Corrected Supplemental Direct Testimony

Rick T. Link

1   the Company's customers by meeting both near-term and long-term needs for additional

2   resources. My supplemental direct testimony explains the following:

3   • The Combined Projects provide net customer benefits under all scenarios

4   studied through 2036, and in seven of the nine scenarios through 2050.

5   • Customer benefits increase to $151 million in the medium case through 2050

6   (as compared to $137 million in the original filing), and range from

7             $333 million to $349 million in the medium case through 2036.

8   • The analysis reflects changes in federal tax law that were enacted in December

9   2017, and updated best-and-final pricing from bidders received December 21,

10   2017, after the federal tax law changes were known.

11   • The treatment of production tax credits ("PTCs") in the system modeling

12   scenarios extending out through 2036 has been changed to better reflect how

13   the PTCs will flow through to customers, which makes the treatment consistent

14   with the nominal revenue requirement results that extend out through 2050.

15   • Sensitivity analysis shows substantial benefits of the Combined Projects persist

16   when paired with PacifiCorp's wind repowering project and are not displaced

17   when considering the potential procurement of solar PPA bids submitted into

18   the on-going RFP for solar resources, the 2017S RFP.

19   **2017R RFP RESULTS**

20   **Q.**   **When did PacifiCorp issue the 2017R RFP?**

21   A.   PacifiCorp issued the 2017R RFP on September 27, 2017, after it was approved by the

22   Public Service Commission of Utah ("Commission") on September 22, 2017, and the

23   Public Utility Commission of Oregon ("Oregon Commission") on September 27, 2017.

1 **CORRECTED Table 2-SD Updated SO Model and PaR PVRR(d)**
(Benefit)/Cost of the Combined Projects ($ million)

Price-Policy Scenario	SO Model PVRR(d)	PaR Stochastic Mean PVRR(d)	PaR Risk-Adjusted PVRR(d)
Low Gas, Zero CO2	$(145)	$(126)	$(131)
Low Gas, Medium CO2	$(186)	$(146)	$(152)
Low Gas, High CO2	$(297)	$(280)	$(294)
Medium Gas, Zero CO2	$(306)	$(268)	$(280)
Medium Gas, Medium CO2	$(343)	$(333)	$(349)
Medium Gas, High CO2	$(430)	$(409)	$(428)
High Gas, Zero CO2	$(619)	$(531)	$(557)
High Gas, Medium CO2	$(636)	$(561)	$(588)
High Gas, High CO2	$(696)	$(627)	$(658)

2   Over a 20-year period, the Combined Projects reduce customer costs in all nine

3   price-policy scenarios. This outcome is consistent in both the SO model and PaR

4   results. Under the central price-policy scenario, assuming medium natural-gas prices

5   and medium CO_2 prices, the PVRR(d) net benefits range between $333 million, when

6   derived from PaR stochastic-mean results, and $349 million, when derived from PaR

7   risk-adjusted results.

8 **Q.** **What trends do you observe in the modeling results across the different price**

9   **policy scenarios?**

10 A. Projected system net benefits increase with higher natural-gas price assumptions, and

11   similarly, increase with higher CO_2 price assumptions. Conversely, system net benefits

12   decline when low natural-gas prices and low CO_2 prices are assumed. This trend holds

13   true when looking at the results from the two simulations used to calculate the PVRR(d)

1   **CORRECTED Table 3-SD. Updated Nominal Revenue Requirement PVRR(d)**
(Benefit)/Cost of the Combined Projects ($ million)

Price-Policy Scenario	Annual Revenue Requirement PVRR(d)
Low Gas, Zero CO2	$195
Low Gas, Medium CO2	$159
Low Gas, High CO2	$(79)
Medium Gas, Zero CO2	$(34)
Medium Gas, Medium CO2	$(151)
Medium Gas, High CO2	$(275)
High Gas, Zero CO2	$(411)
High Gas, Medium CO2	$(453)
High Gas, High CO2	$(559)

