Q. Please state your name, business address, and present position with PacifiCorp dba Rocky Mountain Power ("the Company").

A. My name is Rick T. Link. My business address is 825 NE Multnomah St., Suite 600, Portland, Oregon 97232. I am Director, Origination within Commercial and Trading, for PacifiCorp Energy, a division of PacifiCorp.

Q. Please describe your education and business background.

A. I received a Bachelor of Science degree in Environmental Science from the Ohio State University in 1996 and a Masters of Environmental Management from Duke University in 1999. I have been employed in the Commercial & Trading organization of PacifiCorp since 2003, where I have held positions in market fundamentals, valuation, planning, and origination. Currently, I direct the work of the market assessment group, a group of valuation analysts, the integrated resource plan ("IRP"), contract administration, and origination. Prior to joining the Company, I was an energy and environmental economics consultant for ICF Consulting (now ICF International) from 1999 to 2003.

Q. Have you previously testified for the Company before the Utah Public Service Commission?

A. Yes. I provided direct and rebuttal testimony on the financial analysis supporting the Company's voluntary request for approval for the selective catalytic reduction ("SCR") controls at Jim Bridger Units 3 and 4 in Docket No. 12-035-92.

Purpose and Summary of Rebuttal Testimony

Q. What is the purpose of your rebuttal testimony?

A. The purpose of my rebuttal testimony is to respond to the direct testimony of

Sierra Club witness Mr. Jeremy I. Fisher and Utah Clean Energy ("UCE") witness Ms. Sarah Wright.

Q. Please summarize your rebuttal testimony in this proceeding.

A. My rebuttal testimony responds to Sierra Club's direct testimony on the Company's System Optimizer modeling and financial analysis supporting SCR investments required at Jim Bridger Units 3 and 4 in Docket No. 12-035-92. I also respond to UCE direct testimony on the Company's resource planning and acquisition activities. My rebuttal testimony is summarized as follows:

- Sierra Club's recommendation sanctions related to Jim Bridger Unit 3 and 4 SCR costs, which are not at issue in this docket, are not supported.
- Sierra Club's claim that the benefits of the Jim Bridger Unit 3 and 4 SCR investments are insignificant is dependent upon a series of improper cost comparisons and is not credible.
- Settings used in the Company's System Optimizer modeling are appropriate, and despite Sierra Club's claim to the contrary, have no bearing on the Company's analysis showing benefits associated with Jim Bridger Unit 3 and Unit 4 SCR investments.
- The Company's PVRR(d) analysis, when reviewed with consideration of market conditions current at the time the Commission approved the EPC contract, continues to support the SCR investments required at Jim Bridger Units 3 and 4.

- UCE's position on resource planning and acquisition is not germane to this docket, is best suited for the IRP, and is inconsistent with resource planning principles.

System Optimizer Modeling

Q. Sierra Club witness Mr. Fisher challenges the accuracy of the System Optimizer model as used to analyze the SCR investments required at Jim Bridger Units 3 and 4 in Docket No. 12-035-92. How do you respond?

A. The Jim Bridger Unit 3 and 4 SCR investments have no bearing on revenue requirement in this docket. In fact, Mr. Fisher testifies that "[t]he SCRs at Jim Bridger are not currently part of this rate case, and thus are not available for a full or partial disallowance."[1] The Commission reviewed the Company's System Optimizer analysis in Docket No. 12-035-92 and the Company's analysis in that docket is accurate, and Sierra Club's recommendations for sanctions in this docket are not supported.

Q. Please describe the System Optimizer model and how it is used by the Company.

A. System Optimizer is a resource expansion optimization tool that uses a mixed integer programming ("MIP") solver to produce least cost resource portfolios. System Optimizer is equipped to analyze tradeoffs between operating and capital revenue requirement costs, associated with both existing and prospective new resources, while simultaneously evaluating the tradeoffs in energy value between existing and prospective new resource alternatives. System Optimizer is used in the

[1] See Direct Testimony of Mr. Fisher, page 24, line 21 and page 25, line 1.

Company's IRP and business planning process. The model is also used by the Company in its analysis of resource acquisition opportunities, resource procurement activities, and resource investments.

