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August 13, 2009

Via Electronic and US Mail

Public Utility Commission
Attn: Filing Center
550 Capitol St. NE #215
P.O. Box 2148
Salem OR 97308-2148

Re: In the Matter of PUBLIC UTILITY COMMISSION OF OREGON Investigation into Forecasting Forced Outage Rates for Electric Generating Units
Docket No. UM 1355

Dear Filing Center:

Enclosed please find an original and five copies of the Confidential Supplemental Reply Testimony and Exhibits of Randall J. Falkenberg on behalf of the Industrial Customers of Northwest Utilities ("ICNU") in the above-referenced docket. The confidential pages and exhibits are inserted in separate envelopes and sealed pursuant to the protective order in this proceeding. Also enclosed is a complete Redacted Version of the testimony.

ICNU is serving the confidential testimony and exhibits upon the parties who signed the protective order in this proceeding, with the exception of Idaho Power Company. The confidential information was originated by PacifiCorp, which ICNU understands has objected to the disclosure of any confidential information to Idaho Power Company pursuant to paragraph 11 of the protective order.

Thank you for your assistance.

Sincerely yours,

/s/ Irion A. Sanger
Irion A. Sanger

Enclosures
cc: Service List

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that I have this day served the foregoing Confidential Supplemental Reply Testimony and Exhibits of Randall J. Falkenberg on behalf of the Industrial Customers of Northwest Utilities upon the parties who have signed the Protective Order in this docket (with the exception of Idaho Power Company), on the official service list shown below for UM 1355, via U.S. Mail. A Redacted Version of the testimony and exhibits was served via U.S. mail to parties which have not waived paper service, and via electronic mail to the entire service list.

Dated at Portland, Oregon, this 13th day of August, 2009.

/s/ Brendan E. Levenick
Brendan E. Levenick

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BEFORE THE PUBLIC UTILITY COMMISSION

OF OREGON

UM 1355

In the Matter of	)
	)
The Public Utility Commission of Oregon	)
Investigation into Forecasting Outage Rates	)
For Electric Generating Units	)
	)

SUPPLEMENTAL REPLY TESTIMONY OF

RANDALL J. FALKENBERG

ON BEHALF OF

THE INDUSTRIAL CUSTOMERS OF NORTHWEST UTILITIES

REDACTED VERSION

August 13, 2009

Q. HAVE YOU PREVIOUSLY FILED TESTIMONY IN THIS DOCKET?

A. Yes, on April 7 and May 13, 2009, I filed direct and reply testimony, respectively, on behalf of the Industrial Customers of Northwest Utilities ("ICNU").

Q. WHAT IS THE PURPOSE OF THIS REPLY TESTIMONY?

A. I am responding to PacifiCorp's supplemental testimony.

Forced Outage Rate ("FOR") Collar: Goals and Data Sources

Q. WHAT IS THE PURPOSE OF AN OUTAGE RATE COLLAR?

A. An outage rate collar could serve two possible ends: 1) improvement of forecast accuracy; and/or 2) to implement a minimum performance requirement. Although the consensus view seems to be that a collar is intended to provide for an improvement in outage rate forecast accuracy, I believe a minimum performance requirement is also a reasonable goal, at least in the case of a Company with a Power Cost Adjustment Mechanism ("PCAM").

A collar methodology would replace annual outage rates that fall outside of a pre-defined range with more normal ones. This should then result in a more accurate forecast, because it is unrealistic to assume that an abnormal year will be repeated once every four years, the implicit assumption in a four year rolling average.