2   When system costs and benefits from the Combined Projects are extended out

3   through 2050, covering the full depreciable life of the owned-wind projects included in

4   the 2017R RFP final shortlist, the Combined Projects reduce customer costs in seven

5   out of nine price-policy scenarios. Customer benefits, range from $34 million in the

6   medium natural gas, zero CO_2 scenario to $559 million in the high natural gas, high

7   CO_2 scenario. Under the central price-policy scenario, assuming medium natural-gas

8   prices and medium CO_2 prices, the PVRR(d) benefits of the Combined Projects are

9     $151 million. The Combined Projects provide significant customer benefits in all price-

10   policy scenarios, and the net benefits are unfavorable only when low natural-gas prices

11   are paired with zero or medium CO_2 prices. These results show that upside benefits far
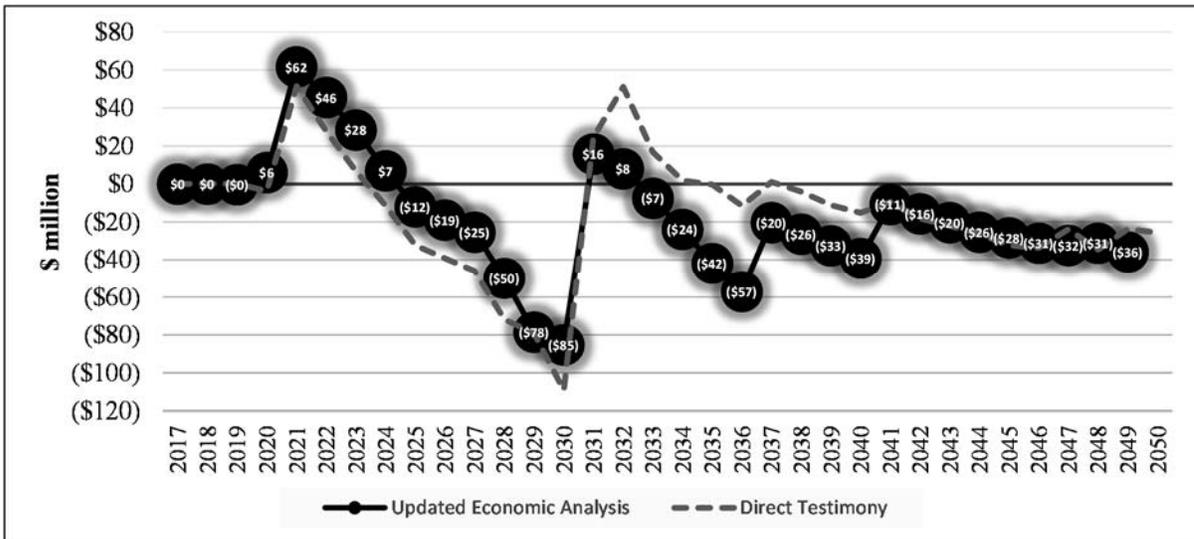
12   outweigh downside risks.

1   O&M expenses, the Wyoming wind-production tax, and PTCs. The project costs are

2   netted against updated system impacts from the Combined Projects, reflecting the

3   change in NPC, emissions, non-NPC variable costs, and system fixed costs that are

4   affected by, but not directly associated with, the Combined Projects.

5   **CORRECTED Figure 5-SD Updated Total-System Annual Revenue Requirement**
With the Combined Projects (Benefit)/Cost ($ million)

6   The data shown in this figure for the updated economic analysis have the same

7   basic profile as the data from the original economic analysis summarized in my direct

8   testimony. This profile shows that despite a reduction in PTC benefits associated with

9   changes in federal tax law, the reduced costs from winning bids from the 2017R RFP

10   continue to generate substantial near-term customer benefits, reduce the magnitude and

11   shorten the duration over which costs increase after federal PTCs for new wind

12   resources expire, and continue to contribute to customer benefits over the long-term.

