Rocky Mountain Power
Docket No. 12-035-92
Witness: Rick T. Link

BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF UTAH

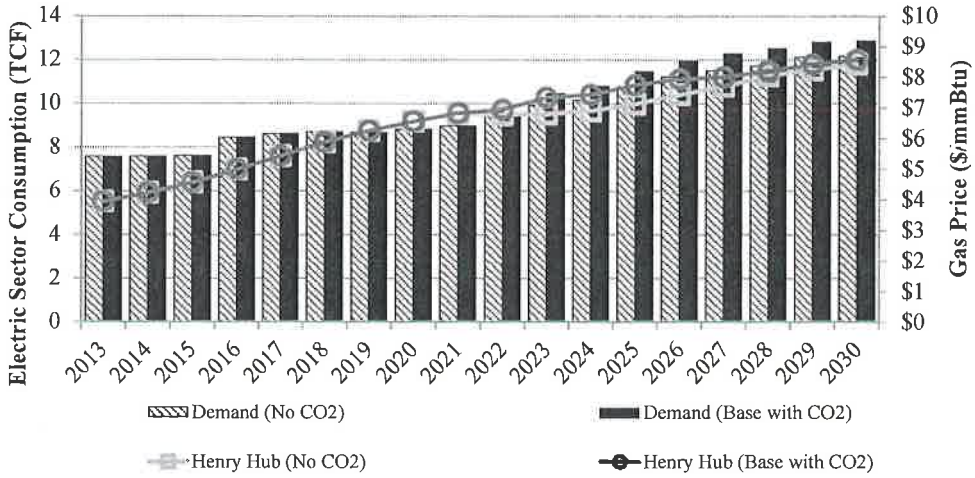
ROCKY MOUNTAIN POWER

REDACTED
Rebuttal Testimony of Rick T. Link

February 2013

DPU Cross 2

Figure 7R
Third Party Forecast: Gas Consumption & Gas Price Changes with Varying CO_2 Price Assumptions



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514 **Q. What types of third party CO_2 price forecasts do you evaluate in developing**
515 **a reasonable range of CO_2 price trajectories?**

516 A. When reviewing third party CO_2 price forecasts, we focus on recent projections
517 from reputable forecast services such as [redacted]
518 [redacted]. As a point of reference, we often compare these forecasts with U.S.
519 EPA's analysis of past policy proposals, focusing on then current baseline
520 projections and any CO_2 price ceilings and floors that may have been included in
521 those proposals. The intent is to provide context for how current price forecasts
522 that take into consideration current market conditions and the current policy
523 landscape, compare with well-known policy proposals that have been debated in
524 the past.

525 **Q. Have any of the parties to this case suggested the Company review additional**
526 **CO_2 price forecasts?**

527 A. Yes. Sierra Club describes how Synapse Energy Economics, Inc., the consulting

firm that employs Sierra Club witness Dr. Jeremy Fisher, has reviewed a wide range of CO_2 price assumptions used in IRP and utility dockets over the 2009 – 2012 timeframe and further reviewed government and "other" forecasts to arrive at a range of base, low and high CO_2 price assumptions.[7] Sierra Club suggests that these data show the Company's CO_2 price assumptions are too low. Moreover, Sierra Club testifies that U.S. EPA's analysis of these past policy proposals produced a range of CO_2 price trajectories and that a valid mechanism of evaluating the high and low estimates of a particular bill would be to look at a range of models and range of scenarios.

Q. How do you respond?

A. As noted earlier, the Company has focused its review on *recent* third party forecasts. Reviewing price forecasts used by others for planning purposes dating back to 2009 is not a reasonable means to establish a range of CO_2 price assumptions that take into consideration current market conditions and policy developments. Natural gas prices have a significant impact on prospective CO_2 price levels that would be required to achieve an emissions target. Higher natural gas prices increase the cost of reducing emissions because it increases the cost of transitioning away from coal-fired generation to natural gas-fired generation. Conversely, lower natural gas prices reduce the cost of achieving emission reductions by reducing the cost of transitioning to natural gas-fired generation, which is more efficient and produces lower CO_2 emissions. Consequently, the CO_2 price required to achieve an emissions target is correlated with the price of natural gas, where, for a given emissions reduction target, high natural gas prices

[7] Please refer to the Direct Testimony of Sierra Club witness Dr. Jeremy Fisher at page 10, line 3.

yield a higher CO_2 price and low natural gas prices yield a lower CO_2 price. Given long-term forecasts for natural gas prices have dropped significantly since 2009, CO_2 price assumptions developed as much as four years ago are antiquated and not relevant to current market conditions. Moreover, it is not reasonable to review the range of CO_2 price trajectories developed by U.S. EPA's analysis of past legislative proposals, which are similarly dated.