The collar can also screen out abnormally poor performance: thus, imposing a "minimum performance requirement."[1/] However, neither the Staff nor PacifiCorp proposals appear intended to provide a "performance standard" as

[1/] Both the Company and Staff proposals are symmetrical, allowing for replacement of abnormally low outage as well. However, most of the focus in this case has been on the screening out of high outage rates. The Company acknowledges that under its proposal the elevation of low outage rates will be rare and inconsequential. In any case, because the outage rate distribution is highly skewed, replacing a very high outage rate will have likely much more impact than replacing a very low one.

conventionally applied by regulators elsewhere. The PacifiCorp proposal might be described as replacing a unit's worst year in history with one nearly as bad. The Staff proposal relies on North American Electric Reliability Corporation ("NERC") data, but also replaces excluded outage rates with data that is well outside normal operating results for the industry as a whole. In this regard, both proposals share the same shortcoming, as I will demonstrate later.

The Staff method is reasonable and it does not pose an unreasonably difficult standard. It is, however, not the best possible solution, and I will offer an improved collar.

Q. HOW DO THESE TWO GOALS RELATE TO THE ISSUE OF WHETHER PLANT HISTORY OR NERC DATA IS USED?

A. I believe that use of unit specific data is likely to be more useful if the primary goal is forecast accuracy improvement, while NERC data is certainly more appropriate for establishing a minimum performance requirement. Unit specific data should provide better forecasts of future performance than industry averages. Conversely, the NERC data provides a more objective standard for evaluating performance. Proper use of either data source could further both goals. However, the matter of deciding what data to use is best determined by the Commission's prioritization of its overall goal.

The Staff proposal is reasonable and acceptable to ICNU for Portland General Electric ("PGE"), largely because PGE has a PCAM. The issue of accuracy is not as high of a priority because forecasts are subject to a partial true up. However, insuring an acceptable performance level is important when a PCAM is used.

Godfrey Testimony

Q. PLEASE SUMMARIZE YOUR COMMENTS CONCERNING MR. GODFREY'S TESTIMONY.

A. Mr. Godfrey's testimony concerning NERC data doesn't fully recognize the Company's past reliance on NERC data as a performance yardstick. Mr. Godfrey's "Alternative" collar proposal raises three concerns: 1) use of unsupported data; 2) reliance on an incorrect statistical assumption, and 3) failure to provide meaningful improvement in forecast accuracy.

Because the Commission has already stated that "past performance is the best predictor of a plant's outage rate,"[2/] historical plant data is more appropriate for PacifiCorp. I recommend modifications to PacifiCorp's proposal to address these concerns and to improve forecast accuracy.[3/]

Q. DOES MR. GODFREY SUPPORT STAFF'S USE OF NERC DATA?

A. No. Mr. Godfrey states:

> I discuss two issues: (1*) the non-comparable and non-verifiable nature of the NERC data* Staff proposes to use in its benchmarking proposal for forced outage rates.

PPL/102, Godfrey/1 (emphasis added).

> Staff proposes using NERC forced outage data, which are based on self reports by utilities. The data are not audited or verified by a third party. As a result, there is no way to determine whether the data reported to NERC are accurate or that they have been reported in a uniform manner.

PPL/102, Godfrey/3-4.

2/ Re PGE, OPUC Docket Nos. UE 180/181/184, Order No. 07-015 at 15 (Jan. 12, 2007).

3/ If it can be shown that use of NERC data will also provide for forecast accuracy improvement, it would help clarify this issue.

However, PacifiCorp has frequently measured its performance relative to "comparable" NERC peer groups in the past. The Company has been quite clear about this. For example, at the May 28, 2009 workshop counsel for the Company stated:

> I think we *often looked* to NERC [GADS] data on [a] fleet basis to demonstrate the prudence of our maintenance practices.

Re OPUC, Docket No. UM 1355, Transcript ("Tr.") of Workshop/Issues Presentation at 77 (May 28, 2009) (emphasis added and spelling corrected).

In UE 191, Company witness Mr. Mark Mansfield testified that PacifiCorp's performance was better than industry averages, which he derived from comparable NERC data. For example:

> At the same time, PacifiCorp's planned outage factor and equivalent availability factor, which results from the combination of forced outages and planned outages, are consistently better than the industry average.

ICNU/301, Falkenberg/7.