13   The year-on-year reduction in net benefits from 2036 to 2037 is driven by the

14   Company's conservative approach to extrapolate benefits from 2037 through 2050

15   based on modeled results from the 2028 through 2036 timeframe. This leads to an

1   Projects were evaluated without solar PPA bids.

2   **CORRECTED Table 4-SD Solar Sensitivity with Solar PPAs Included**
           in lieu of the Combined Projects (Benefit)/Cost ($ million)

	Sensitivity PVRR(d)	Benchmark PVRR(d)	Change in PVRR(d)
Medium Gas, Medium CO2			
SO Model	$(334)	$(343)	$9
PaR Stochastic Mean	$(222)	$(333)	$111
PaR Risk Adjusted	$(233)	$(349)	$116
Low Gas, Zero CO2			
SO Model	$(206)	$(145)	$(61)
PaR Stochastic Mean	$(141)	$(126)	$(15)
PaR Risk Adjusted	$(148)	$(131)	$(17)

3   In the medium natural gas, medium CO_2 price-policy scenario, a portfolio with

4   the Combined Projects delivers greater customer benefits relative to a portfolio that

5   adds solar PPA bids without the Combined Projects. Customer benefits are greater

6   when the resource portfolio includes the Combined Projects without solar PPA bids by

7          $116 million in the medium natural gas, medium CO_2 price-policy scenario based on

8   the risk-adjusted PaR results. In the low natural gas, zero CO_2 price-policy scenario,

9   the portfolio with solar PPA bids and without the Combined Projects has higher net

10   customer benefits relative to a portfolio containing just the Combined Projects. The

11   increase in net benefits in the solar PPA portfolio is $17 million based on the risk-

12   adjusted PaR results.

13   **Q.   What were the results of the solar sensitivity where solar PPA bids are pursued**

14   **with the Combined Projects?**

15   A.   Table 5-SD summarizes PVRR(d) results for the solar sensitivity where solar PPA bids

16   are assumed to be pursued along with the proposed investments in the Combined

1   Projects. This sensitivity was developed using SO model and PaR simulations through

2   2036 for the medium natural gas, medium CO_2 and the low natural gas, zero CO_2 price-

3   policy scenarios. The results are shown alongside the benchmark study in which the

4   Combined Projects were evaluated without solar PPA bids.

5   **CORRECTED Table 5-SD Solar Sensitivity with Solar PPAs Included**
With the Combined Projects (Benefit)/Cost ($ million)

	Sensitivity PVRR(d)	Benchmark PVRR(d)	Change in PVRR(d)
Medium Gas, Medium CO2			
SO Model	$(602)	$(343)	$(259)
PaR Stochastic Mean	$(482)	$(333)	$(149)
PaR Risk Adjusted	$(504)	$(349)	$(155)
Low Gas, Zero CO2			
SO Model	$(286)	$(145)	$(141)
PaR Stochastic Mean	$(217)	$(126)	$(91)
PaR Risk Adjusted	$(227)	$(131)	$(96)

6   When the solar PPAs are pursued in addition to the Combined Projects, the total

7   benefits increase, but are diluted (*i.e.*, the aggregate net benefits are less than the sum

8   of the benefits for the cases where Combined Projects or solar PPAs are pursued

9   independently).