Updated Natural Gas and CO_2 Price Scenario Results

Q. Please describe the results from the updated natural gas and CO_2 price scenarios.

A. The natural gas and CO_2 price scenario results show that the investment in SCRs at Jim Bridger Unit 3 and Jim Bridger Unit 4 remains favorable to the next best, albeit higher cost natural gas conversion alternative under all base and high natural gas price scenarios at all assumed CO_2 price levels. In these scenarios, the PVRR(d) ranges between [redacted] favorable to the SCRs (base gas, high CO_2) and [redacted] favorable to the SCRs (high gas, zero CO_2). The PVRR(d) results are unfavorable to the SCRs only in those scenarios where low natural gas prices are assumed.

When low natural gas price assumptions are paired with base CO_2 price assumptions, the nominal levelized price of natural gas at Opal over the period 2016 to 2030 is $3.70 per mmBtu and the PVRR(d) is [redacted] unfavorable to the SCR investments required at Jim Bridger Units 3 and 4. In the low gas zero CO_2 scenario, the nominal levelized price of natural gas at Opal is $3.41 per mmBtu over the 2016 to 2030 timeframe, and the PVRR(d) is [redacted]

unfavorable to the SCRs. When low natural gas prices are paired with high CO_2 price assumptions, the nominal levelized price at Opal over the period 2016 to 2030 is $3.78 per mmBtu, and the PVRR(d) is [redacted] unfavorable to the SCRs. The PVRR(d) results from the updated natural gas and CO_2 price scenarios are summarized alongside the base case results in Confidential Exhibit RMP___(RTL-5R) to my testimony.

Q. How do the PVRR(d) results trend among the different updated natural gas price assumptions?

A. As demonstrated in the Company's original analysis, the updated scenario results show that there is a strong trend between natural gas price assumptions and the PVRR(d) benefit/cost associated with the incremental pollution control investments required for continued operation of Jim Bridger Units 3 and 4 as coal-fueled assets. With higher natural gas price assumptions, the incremental SCR investments become more favorable to the Jim Bridger Unit 3 and Unit 4 gas conversion alternatives. Conversely, lower natural gas prices improve the PVRR(d) results in favor of the gas conversion alternative. Lower natural gas prices lower the fuel cost of the gas conversion alternative, lowers the fuel cost of the other natural gas-fueled system resources that partially offset the generation lost from the coal-fueled Jim Bridger units, and lowers the opportunity cost of reduced off system sales when Jim Bridger Units 3 and/or 4 operate as a gas-fueled generation assets.

Q. Can you infer from this trend how far natural gas prices would need to fall for gas conversion to become favorable to making the incremental

environmental investments in Jim Bridger Units 3 and 4?

A. Yes. Confidential Exhibit RMP___(RTL-6R) to my testimony graphically displays the updated relationship between the nominal levelized natural gas price at the Opal market hub over the period 2016 through 2030 and the PVRR(d) benefit/cost of the incremental investments required for continued coal operation of Jim Bridger Units 3 and 4. To isolate the effects of CO_2 prices, which as I described earlier are assumed to elicit a natural gas price response due to changes in demand for natural gas in the electric sector, the natural gas price relationship with PVRR(d) results is shown for the natural gas price scenarios in which the base case CO_2 price assumption is used. Based upon this trend, levelized natural gas prices over the period 2016 through 2030 would need to decrease by 15 percent, from $5.72 per mmBtu to $4.86 per mmBtu, to achieve a breakeven PVRR(d).

Q. Has the Company's natural gas price curve for Opal changed since September 2012?

A. Yes. The nominal levelized natural gas price at Opal from the Company's December 2012 OFPC is $5.54 per mmBtu, which is approximately three percent lower than the updated base case. Based upon the relationship above, the predicted PVRR(d) with the most recent gas prices would be [redacted] and remain favorable to the SCR investments required at Jim Bridger Units 3 and 4.

Q. What CO_2 price would be required to change the PVRR(d) results in favor of converting Jim Bridger Units 3 and 4 to natural gas?