In Utah Docket No. 07-035-93, Mr. Mansfield also testified concerning the favorable comparison of PacifiCorp to NERC averages. He also singled out the Bridger plant's above average capacity factor. ICNU/301, Falkenberg/22. Consequently, these comparisons have not always been on a fleet basis.

In Washington Docket No. UE–032065, Mr. Richard Wolley also testified concerning the favorable comparison of the Company resource to NERC averages as concerns personnel and operator errors:

> The loss of Equivalent Availability Factor for the industry was 0.06 percent per unit-year and the rate for PacifiCorp is 0.03 percent per unit-year. PacifiCorp's performance is thus in line with – and in fact is slightly better than – the industry standard.

ICNU/301, Falkenberg/31.

Indeed, the testimony referenced in all of the cases above, deals specifically with comparisons the Company has made to NERC data. These prior statements in various regulatory venues demonstrate that the Company has frequently relied on NERC data in the past to evaluate its plant performance.

Q. IS MR. GODFREY'S ALTERNATIVE PROPOSAL BASED ON VERIFIABLE DATA?

A. No. Mr. Godfrey did not provide any documents or workpapers supporting his annual outage rate observations used in PPL/106. Consequently, at this point the Company data is not better supported than the NERC statistics.

Q. PLEASE DISCUSS MR. GODFREY'S PROPOSED ALTERNATIVE TO THE STAFF COLLAR.

A. Mr. Godfrey's proposal relies on unit specific outage rates rather than NERC data after removing outages longer than 28 days.[4/] However, both the Staff and Company proposals replace outage rates from an abnormal year with ones that they argue to be "closer to normal." Neither proposal moves very far off of the abnormal observation, however.

[4/] This is apparently done out of respect for the precedent established in UE 191, which I addressed in my earlier testimony. I endorse this aspect of the PacifiCorp proposal.

Q. WHY SHOULD ONE REPLACE AN ABNORMAL OUTAGE RATE WITH A MORE NORMAL ONE?

A. This is recognition of the well known statistical phenomena of *reversion to the mean*.[5/] The questioning by Commissioner Savage at the May 28, 2009 workshop seems to suggest this concept. Commissioner Savage asked if a four year rolling average should include a one in ten or one in twenty event. Tr. at 19.

Reversion to the mean suggests that an abnormal observation is likely to be followed by one that is closer to normal. This applies in many (though not all) situations, including outage rates. A high or low outage rate in a given year will likely be followed by one that is closer to the mean. To improve forecasts we would want to find a way to remove the bias created by including abnormal outage rates in the four year average. The difficulty, of course, is in defining what is abnormal and once that is decided, what to replace it with. This is basically the issue between Staff and PacifiCorp.

Q. DO PACIFICORP'S OUTAGE RATES EXHIBIT REVERSION TO THE MEAN?

A. Definitely. The figure below presents an analysis of PacifiCorp's average forced outage rates for the period 1989-2008 based on Mr. Godfrey's raw data provided in PPL/106. The figure shows the average of the "best year" for all units, the average of the subsequent year, the mean or average of all years, the average of the "worst year" and the following year. It shows that for PacifiCorp units, the average of the "best year" outage rates was 3%, while the average for the very next