10 **Q.   What conclusions can you draw from these solar sensitivity analyses?**

11 A.   These sensitivities demonstrate that should the Company choose to pursue solar bids

12   through the 2017S RFP, the resulting solar PPAs would not displace the Combined

13   Projects as an alternative means to deliver economic savings for customers.

14   While the sensitivity with a portfolio containing solar PPAs without the

15   Combined Projects produces a PVRR(d) with net benefits that are slightly higher than

1   sensitivity was developed using SO model and PaR simulations through 2036 for the

2   medium natural gas, medium CO_2 and the low natural gas, zero CO_2 price-policy

3   scenarios. The results are shown alongside the benchmark study in which the Combined

4   Projects were evaluated without wind repowering.

5   **CORRECTED Table 6-SD Wind-Repowering**
                     Sensitivity (Benefit)/Cost ($ million)

	Sensitivity PVRR(d)	Benchmark PVRR(d)	Change in PVRR(d)
Medium Gas, Medium CO2			
SO Model	$(541)	$(343)	$(198)
PaR Stochastic Mean	$(497)	$(333)	$(164)
PaR Risk Adjusted	$(520)	$(349)	$(171)
Low Gas, Zero CO2			
SO Model	$(313)	$(145)	$(169)
PaR Stochastic Mean	$(277)	$(126)	$(152)
PaR Risk Adjusted	$(290)	$(131)	$(159)

6   In the wind-repowering sensitivity, customer benefits increase significantly

7   when the wind repowering project is implemented with the Combined Projects in both

8   the medium natural gas, medium CO_2 and the low natural gas, zero CO_2 price-policy

9   scenarios. These results demonstrate that customer benefits not only persist, but

10   increase, if both the wind-repowering project and the Combined Projects are

11   completed.

12   **Q.   Please summarize the conclusion of your supplemental direct testimony.**

13   A.   The results of the 2017R RFP confirm that the Combined Projects are the least-cost,

14   least-risk customer resources available to serve the Company's customers. The

15   substantial volume of bids into the 2017R RFP produced competitive project costs,

16   allowing the Company to obtain greater wind generating capacity at lower overall

1   the Company's customers by meeting both near-term and long-term needs for additional

2   resources. My supplemental direct testimony explains the following:

3   • The Combined Projects provide net customer benefits under all scenarios

4   studied through 2036, and in seven of the nine scenarios through 2050.

5   • Customer benefits increase to $~~177~~151 million in the medium case through

6   2050 (as compared to $137 million in the original filing), and range from

7    $~~311~~333 million to $~~343~~349 million in the medium case through 2036.

8   • The analysis reflects changes in federal tax law that were enacted in December

9   2017, and updated best-and-final pricing from bidders received December 21,

10   2017, after the federal tax law changes were known.

11   • The treatment of production tax credits ("PTCs") in the system modeling

12   scenarios extending out through 2036 has been changed to better reflect how

13   the PTCs will flow through to customers, which makes the treatment consistent

14   with the nominal revenue requirement results that extend out through 2050.

15   • Sensitivity analysis shows substantial benefits of the Combined Projects persist

16   when paired with PacifiCorp's wind repowering project and are not displaced

17   when considering the potential procurement of solar PPA bids submitted into

18   the on-going RFP for solar resources, the 2017S RFP.

19   **2017R RFP RESULTS**

20   **Q.   When did PacifiCorp issue the 2017R RFP?**

21   A.   PacifiCorp issued the 2017R RFP on September 27, 2017, after it was approved by the

22   Public Service Commission of Utah ("Commission") on September 22, 2017, and the

23   Public Utility Commission of Oregon ("Oregon Commission") on September 27, 2017.

1   **CORRECTED Table 2-SD Updated SO Model and PaR PVRR(d)**
(Benefit)/Cost of the Combined Projects ($ million)

Price-Policy Scenario	SO Model PVRR(d)	PaR Stochastic Mean PVRR(d)	PaR Risk-Adjusted PVRR(d)
Low Gas, Zero CO2	$(145)	$(~~104~~126)	$(~~109~~131)
Low Gas, Medium CO2	$(186)	$(~~124~~146)	$(~~131~~152)
Low Gas, High CO2	$(297)	$(~~258~~280)	$(~~272~~294)
Medium Gas, Zero CO2	$(306)	$(~~246~~268)	$(~~258~~280)
Medium Gas, Medium CO2	$(343)	$(~~311~~333)	$(~~327~~349)
Medium Gas, High CO2	$(430)	$(~~388~~409)	$(~~406~~428)
High Gas, Zero CO2	$(619)	$(~~509~~531)	$(~~535~~557)
High Gas, Medium CO2	$(636)	$(~~539~~561)	$(~~567~~588)
High Gas, High CO2	$(696)	$(~~605~~627)	$(~~636~~658)