Q. Is System Optimizer an appropriate tool for analyzing incremental environmental investments required for coal resources?

A. Yes. System Optimizer is well equipped to evaluate capital investment decisions in which alternatives to those investments include early retirement or conversion to natural gas. System Optimizer's system dispatch and resource expansion capabilities can be used to understand how system operating costs and the cost for future resource needs change if alternatives to making environmental investments, such as early retirement or natural gas conversion, are pursued. Total system costs for each of these alternatives can be compared and analyzed among a wide range of scenarios to understand how future uncertainties, such as long term natural gas prices and potential future carbon dioxide ("CO_2") emission prices, affect the relative economics of each alternative.

Q. Describe how System Optimizer was used to analyze the SCR investments required for Jim Bridger Units 3 and 4.

A. For each of nine natural gas price and CO_2 emission price scenarios, the Jim Bridger Unit 3 and 4 SCR investments were analyzed by performing two System Optimizer runs. In one run, Jim Bridger Units 3 and 4 are assumed to continue operating as coal-fired resources, which requires the installation of SCR in 2015 for Jim Bridger Unit 3 and in 2016 for Jim Bridger Unit 4. In the second run, coal-fired operation ceases, the SCR equipment is not installed, and both units are

converted to natural gas. The present value revenue requirement ("PVRR") of each System Optimizer run is recorded, and the PVRR differential ("PVRR(d)") between the two model runs establishes the benefit or cost of the SCR investment relative to the gas conversion alternative.

Q. Are the PVRR(d) benefits of the Jim Bridger Unit 3 and 4 SCR investments calculated from System Optimizer insignificant?

A. No, and Sierra Club's claims to the contrary are not valid. Sierra Club asserts that Jim Bridger coal costs have increased, that these higher coal costs erode the PVRR(d) benefits of the SCR equipment at Jim Bridger Unit 3 and 4, and that an adjusted PVRR(d) result reflecting these higher coal costs is insignificant due to perceived limitations in System Optimizer. As discussed in the rebuttal testimony of Company witness Ms. Cindy A. Crane, Sierra Club recklessly misapplied the Company's coal cost data when developing its own long term coal cost forecast to draw misinformed conclusions that are entirely dependent upon an improper cost comparison. Ms. Crane also testifies that the Company correctly applied a coal cash coal cost forecast in its analysis of SCR investments at Jim Bridger Units 3 and 4. Consequently, Sierra Club's claim that the PVRR(d) benefit of the Jim Bridger Unit 3 and 4 SCR investments is greatly reduced due to higher coal costs is based on flawed analysis, and therefore, this claim is not credible. Moreover, Sierra Club inappropriately speculates that there are limitations in any given System Optimizer run that translate into a mathematical uncertainty in the PVRR(d) calculated from two System Optimizer runs.

Q. Could you briefly highlight the major differences in coal costs between what are included in the current proceeding and what were included in the analysis of SCR investments at Jim Bridger Units 3 and 4?

A. As described by Ms. Crane, the test period costs for Bridger Coal are prepared in accordance with Generally Accepted Accounting Principles ("GAAP") for regulated entities. GAAP accounting requires the recognition of both cash and non-cash costs for the period in which they occur. More specifically, the Bridger Coal Company test period costs include both the cash and accrued expenditures for the period and the non-cash costs of depreciation, depletion and amortization that are associated with past investments. The SCR analysis studies the impact of future investments and costs on customer rates by comparing present values of revenue requirements between alternative investment options and therefore excludes non-cash costs such as depreciation, depletion and amortization associated with past expenditures. Inclusion of the non-cash costs for past expenditures would not impact the result of the SCR analysis because the same value would be included across all scenarios. In other words, the SCR analysis studies are forward looking revenue requirement comparisons which capture the return on and of future investments. As a result, the Bridger Coal costs included in the test period of the current proceeding are not directly comparable to the coal supply costs included in the analysis of the SCR investments.

Q. Sierra Club describes the use of a gap setting in System Optimizer. Please describe this setting and explain how it is used.

