2050, are questionable. However, even if they are found to be reasonable, the results are not very satisfying given that customers would have to wait 20 years before significant benefits could be achieved, and in the meantime, there could be other significant advancements in technology that could occur over that 20-year period that might be a better use of ratepayer money.

IV. THE OFFICE'S ANALYSIS AND STUDIES PERFORMED

Q. WHAT ARE YOUR CONCERNS BASED ON YOUR REVIEW OF THE COMPANY'S ECONOMIC ANALYSIS?

A. Based on my review, I am concerned that the Company has not proven in accordance with Utah Code Ann. § 54-17-402, that repowering its wind resources "will most likely result in the "acquisition, production, and delivery" of electricity to its customers at the lowest reasonable cost and least risk possible.[10] I do not believe that the Company has fully studied and addressed the potential risks of investing in this project, and I believe the Company has relied on questionable modeling assumptions that have led to questionable results. The Office is further concerned that the Company may be rushing into these repowering projects without having conducted all evaluations that should be performed.

Q. WHAT ARE YOUR SPECIFIC CONCERNS?

A. In addition to the concern I discussed above, that the results are modest through 2036, I have the following specific concerns:

[10] Utah Code Ann. Section 54-17-402.

1) **Tax Rates.** The Company has not evaluated the impacts of potential reductions in the corporate federal tax rates, which would impact the PTC benefits. Since the PTC benefits, to a large extent, drive the repowering decision, a reduction in federal tax rates could greatly affect the benefit of the repowering projects to customers. Office witness Donna Ramas also discusses this, and the Office believes this is a sensitivity that should not be overlooked.

2) **Repowering Portfolio Evaluation.** The Company has not properly evaluated whether all of the wind resources that it identified should be repowered.[11] The Company has taken an all-or-nothing approach for its analysis to repower its wind turbines, and I believe it reached the wrong conclusion in evaluating individual projects. In other words, for most of the repowering projects, the Company compared the costs and benefits of repowering all of the wind projects together as one big project versus not repowering any of the projects at all. As the Company notes, collectively, the energy produced by the wind resources will increase by about 19%; however, on an individual basis, each wind project will increase by between 11% and 35%, which is a wide range.[12] Given that the cost to repower each individual wind turbine is about the same, the benefits produced by different wind turbines can be dramatically different depending on wind conditions, and the Company has not considered whether it might be more beneficial to repower just some of the wind resources. I recommend that the Company be required to perform additional analysis of this issue.

3) **Questionable Assumptions and Modeling Results over the 2037 – 2050 period.** I have several concerns regarding the Company's 2037 through 2050 modeling results.

[11] This also seems to be a concern of the Division. See DPU 10.1.
[12] Direct Testimony Timothy Hemstreet, at line 96.

First, while the Company went to great lengths to develop optimal expansions plans for all of the cases that it performed covering the 2017 to 2036 period, it ignored this step in deriving benefits over the 2037 to 2050 period. The importance of this cannot be minimized by suggesting that period is far out in time, because the Company is practically justifying the repowering project based on its 2037 through 2050 results. Second, the same issue applies to production cost modeling. While the Company developed detailed production cost results over the 2017 to 2036 period, it did not do so for the 2037 to 2050 period.

Third, the Company created a methodology that used system benefit results from 2028 to 2036 to derive results for the 2037 to 2050 period without any evidence proving that the methodology was reasonable. This is an issue because the system benefits derived during 2028 to 2036 were based on the Company's assumed repowering energy differential of about 550 GWh per year, and were extended and used to derive system benefits during the 2037 to 2050 period based on the Company's assumed repowering energy differential of about 3,300 GWh per year. This overstates the benefits because production cost benefits generally cannot be linearly scaled the way the Company has assumed.