2   Over a 20-year period, the Combined Projects reduce customer costs in all nine

3 price-policy scenarios. This outcome is consistent in both the SO model and PaR

4 results. Under the central price-policy scenario, assuming medium natural-gas prices

5 and medium CO_2 prices, the PVRR(d) net benefits range between $~~311~~333 million,

6 when derived from PaR stochastic-mean results, and $~~343~~349 million, when derived

7 from ~~SO model~~PaR risk-adjusted results.

8 **Q. What trends do you observe in the modeling results across the different price**

9   **policy scenarios?**

10 A. Projected system net benefits increase with higher natural-gas price assumptions, and

11   similarly, increase with higher CO_2 price assumptions. Conversely, system net benefits

12   decline when low natural-gas prices and low CO_2 prices are assumed. This trend holds

13   true when looking at the results from the two simulations used to calculate the PVRR(d)
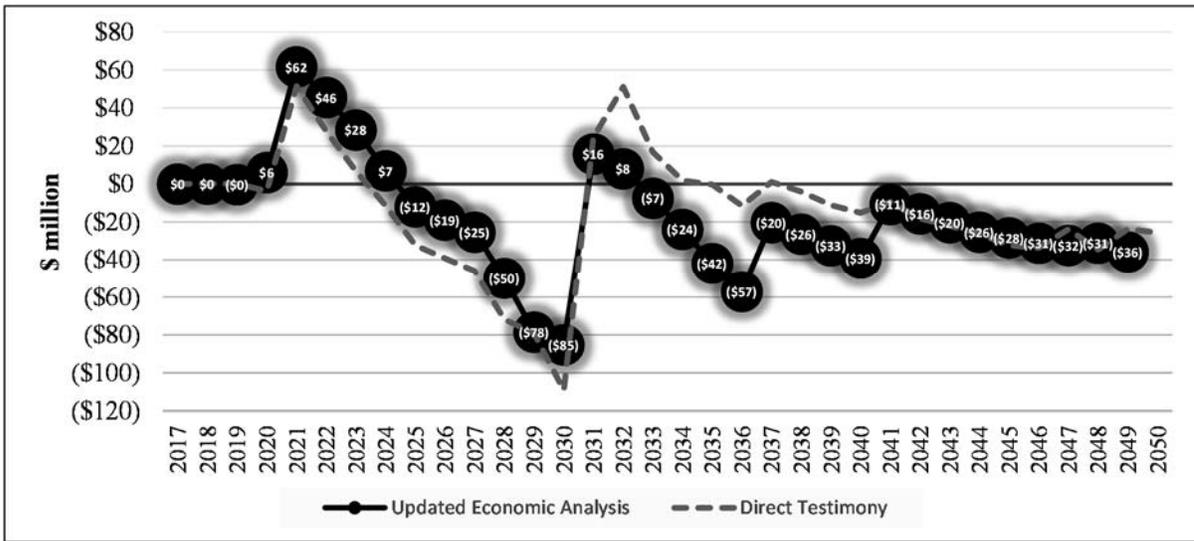
1   **CORRECTED** Table 3-SD. Updated Nominal Revenue Requirement PVRR(d)
(Benefit)/Cost of the Combined Projects ($ million)