A. The solution gap is setting available in commercial solvers that are used to find solutions to MIP optimization problems, which is the type of mathematical problem found in System Optimizer. The solution gap is a measure of how far the optimized solution is from an estimate of a perfectly optimal solution. The estimate of the perfectly optimal solution is calculated by the System Optimizer solver by relaxing integer constraints and treating the optimization problem as a linear program ("LP"). Because the LP optimization ignores the integer constraints found in the true MIP optimization problem, the solution to the LP optimization can reflect outcomes that are not possible to implement in the real world (i.e. building 2.5 megawatts of a 600 megawatt combined cycle plant or retiring 7.8 megawatts of a 400 megawatt coal unit). As a result, the estimate of the perfectly optimal solution may not be achievable and is not necessarily representative of the perfectly optimal MIP solution.

The gap setting, which is specified as a percentage, defines an acceptable maximum percentage variance from an estimate of a perfectly optimal solution. MIP optimization problems are complex mathematical problems, and configuring a commercial solver to find a perfectly optimal solution can lead to excessive model run times or cause the run to terminate due to computing power limitations. With current computer software and hardware capabilities, it is often not practical to configure a commercial solver to find the perfectly optimal solution for complex MIP optimization problems. In these instances, the gap setting is used to prevent early termination of a simulation and excessive model run times. The Company used a solution gap setting of 0.2 percent in System Optimizer when analyzing the

SCR investments required at Jim Bridger Units 3 and 4 in Docket No. 12-035-92.

Q. Is Sierra Club's estimate of the mathematical uncertainty in the Jim Bridger Unit 3 and 4 PVRR(d) results from System Optimizer correct?

A. No. Sierra Club uses the variance between System Optimizer's MIP solution and an estimate of the perfectly optimal solution from System Optimizer studies that were not used to analyze the Jim Bridger Unit 3 and 4 SCR investments. Sierra Club then incorrectly speculates that these unrelated results are indicative of System Optimizer runs that were used to analyze the Jim Bridger Unit 3 and 4 SCR investments in Docket No. 12-035-92.

Q. Would Sierra Club's calculations be correct if it had analyzed similar metrics from the System Optimizer runs used to analyze the Jim Bridger Unit 3 and 4 SCR investments?

A. No. As is the case in its analysis of Jim Bridger coal costs, Sierra Club is again formulating conclusions that are entirely dependent upon improper cost comparisons. Sierra Club compares a PVRR that is a rough measure of the level of optimality from a single System Optimizer run to the PVRR(d) between two runs. This approach is flawed in that it completely ignores the relative level of optimality between the two System Optimizer runs used to calculate the PVRR(d).

Q. Can one estimate how the solution gap setting might affect the PVRR(d) results reported by System Optimizer?

A. Yes. A PVRR(d) is calculated from two System Optimizer runs. For each System Optimizer run, the model reports the PVRR from the MIP solution and the PVRR from an estimate of the perfectly optimal solution. The PVRR(d) from the MIP

solutions can be calculated and the PVRR(d) from the estimates of the perfectly optimal solutions can be calculated. The two PVRR(d) results can then be compared to understand whether the gap setting is influential to the overall outcome.

An illustrative example of this calculation is summarized in Table 1R below. Using the actual MIP solution between the two runs, the PVRR(d) result shows a $300 million benefit to the first System Optimizer run. Using the estimated perfectly optimal solution between the two runs, there is a $305 million benefit to the first System Optimizer run. The difference in the two PVRR(d) results is $5 million, which is an accurate approximation of how influential the gap setting is on the overall MIP PVRR(d) results reported by System Optimizer. Note, the variance between the MIP PVRR and the estimated perfectly optimal PVRR is $50 million and $45 million for the first and second System Optimizer runs, respectively. Taken alone, neither of these figures approximate how the gap setting might be influencing the PVRR(d) outcome reported by System Optimizer.

Table 1R
Illustrative Example of 0.2% Solution Gap PVRR(d) Analysis

Metric Description	System Optimizer Run 1 ($ million)	System Optimizer Run 2 ($ million)	PVRR(d) Benefit/(Cost) of Run 1 ($ million)
MIP PVRR	$30,200	$30,500	$300
Estimated Perfectly Optimal PVRR	$30,150	$30,455	$305
MIP PVRR less Estimated Optimal PVRR	$50	$45	$5

Q. Did Sierra Club have access to the type of calculations illustrated in Table 1R of your rebuttal testimony?

A. Yes. Sierra Club cites a highly confidential attachment to the Company's response

to SC 2.1 in the direct testimony of Sierra Club witness Mr. Fisher.[2] The cited attachment explicitly describes how the Company evaluates the gap setting in a manner that is consistent with the calculations summarized in Table 1R.