Fourth, there is no certainty that there would be such a substantial jump in the incremental energy due to repowering when comparing the period of 2017 to 2036 (550 GWh) versus the period of 2037 to 2050 (3,300 GWh). Based on the Company's assumption that it would have to spend more on O&M and capital additions on the existing units if they are not repowered, there is every reason to expect that some, if

not all, of the wind units could operate beyond 2036.[13] This means the difference in energy between the two periods would not be such a significant step increase going from 550 GWh to 3,300 GWh, as the Company's analysis assumes, but would likely be more gradual and smaller between the periods.

Fifth, another questionable modeling result stems from the significant differences in expansion plans that occur between cases with and without repowering. During the period of 2017 to 2036, the Company assumes that the repowering will provide 500 GWh more energy per year on a system who annual load is greater than 60,000 GWh, yet this energy difference could lead to dramatic shifts in expansion plans between the cases.[14] The Company has made no attempt to analyze this issue, and did not perform additional modeling analyses that the Office requested the Company to address this in discovery.[15]

4) **Evaluation of Repowering before the new wind/new transmission project.** The Company is requesting approval of the repowering projects before the new wind/ new transmission projects, which may be understandable given that the Company reached a decision about the repowering project first in the IRP, and because the new wind project requires an additional step of going through a solicitation process. However, the Company has not fully considered the possibility that if the new wind/new transmission projects were completed, the repowered wind units might provide little additional value.

Q. HAVE YOU PERFORMED ADDITIONAL ANALYSIS OF THESE ISSUES?

[13] Timothy Hemstreet Direct Testimony, beginning at line 302.
[14] 2017 IRP Volume 1, Figure 7.18.
[15] OCS 4.7 (OCS Exhibit 2.3D).

A. Yes, the first analysis I discuss that I performed concerns the federal tax rate issue. As described in Ms. Ramas' testimony, the Company's analyses are based on the 35% federal corporate tax rate currently in effect, and there is a great deal of effort afoot in Washington to substantially lower the corporate income tax rates.

Q. DID THE COMPANY CONDUCT ANY STUDY OF THE IMPACTS ON ITS ECONOMIC ANALYSIS OF THE POTENTIAL TAX CODE CHANGES?

A. No, and in fact the Company declined to perform any further studies as requested by the Office in its Discovery requests 7.1 through 7.3 (OCS Exhibits 2.3-2.5D). In those requests, the Office asked the Company to consider lower tax rates ranging from 15% to 25%. Instead of performing the analyses, the Company simply responded those had not been performed.

Q. HAVE YOU QUANTIFIED THE IMPACTS OF A LOWER TAX RATE?

A. Yes, the effect of a reduction in the federal corporate tax rate would impact the wind repowering capital revenue requirements due to a lower tax gross-up on the equity return, and the PTCs. I have revised the Company's analysis for each repowered wind generating unit by lowering the effective tax to 15%. Reducing the tax rate to 15% decreased the net present value benefits by $186 million, which is a substantial reduction in the project benefit. This $186 million is the combined effect of a moderate decrease in the project costs, but a significant decrease in the PTC benefit, resulting in a net reduction in the repowering benefit. You can see this on an individual project basis in the following table.

Table 2
Tax Rate Sensitivity at 15%

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	Company Analysis		15% Tax Rate		Delta	
PaR through 2036 (levelized) ($millions) NPV 2016	Net Levelized Costs	Net levelized PTC benefit	Net Levelized Costs	Net levelized PTC benefit	Decrease in Net Levelized Cost	Loss of levelized PTC benefits
Leaning Juniper	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Goodnoe Hills	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Marengo I	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Marengo II	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Glenrock I	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Glenrock II	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Rolling Hills	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Seven Mile Hills I	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Seven Mile Hills II	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
High Plains	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
McFadden Ridge	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Dunlap I	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total impact of repower:	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Costs net of PTC Benefit		[redacted]		[redacted]		[redacted]