A. Confidential Exhibit RMP___(RTL-7R) to my testimony includes an updated

graphical representation of the relationship between the nominal levelized CO_2 price over the period 2016 to 2030 and the PVRR(d) benefit/cost of the incremental investments required for continued coal operation of Jim Bridger Units 3 and 4. To isolate the effects of fundamental shifts in the natural gas price assumptions, the CO_2 price relationship with the PVRR(d) results is shown for the two CO_2 price scenarios that are paired with the same underlying base case natural gas price assumption. Based upon the trend between PVRR(d) and nominal levelized CO_2 price assumptions, the levelized CO_2 prices over the period 2016 through 2030 would need to exceed $30 per ton, more than three times the base case nominal levelized CO_2 price assumption, to achieve a breakeven PVRR(d) for the Jim Bridger Unit 3 and Unit 4 SCR investments.

Q. Have you assigned probabilities to each of these scenarios to arrive at a weighted PVRR(d) result?

A. No. The DPU has taken the position that the PVRR(d) results from the Company's natural gas and CO_2 price scenarios should be weighted by a scenario specific probability representing the likelihood that each case will actually occur. While such an approach would as a matter of convenience produce a single PVRR(d) outcome, it is problematic in that there is no way to develop empirically derived probability assumptions. Rather, assigning probability assumptions would be a highly subjective exercise largely informed by individual opinion.

Q. How does the Company use the natural gas and CO_2 price scenario results to inform the Company's decision to pursue the Jim Bridger Unit 3 and Unit 4 SCR investments?

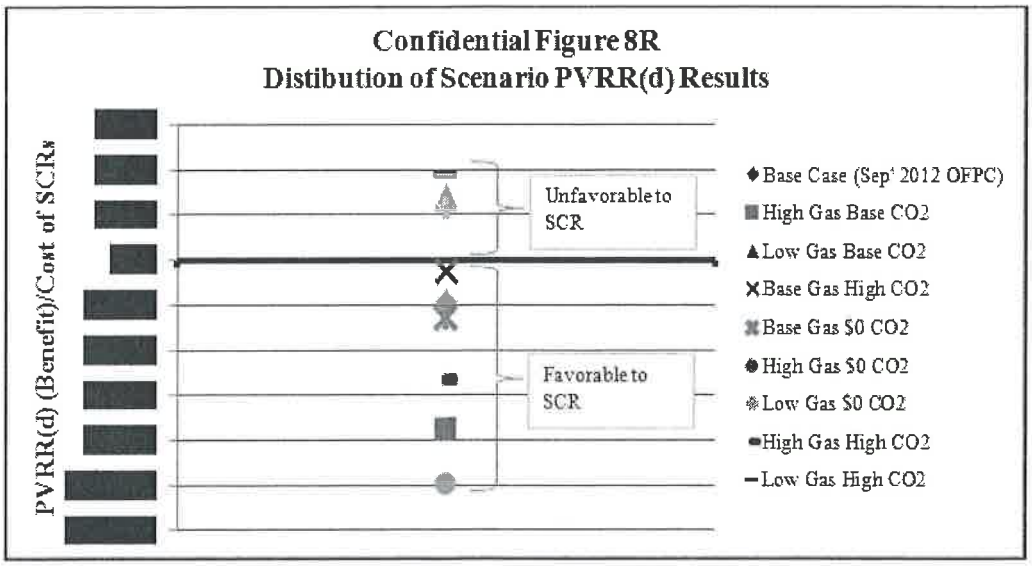
A. We first evaluate the magnitude of the PVRR(d) results from the base case, which is defined by assumptions representing the Company's best estimate of forward looking assumptions at any given point in time. The base case results provide an initial look at how favorable or unfavorable the SCR investments are in relation to the next best alternative and provides useful context when reviewing scenario results. The updated base case results summarized earlier in my testimony yield a PVRR(d) that is [redacted] favorable to the Jim Bridger Unit 3 and Unit 4 SCRs. This outcome also indicates that when the Company's best estimate of forward looking assumptions are used, there is a reasonably sized "cushion" in the PVRR(d) results allowing for some erosion of the favorable economics should long term natural gas prices or CO_2 prices change from what was assumed in the base case analysis. The natural gas and CO_2 price scenarios are then used to quantify how sensitive the PVRR(d) results are to these key assumptions and provide the foundation for judging risk.