Q. Does the Company routinely check to see if the gap setting might have undue influence on the PVRR(d) results calculated from System Optimizer runs?

A. Absolutely. When evaluating the relative difference in solutions from MIP optimization problems that are configured with a gap setting, it is sound modeling practice to check whether the effect of the gap setting needs to be considered when interpreting model results. As it relates to System Optimizer, this is of greatest concern when the relative difference between the MIP solution and the estimate of the perfectly optimal solution varies significantly between two model runs and when this variance is equal to or greater than the PVRR(d) calculated from the MIP solution.

Q. Did the Company evaluate the gap setting impacts on the PVRR(d) results for the System Optimizer runs used to analyze the SCR investments required at Jim Bridger Units 3 and 4?

A. Yes. In the Company's base case analysis of the Jim Bridger Unit 3 and 4 SCR investments, the reported variance from the estimated perfectly optimal PVRR was [redacted] in the continued coal operation System Optimizer run and [redacted] for the gas conversion System Optimizer run. The difference between these two figures indicate that the PVRR(d) of the estimated perfectly optimal solution is [redacted] in favor of the SCR investments. As such, the [redacted] base case

[2] Ibid, page 15, Footnote 30.

benefit of the SCR investments, which I presented in my rebuttal testimony in Docket No. 12-035-92, could be as high as [redacted] when taking into consideration the potential impact of the gap setting on the reported MIP PVRR(d) results. When correctly evaluating the potential impact of the gap setting on these runs, the differences between the MIP solution and the estimate of the perfectly optimal solution are not significant and have no bearing on the overall conclusion that the SCR investments at Jim Bridger Unit 3 and 4 is lower cost than the gas conversion alternative.

Natural Gas Prices

Q. How do natural gas prices impact the economic benefits of the SCR investments required at Jim Bridger Units 3 and 4?

A. There is a strong relationship between natural gas price assumptions and the PVRR(d) benefit or cost associated with the Jim Bridger Unit 3 and 4 SCRs as compared to a natural gas conversion alternative. When natural gas prices assumptions are increased, the SCR investments become more favorable to the natural gas conversion alternative. Conversely, low natural gas prices improve the PVRR(d) results in favor of the natural gas conversion alternative. Reduced natural gas prices lowers the fuel cost of the gas conversion alternative, lowers the fuel cost of 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 4 operate as gas-fueled generation assets.

Q. Did the Company analyze the impacts of different natural gas price

assumptions in its analysis of the Jim Bridger Unit 3 and 4 SCR investments?

A. Yes. The Company is keenly aware that natural gas prices are influential to the benefits of the SCR investments at Jim Bridger Unit 3 and 4 and that future natural gas prices are uncertain. For these very reasons, the Company evaluated both low and high natural gas price sensitivities, and I summarized these sensitivities in my rebuttal testimony in Docket No. 12-035-92.[3]

Q. Did the Company estimate how far natural gas prices would need to fall in order to achieve breakeven economics between the SCR investments and the natural gas conversation alternative?

A. Yes. Based upon the strong relationship between the levelized natural gas price at the Opal market hub and the PVRR(d) results, I testified that natural gas prices would need to fall by 15 percent, from $5.72 per MMBtu to $4.86 per MMBtu, to achieve a breakeven PVRR(d).[4]

Q. Sierra Club's claims that the relationship between the levelized natural gas price at Opal and its re-analysis of the PVRR(d) results shows the break-even natural gas price should be $5.30 per MMBtu. Is this claim valid?

A. No. As mentioned earlier in my rebuttal testimony and as addressed in the rebuttal testimony of Company witness Ms. Crane, Sierra Club arrives at this figure on the basis of a flawed coal cost analysis that is not credible.