REDACTED

Q. HAVE YOU CONDUCTED ANY ANALYSIS COMPARING INDIVIDUAL PROJECT RESULTS TO THE ENTIRE PORTFOLIO OF PROJECT RESULTS?

A. Yes, I examined the Company's proposal to repower all 12 wind power projects, located at different sites across the Company's system in Washington, Oregon and Wyoming, and compared that to results in which the projects were examined one at a time. With the exception of Goodnoe Hills and Leaning Juniper, the Company evaluated the benefit of repowering all of the wind projects as one big project. The problem is that while the overall portfolio of projects could show a benefit, when examined individually, some of the individual wind projects may not be economic. I performed my own analysis and determined that in fact this was the case. The analysis I performed still relied on the Company's production cost results, since I had no way to run the Company's SO or PaR

models. It is likely that the results would be different if production cost modeling was performed, and I understand that the Division requested such an analysis to be performed, in discovery request DPU 10.1 (OCS Exhibit 2.7D).

Q. HOW DID YOU CONDUCT YOUR ANALYSIS?

A. My analysis used the Company's medium gas/medium CO_2 2036 PaR case. Instead of comparing costs and benefits for all wind projects together, I allocated the Company's production cost savings for the entire portfolio to each unit on the basis of the incremental energy produced at each wind resource. In that way, I compared the costs and benefits on a wind project-by-wind project basis. Table 3 below provides the results of my analysis and compares those results to other characteristics of the wind projects.

Table 3
Individual Analysis of Wind Repowering Projects

REDACTED

Project	State	Project Generation Increase [16] %	Current Capacity Factor %	Future Capacity MW	Project Capital Cost ($ M)	Project In-Service Date	Individual Economic Analysis ($ M)
Marengo 1	WA						
Marengo II	WA						
Leaning Juniper	OR						
Goodnoe Hills	WA						
McFadden Ridge	WY						
High Plains	WY						
Seven Mile Hills 1	WY						
Seven Mile Hills II	WY						
Dunlap 1	WY						
Glenrock 1	WY						
Glenrock III	WY						
Rolling Hills	WY						

[16] Project generation increases assuming current Large Generator Interconnection Agreements ("LGIA") limits.

Total Benefit												

REDACTED

Q. WHAT DO THESE RESULTS INDICATE?

A. In Table 3 above, the economic results for each wind project are found in the farthest column to the right, and negative values indicate projects are beneficial. Based on all of the Company's modeling assumptions, the results indicate that six out of twelve projects are economic, although in some cases by a small margin. At a minimum, the projects that are not economic on an individual basis should not be repowered.

Q. YOU MENTIONED THAT THE COMPANY ALSO PERFORMED INDIVIDUAL ANALYSES FOR THE GOODNOE HILLS AND LEANING JUNIPER PROJECTS. HOW DID YOUR RESULTS COMPARE?

A. The Company conducted an individual analysis for the Goodnoe Hills project since it was not examined as part of the repowering portfolio in the IRP. Therefore, the Company tested to determine if it would be economic to add it to the list of repowered projects. The Company determined it would be economic to repower Goodnoe Hills, and included it within the portfolio of projects to be repowered. I agree with the Company as our results shown in Table 3 above indicate that it would be economic to repower Goodnoe Hills, relying on all of the Company's modeling assumptions. In the case of Leaning Juniper, we both found it would be economic to repower when considered on an individual basis. However, while our results related to economics of Goodnoe Hills and Leaning Juniper were the same, other conclusions we both reached were very different.