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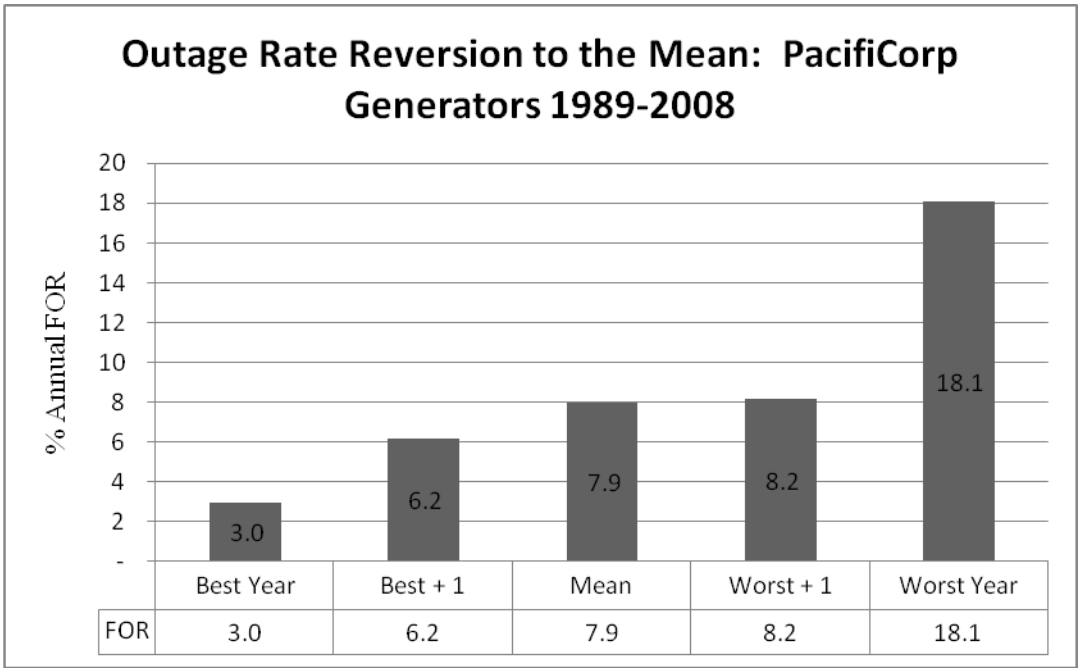
5/ This concept was first discussed by Sir Francis Galton in the late 19th century. He observed that taller parents may have taller offspring, but the offspring will be closer to the average height than the parent. Francis Galton, *Regression towards mediocrity in hereditary stature*. 15 J. ANTHROPOLOGICAL INST. 246 (1886).

year was 6.2%. This is much closer to the 20 year average of 7.9% than the "best year" average.

The average of the "worst year" outage rates was over 18%, while the outage rates in the very next year averaged only 8.2%, which is, again, much closer to the 20 year mean of 7.9%.

It is not surprising that the year after the "best" or worst" year for any unit is closer to the mean — by definition, they had to be. What is significant is how much closer to the mean they were. In fact, the year after the "worst" or "best" years reverts almost all the way back to the mean. Unfortunately, neither the Staff nor PaciCorp collar design assumes anything approaching full reversion to the mean. Instead, both proposals "revert" back to just slightly less extreme outcomes. For this reason, neither collar produces as much improvement in forecast accuracy as possible. This is a major concern with both proposals in achieving a goal forecast accuracy improvement.



Q. IS MR. GODFREY'S PROPOSAL BASED ON AN INCORRECT STATISICAL ASSUMPTION?

A. Yes. Mr. Godfrey assumes that generator outage rates follow a normal distribution, or "bell shaped curve." This is incorrect as outage rate distributions are asymmetrical and bounded, while the normal distribution is symmetrical but unbounded.