Q. How did the natural gas price forecast at the Opal market hub change between the time the Company filed its rebuttal testimony and the time the Commission

[3] Confidential Rebuttal Testimony of Rick T. Link in Docket No. 12-035-92, pages 30 - 31, lines 580 - 616.
[4] Ibid, page 31, lines 606 - 609.

approved the EPC contract in Docket No. 12-035-92?

A. The Company's rebuttal analysis in Docket No. 12-035-92 was performed using the September 2012 official forward price curve ("OFPC") for its base case analysis. At the time the Commission approved the EPC contract, the most current OFPC was from September 2013. The levelized natural gas price at Opal over the period 2015 through 2030 from the Company's September 2013 OFPC is $5.35 per MMBtu, which is $0.49 per MMBtu above the estimated breakeven natural gas price described in my rebuttal testimony in Docket No. 12-035-92.[5] Contrary to Sierra Club's claims, this demonstrates that the Company's analysis, when reviewed with consideration of market conditions current at the time the Commission approved the EPC contract, continues to support the SCR investments required at Jim Bridger Units 3 and 4.

Resource Planning

Q. UCE witness Ms. Wright states that resource planning and acquisition must be undertaken with the specific objective of reducing greenhouse gas emissions to ensure that rates are just and reasonable and in the public interest. How do you respond?

A. While UCE expresses its position on this topic, it does not identify any specific revenue requirement items germane to this docket that run counter to its views, and in fact, Ms. Wright states that she "does not propose specific revenue requirement adjustments."[6] UCE does provide commentary on the Company's IRP; however,

[5] Ibid.
[6] Highly Confidential Direct Testimony of Ms. Wright on behalf of Utah Clean Energy, page 5, lines 65 - 66.

the IRP is not being litigated in this docket. UCE's comments appear to be better suited for consideration in the Company's IRP, which is performed consistent with the Commission's IRP Standards and Guidelines as outlined in Docket No. 90-2035-01.

Q. Notwithstanding the applicability of UCE's position on this issue in this docket, do you agree with its views?

A. No. UCE contends that any resource activity that does not significantly reduce greenhouse gas emissions from electricity generation cannot be in the public interest.[7] In taking this view, UCE entirely dismisses critical resource planning and acquisition considerations that include reliability, cost, and a wide range of different types of risk. In its IRP, the Company evaluates many different criteria, including CO_2 emissions, reliability, cost, and risk when choosing a preferred portfolio that is consistent with the long-run public interest.

Q. Is UCE's analysis of carbon costs from the Company's 2013 IRP reasonable?

A. No. UCE's analysis is inherently flawed because it inappropriately applies system CO_2 emission levels from two resource portfolios to CO_2 price assumptions that differ from those used to generate the resource portfolios in the first place. This method produces projections of CO_2 costs across a range of CO_2 price scenarios that are not comparable because it inherently and inappropriately assumes the Company would blindly pursue a resource strategy without taking into consideration changes in the planning environment over time.

UCE's analysis simply shows that should the planning environment change such

[7] Ibid. page 8, lines 129 - 131.

that future costs for CO_2 emissions and coal costs increase and future prices for natural gas decrease, then the least cost resource plan would be different. The Company clearly and specifically addresses this precise observation in its 2013 IRP acquisition path analysis, which explains how the Company's near-term and long-term resource acquisition strategy would change should the planning environment materialize consistent with the conditions used to develop the low carbon portfolio that Ms. Wright chose to summarize in her direct testimony.[8]

Conclusion

Q. Please summarize the conclusions of your testimony.

A. The conclusions of my testimony are as follows:

- The solution gap setting used in System Optimizer has no bearing on the Company's analysis showing benefits associated with Jim Bridger Unit 3 and 4 SCR investments as analyzed in Docket No. 12-035-92.
- Contrary to Sierra Club's claims, the Company's PVRR(d) analysis, when reviewed with consideration of market conditions current at the time the Commission approved the EPC contract, continues to support the SCR investments required at Jim Bridger Units 3 and 4.
- UCE's position on resource planning and acquisition is not germane to this docket, is best suited for the IRP, and is inconsistent with resource planning principles.

Q. Does this conclude your rebuttal testimony?

A. Yes.

[8] See the Company's acquisition path analysis in the 2013 IRP, Volume I, Table 9.2, page 267.