Q. PLEASE EXPLAIN WHAT YOU MEAN.

A. This relates to Mr. Link's conclusion that if Leaning Juniper, having the lowest capacity factor in PacifiCorp's fleet of owned wind resources, was found to be economic then all

the other wind projects would have to be economic as well.[17] I disagree with this based on the analysis I performed, with the results shown in Table 3 above. I believe that a unit could have a high capacity factor and still be found uneconomic. For example, Dunlap 1 has a very high capacity factor, yet I found it to be uneconomic based on two factors. First, Dunlap was the last unit to be installed in 2010. Because it must be repowered by 2020, the full set of initial PTC benefits it could have received will be cut short by a small amount. Second, from Table 3 above, the incremental increase in energy generation at Dunlap will be among the lowest of the 12 repowered projects, which means that the energy benefit of repowering Dunlap will not be as great compared to some of the other units. The energy benefit may also be discounted due to the timing of the life-extension period. Given that the Dunlap project is the most recent wind power unit of the group, it has a longer expected operating life under the without repowering scenario, and therefore, the life-extension benefits happen later in time resulting in a smaller NPV benefit. Considering all of these factors together, the costs to repower Dunlap exceeds its PTC and energy benefits. Thus, I disagree with Mr. Link and believe that the Company should conduct a proper analysis, examining every one of the projects individually and prioritizing the order of the most economic projects.

Q. WHAT ANALYSIS DID YOU PERFORM IN REACHING YOUR CONCLUSION THAT THE COMPANY'S ASSUMPTIONS AND MODELING RESULTS OVER THE 2037 TO 2050 PERIOD ARE QUESTIONABLE?

A. Previously, I mentioned there were five issues I am concerned about regarding the Company's estimates of energy benefits. These issues, which are interrelated, concern

[17] See Rick Link Direct Testimony, beginning at line 303.

both the expansion plans that were developed, and the incremental energy benefits that could be expected from repowering. I conducted two analyses to explore the sensitivity of the "life-extension benefit."

Q. PLEASE EXPLAIN WHAT ANALYSIS YOU PERFORMED TO CONSIDER THE "LIFE-EXTENSION BENEFIT"?

A. This analysis relates to the Company's contention that by repowering it is essentially adding wind turbines that will last for ten years longer than the existing wind turbines. Since the original units were set to retire around 2040, Mr. Link contends that the new wind turbines will provide energy for an additional 10 years to 2050. Mr. Link's Figure 4 at line 694 shows the additional energy that he assumes will be produced by the repowered units over the period of 2017 to 2050. I would like to point out that the benefits might not be as great as Mr. Link suggests if the existing wind turbines continue to operate beyond their 30-year operating lives, which is conceivable.

Q. HAS THE COMPANY CONSIDERED THE POSSIBILITY THAT WIND TURBINES MIGHT OPERATE FOR LONGER THAN 30 YEARS?

A. Yes, one of the sensitivity analyses that Mr. Link performed considered the possibility that the repowered wind turbines could last another ten years, but he never considered the possibility that the existing wind turbines could last any longer.[18] I have examined two cases, one in which both the repowered and non-repowered units have their lives extended by ten years, with a study period extending to 2060, and a second case consisting of the same analysis, but with the study period ending in 2050. The results of my analysis are provided in Table 4.

Table 4

[18] See Mr. Link testimony beginning at line 732.

Comparison of Life Extension Cases (NPVRR in Millions of Dollars)

Price-Policy Scenario	Company PaR Analysis	OCS Extended 10-Yr Life Sensitivity	OCS Extended 10 Yr Life Sensitivity
Study Horizon:	**To 2050**	**To 2060**	**To 2050**
Low Gas, Zero CO_2	(41)	79	121
Low Gas, Medium CO_2	(245)	(99)	27
Low Gas, High CO_2	(344)	(187)	(25)
Medium Gas, Zero CO_2	(362)	(203)	(36)
Medium Gas, Medium CO_2	(359)	(199)	(27)
Medium Gas, High CO_2	(401)	(238)	(57)
High Gas, Zero CO_2	(400)	(238)	(60)
High Gas, Medium CO_2	(274)	(130)	(11)
High Gas, High CO_2	(589)	(404)	(153)
Expected Value	(335)	(180)	(25)

Q. PLEASE DESCRIBE TABLE 4 ABOVE.

A. The left most column of results is the same "PaR to 2050" results that Mr. Link presented in his Table 3, with the exception that I have added an expected value calculation at the bottom, which assumes that all cases are equally likely to occur.[19] The next column extends the life of the existing units 10 years, to approximately 2050, and the repowered units 10 years, to about 2060, and it indicates that when longer operating lives are considered, which could conceivably occur, the present value benefit of the life-extension period decreases. In that case, the benefits drop almost 50% ($335 to $180 million).