Q. Can you describe how the Company has evaluated risk in the context of the updated results from the natural gas and CO_2 price scenarios?

A. Yes. Confidential Figure 8R below shows the distribution of PVRR(d) results for the base case and the eight natural gas and CO_2 price scenarios. The figure shows that of the nine cases analyzed, six scenarios produce a PVRR(d) favorable to the SCR investments and the three scenarios with low gas price assumptions produce a PVRR(d) that is unfavorable to the SCR investments. The figure further illustrates the range of potential PVRR(d) outcomes among the scenarios analyzed. At one end of the spectrum, the PVRR(d) for the high gas zero CO_2

scenario is [redacted] favorable to the SCRs. On the other end of the spectrum, the PVRR(d) for the low gas high CO_2 scenario is [redacted] unfavorable to the Jim Bridger Unit 3 and Unit 4 SCRs. Among the scenarios analyzed, the distribution of PVRR(d) outcomes indicate a disproportionate risk profile. While there is a possibility evolution of future natural gas prices could render the decision to invest in SCRs to be higher cost than a gas conversion alternative, the cost impacts to customers of such an outcome are higher under a gas conversion alternative should future natural gas prices rise relative to the base case.

Confidential Figure 8R
Distibution of Scenario PVRR(d) Results

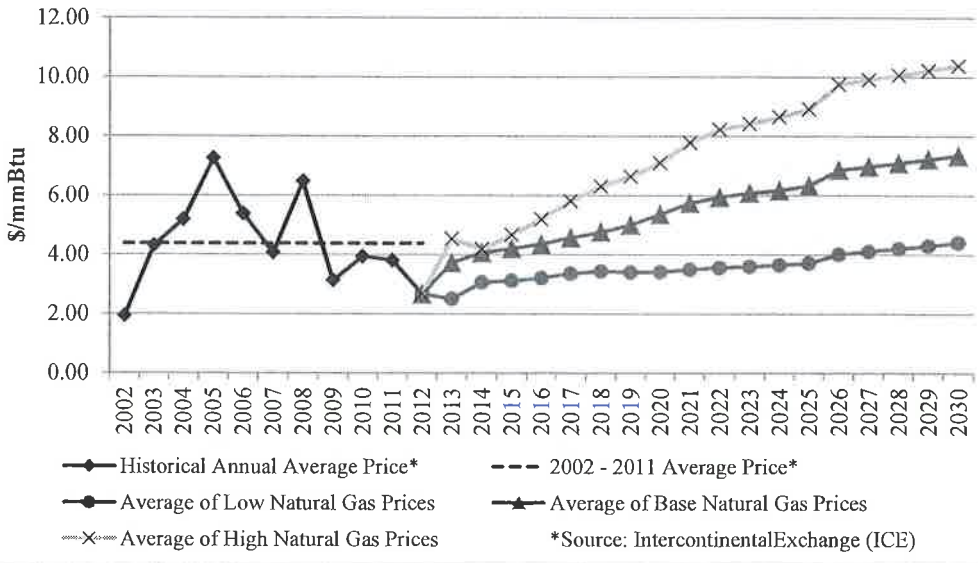


Q. Absent assigning probabilities to each scenario, how does the Company consider the uncertainty of future natural gas prices?

A. A useful metric is to compare the potential range of future natural gas price scenarios in the context of historical natural gas price levels. Figure 9R below plots historical natural gas prices alongside the average annual natural gas price at the Opal hub among the three low natural gas price scenarios, the three base natural gas price scenarios, and the three high natural gas price scenarios.

Opal natural gas prices among the low natural gas price scenarios never reach 2002 to 2012 historical average price levels over the course of the next 18 years. Among the low natural gas price scenarios, the average annual price for natural gas at Opal over the period 2013 through 2030 is $3.59 per mmBtu, which is 18 percent below 2002 to 2012 historical price levels. Among the base natural gas price scenarios, which are representative of the best estimate of forward looking assumptions, the average annual price for Opal natural gas is $5.66 per mmBtu, or 29% above 2002 – 2012 historical price levels. Among the high natural gas price scenarios, Opal natural gas prices average $7.60 per mmBtu, representing a 73% increase relative to 2002 to 2012 historical prices.

Figure 9R
Average Annual Natural Gas Prices at Opal



Additional Sensitivities

Q. Were there any other criticisms of the Company's analysis raised by parties in this case?

A. Yes. The OCS, WRA, and Sierra Club have taken the position that the