Price-Policy Scenario	Annual Revenue Requirement PVRR(d)
Low Gas, Zero CO2	$~~169~~195
Low Gas, Medium CO2	$~~133~~159
Low Gas, High CO2	$(~~105~~79)
Medium Gas, Zero CO2	$(~~60~~34)
Medium Gas, Medium CO2	$(~~177~~151)
Medium Gas, High CO2	$(~~301~~275)
High Gas, Zero CO2	$(~~437~~411)
High Gas, Medium CO2	$(~~479~~453)
High Gas, High CO2	$(~~585~~559)

2   When system costs and benefits from the Combined Projects are extended out

3   through 2050, covering the full depreciable life of the owned-wind projects included in

4   the 2017R RFP final shortlist, the Combined Projects reduce customer costs in seven

5   out of nine price-policy scenarios. Customer benefits, range from $~~60~~34 million in the

6   medium natural gas, zero CO_2 scenario to $~~585~~559 million in the high natural gas, high

7   CO_2 scenario. Under the central price-policy scenario, assuming medium natural-gas

8   prices and medium CO_2 prices, the PVRR(d) benefits of the Combined Projects are

9    $~~177~~151 million. The Combined Projects provide significant customer benefits in all

10   price-policy scenarios, and the net benefits are unfavorable only when low natural-gas

11   prices are paired with zero or medium CO_2 prices. These results show that upside

12   benefits far outweigh downside risks.

1   O&M expenses, the Wyoming wind-production tax, and PTCs. The project costs are

2   netted against updated system impacts from the Combined Projects, reflecting the

3   change in NPC, emissions, non-NPC variable costs, and system fixed costs that are

4   affected by, but not directly associated with, the Combined Projects.

5   **CORRECTED Figure 5-SD Updated Total-System Annual Revenue Requirement With the Combined Projects (Benefit)/Cost ($ million)**

6   The data shown in this figure for the updated economic analysis have the same

7   basic profile as the data from the original economic analysis summarized in my direct

8   testimony. This profile shows that despite a reduction in PTC benefits associated with

9   changes in federal tax law, the reduced costs from winning bids from the 2017R RFP

10   continue to generate substantial near-term customer benefits, reduce the magnitude and

11   shorten the duration over which costs increase after federal PTCs for new wind

12   resources expire, and continue to contribute to customer benefits over the long-term.

13   The year-on-year reduction in net benefits from 2036 to 2037 is driven by the

14   Company's conservative approach to extrapolate benefits from 2037 through 2050

15   based on modeled results from the 2028 through 2036 timeframe. This leads to an

1   Projects were evaluated without solar PPA bids.

2   **CORRECTED Table 4-SD Solar Sensitivity with Solar PPAs Included**
in lieu of the Combined Projects (Benefit)/Cost ($ million)

	Sensitivity PVRR(d)	Benchmark PVRR(d)	Change in PVRR(d)
Medium Gas, Medium CO2			
SO Model	$(334)	$(343)	$9
PaR Stochastic Mean	$(~~203~~222)	$(~~311~~333)	$~~108~~111
PaR Risk Adjusted	$(~~213~~233)	$(~~327~~349)	$~~114~~116
Low Gas, Zero CO2			
SO Model	$(206)	$(145)	$(61)
PaR Stochastic Mean	$(~~126~~141)	$(~~104~~126)	$(~~22~~15)
PaR Risk Adjusted	$(~~133~~148)	$(~~109~~131)	$(~~24~~17)

3   In the medium natural gas, medium CO_2 price-policy scenario, a portfolio with

4   the Combined Projects delivers greater customer benefits relative to a portfolio that

5   adds solar PPA bids without the Combined Projects. Customer benefits are greater

6   when the resource portfolio includes the Combined Projects without solar PPA bids by

7    $~~114~~116 million in the medium natural gas, medium CO_2 price-policy scenario based

8   on the risk-adjusted PaR results. In the low natural gas, zero CO_2 price-policy scenario,

9   the portfolio with solar PPA bids and without the Combined Projects has higher net

10   customer benefits relative to a portfolio containing just the Combined Projects. The

11   increase in net benefits in the solar PPA portfolio is $~~24~~17 million based on the risk-

12   adjusted PaR results.