The third column of results is the same analysis, but in this case, I limited the study period to end in 2050, which is the same end date as Mr. Link's original analysis. When the study period is limited in this way, the results indicate that the benefit of repowering is

[19] I do not necessarily believe that will be the case, as I believe we are more likely to experience a low gas/low CO_2 price environment for some time to come, however, for purposes of this analysis, I made that simplifying assumption.

just $25 million on an expected value basis, with the two lowest gas and CO_2 cases being detrimental.

The third column of results can also be compared to the second column, to evaluate the timing when more substantial benefits could be expected to occur. Previously, I explained that when the studies the Company performed where extended from 2036 to 2050, customers would not expect to see significant benefits for 20 years, as the significant benefits would occur between 2036 and 2050. The results in Table 4 above demonstrate that if the original unit lives are extended, as Mr. Link suggests is possible for wind turbines, then the significant benefits would be pushed out even further in time, to between 2050 and 2060.

Q. DO YOU HAVE ANY OTHER CONCERNS ABOUT THE COMPANY'S LIFE EXTENSION ASSUMPTIONS?

A. From my review of the Company's analysis, I am concerned that the Company has both overstated the amount of energy differential associated with the repowered units, and I am concerned that the Company has overstated the benefit calculation that it associates with the repowered units during the extension period. While I can understand the reason that the Company did not perform production cost modeling analysis or develop optimal expansion plans for the 2036 – 2050 extension period, as I would have preferred, I do not have confidence in the analysis that the Company performed to derive energy benefits during the extension period.

For instance, the Company assumes that benefits derived from an analysis during the 2027 to 2036 period, could after some calculation be escalated and applied to the period 2037 to 2050. The problem is that this is basically an avoided cost calculation and it is not

reasonable to assume that avoided costs derived based on an energy differential of 550 GWh would be the same as it would be based on 3,300 GWh. Typically, the lower the differential in capacity/energy is when avoided costs are calculated, the higher the avoided costs would turn out to be on a $ per MWh basis. Therefore, it is likely that the Company has overstated the energy benefits that it has calculated during the extension period.

Q. DID YOU PERFORM ANY ANALYSIS TO DETERMINE THE IMPACT OF LOWER ENERGY BENEFITS DURING THE EXTENSION PERIOD?

A. Yes, I performed a simple analysis, in which I reduced the value of the energy benefit by 25% each year during the 2037 to 2050 extension period from what the Company assumed. To do this, I temporarily removed the capital cost revenue requirements of the repowered units from the benefits the Company had derived, and I then reduced the energy benefits 25% and added back in the capital cost revenue requirements for the repowered units. The 25% energy reduction assumption was chosen arbitrarily to consider a variety of drivers that could impact the Company's energy value. Under this assumption, the benefits decreased by approximately 28% on an expected value basis. On an expected value basis, the Company's result reduced from $335 million to $240 million.

Q. PLEASE ELABORATE ON YOUR CONCERN ABOUT WHETHER THE REPOWERING PROJECTS WOULD PROVIDE A SIGNIFICANT INCREMENTAL BENEFIT IN ADDITION TO THE NEW WIND/NEW TRANSMISSION PROJECTS.

A. The Company is requesting approval of the repowering projects before the new wind/ new transmission projects, and I am concerned that if the new wind/new transmission projects were examined first, then the repowered wind units might provide little additional value on

top of those projects. Mr. Link presented the results of a sensitivity study in his testimony in which he examined the additional benefits of the new wind/new transmission projects when analyzing the SO and PaR results to 2036 for just the medium gas/medium CO_2 case. Mr. Link had previously found that the benefits of the repowering ranged from $13 to $22 million depending on whether the SO or PaR model was used, and those benefits grew by $91 to $101 million if the new wind/new transmission projects were incrementally added. This indicates that according to the Company's analysis, the benefit of the new wind/new transmission investment is between 4 to 7 times greater than the benefit of the new wind projects.

Q. WOULD THE INCREMENTAL BENEFIT OF THE REPOWERING PROJECT BE THE SAME IF THE COMPANY EVALUATED THE NEW WIND/NEW TRANSMISSION FIRST?

A. No, it would not. In the new wind/new transmission proceeding, Docket No. 17-035-40, Mr. Link provided results from an analysis in which he evaluated the new wind/new transmission first, and determined the incremental benefits of performing the repowering projects second. From that analysis, he determined there could be dis-benefits to performing the repowering projects once a commitment was made to the new wind/new transmission projects. In that case, he found that the economic result of repowering ranged from a dis-benefit of $8 million to a positive benefit of $29 million depending on if the SO or PaR model was used.

Q. ARE YOU SURPRISED BY THESE RESULTS?

A. I am not surprised that there could be dis-benefits, because it seems reasonable that after committing to the new wind/new transmission projects, there might not be sufficient

remaining benefits to be able to offset the $1.13 billion repowering investment. But, I am surprised by the fact that the SO and PaR models showed contradictory results. The SO model determined there would a $29 million benefit to repowering, while the PaR model determined there would be a dis-benefit of $8 million. I believe that Company should attempt to explain why one model results in positive benefits while the other results in negative benefits.

Furthermore, I find it surprising that the SO model could have determined that the benefit of repowering would increase if the new wind/new transmission projects were considered first. In other words, when repowering was considered first, the SO model determined the benefit of repowering to be $22 million. But when the new wind/new transmission projects were considered first, the benefit of repowering increased to $29 million. I don't think it is realistic that there could an increase in the benefit of repowering after first committing to the new wind/new transmission projects, and I think that the PaR, $8 million dis-benefit results, are more likely correct. In summary, it appears that the New Wind/New Transmission benefits are significantly greater than the Repowering benefits, and the repowering results are marginal at best. Furthermore, incremental benefits will differ depending on the order that projects are implemented. In any event, I believe the Company needs to explain these results.

Q. ARE YOU AWARE THAT IN HIS DIRECT TESTIMONY IN THE 17-035-40 DOCKET, MR. LINK OPINED THAT BENEFITS OF REPOWERING IN THE SENSITIVITY ANALYSIS HE PERFORMED IN THAT PROCEEDING WOULD INCREASE IF THE ANALYSIS WAS CONDUCTED TO 2050?

A. Mr. Link did not actually perform an analysis, but if he had, my concerns about the methodology he would have used to extend the results to 2050 would have been the same as I have already discussed. Furthermore, as I said before, it is not very satisfying to consider that the Company might spend a billion dollars, and incur negative benefits for 20 years, and only after that begin to achieve positive benefits.

V. RECOMMENDATIONS

Q. PLEASE STATE YOUR RECOMMENDATION?

A. Based on my review, I recommend that the Commission deny the Company's request because the Company has not proven that its plans to repower its wind units will lead to it investing in the most optimal, least cost, least risk resources possible. I believe the Company could allow for additional time to collaborate further with stakeholders and to conduct additional analyses, and then refile a revised application if it still believes the repowering options are economic. Any refiled petition should only include proposals to repower projects that are cost-effective on an individual basis, rather than socializing the benefits to increase the total amount of projects completed. I have not seen any evidence suggesting the Company would be risking jeopardizing its opportunity to receive the full PTC benefits if it allowed an additional four to six months to address the concerns we have raised. As previously mentioned, the Company's current schedule includes plans to complete the repower projects well in advance of the deadline.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes, it does.