13 **Q.   What were the results of the solar sensitivity where solar PPA bids are pursued**

14   **with the Combined Projects?**

15 A.   Table 5-SD summarizes PVRR(d) results for the solar sensitivity where solar PPA bids

16   are assumed to be pursued along with the proposed investments in the Combined

1   Projects. This sensitivity was developed using SO model and PaR simulations through

2   2036 for the medium natural gas, medium CO_2 and the low natural gas, zero CO_2 price-

3   policy scenarios. The results are shown alongside the benchmark study in which the

4   Combined Projects were evaluated without solar PPA bids.

CORRECTED Table 5-SD Solar Sensitivity with Solar PPAs Included
With the Combined Projects (Benefit)/Cost ($ million)

	Sensitivity PVRR(d)	Benchmark PVRR(d)	Change in PVRR(d)
Medium Gas, Medium CO2			
SO Model	$(602)	$(343)	$(259)
PaR Stochastic Mean	$(~~442~~482)	$(~~311~~333)	$(~~131~~149)
PaR Risk Adjusted	$(~~464~~504)	$(~~327~~349)	$(~~137~~155)
Low Gas, Zero CO2			
SO Model	$(286)	$(145)	$(141)
PaR Stochastic Mean	$(~~185~~217)	$(~~104~~126)	$(~~81~~91)
PaR Risk Adjusted	$(~~195~~227)	$(~~109~~131)	$(~~86~~96)

6   When the solar PPAs are pursued in addition to the Combined Projects, the total

7   benefits increase, but are diluted (*i.e.*, the aggregate net benefits are less than the sum

8   of the benefits for the cases where Combined Projects or solar PPAs are pursued

9   independently).

10   **Q.   What conclusions can you draw from these solar sensitivity analyses?**

11   A.   These sensitivities demonstrate that should the Company choose to pursue solar bids

12   through the 2017S RFP, the resulting solar PPAs would not displace the Combined

13   Projects as an alternative means to deliver economic savings for customers.

14   While the sensitivity with a portfolio containing solar PPAs without the

15   Combined Projects produces a PVRR(d) with net benefits that are slightly higher than

1   sensitivity was developed using SO model and PaR simulations through 2036 for the

2   medium natural gas, medium CO_2 and the low natural gas, zero CO_2 price-policy

3   scenarios. The results are shown alongside the benchmark study in which the Combined

4   Projects were evaluated without wind repowering.

**CORRECTED Table 6-SD Wind-Repowering
Sensitivity (Benefit)/Cost ($ million)**

	Sensitivity PVRR(d)	Benchmark PVRR(d)	Change in PVRR(d)
Medium Gas, Medium CO2			
SO Model	$(541)	$(343)	$(198)
PaR Stochastic Mean	$(~~475~~497)	$(~~311~~333)	$(164)
PaR Risk Adjusted	$(~~498~~520)	$(~~327~~349)	$(171)
Low Gas, Zero CO2			
SO Model	$(313)	$(145)	$(169)
PaR Stochastic Mean	$(~~255~~277)	$(~~104~~126)	$(152)
PaR Risk Adjusted	$(~~268~~290)	$(~~109~~131)	$(159)

6   In the wind-repowering sensitivity, customer benefits increase significantly

7   when the wind repowering project is implemented with the Combined Projects in both

8   the medium natural gas, medium CO_2 and the low natural gas, zero CO_2 price-policy

9   scenarios. These results demonstrate that customer benefits not only persist, but

10   increase, if both the wind-repowering project and the Combined Projects are

11   completed.

12 **Q.   Please summarize the conclusion of your supplemental direct testimony.**

13 A.   The results of the 2017R RFP confirm that the Combined Projects are the least-cost,

14   least-risk customer resources available to serve the Company's customers. The

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