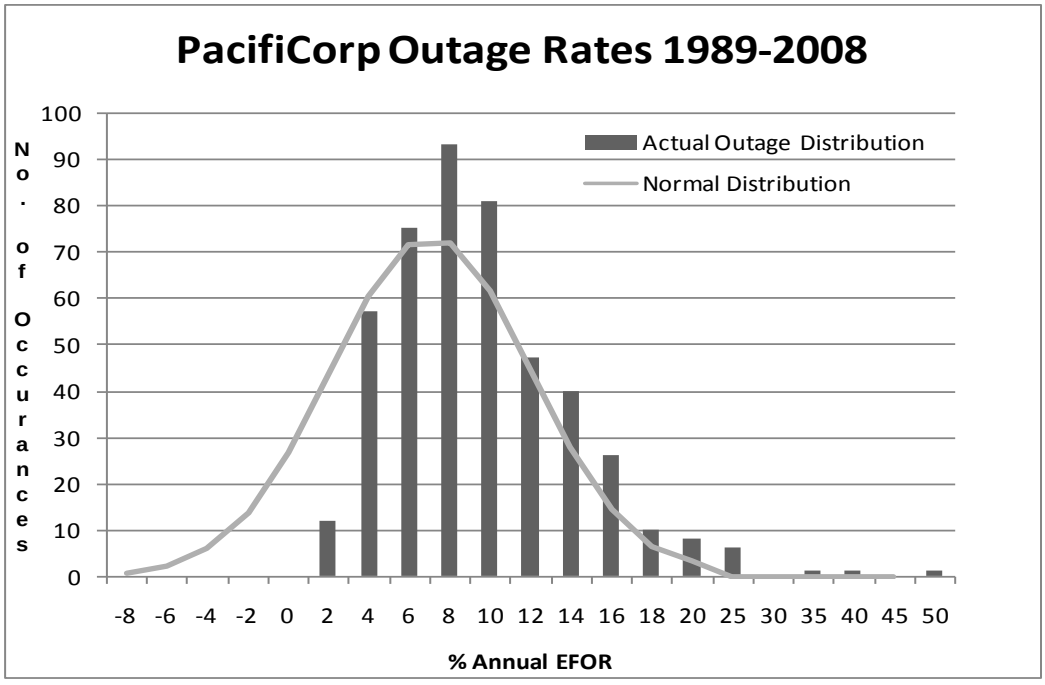
Q. PLEASE EXPLAIN FURTHER.

A. Any outage rate between 0% and 100% is possible, while anything greater or less is impossible. While more than 90% of all Mr. Godfrey's observations fall between zero and 15%, a few observations exceed 30%. However, there are no outage rates less than zero, which would be the case were they to follow a normal distribution. The data Mr. Godfrey uses are non-symmetrical and "skewed," again clearly unlike the bell shaped curve.

The figure below shows the actual distribution of outage rates used by Mr. Godfrey and that of a normal distribution with the same mean and standard deviation. The figure shows a plot of the number of occurrences of annual outage rates for PacifiCorp coal units from 1989 to 2009. In total there were 458 observations or "unit years" of data. The figure demonstrates the actual outage rates do not follow a normal distribution because too many actual outage rates occurred at the high end of the range (i.e., 25% or more) and too few at the low end of the range (less than zero) as compared to the predictions of the bell shaped curve.

As the figure illustrates, if the actual outage rates followed a normal distribution, many outages would have been less than zero, but there would have

been no annual outage rates equal to or above 25% observed in the data. In reality, there are never any outage rates less than zero, and there were 10 observations in excess of 25% (i.e., one in 45 unit years.) These observations demonstrate that the actual distribution is "skewed" to the high end of the range. Further, a normal distribution is "flatter" meaning that it would have fewer observations near the mean, as compared to the actual data.



Q. IS THIS ASSUMPTION CENTRAL TO MR. GODFREY'S PROPOSAL?

A. Yes, in fact it is the very foundation of his proposal. Mr. Godfrey argues in favor of using a collar range encompassing *two standard deviations* ("Two Sigma") about the mean, because "Typically the reported margin of error is about twice the standard deviation, the radius of a 95 percent confidence interval." PPL/102 Godfrey/10. This comment is applicable to a normal distribution, but not to Mr. Godfrey's actual outage rate data. The problem with Mr. Godfrey's approach can

be seen in the fact that the lower outage rate limit he computes is often negative: an impossible outcome.

Were outage rates to actually follow a normal distribution, PacifiCorp is advocating a collar based on the 97.5th and 2.5th percentiles. The "Two Sigma" rule excludes the most extreme 2.5th percentiles of observations on either side of the mean.[6/] As a result, "design specification" of the PacifiCorp collar is to exclude only 5% of all observations, or the best and worst 2.5%. To return to Commissioner Savage's query, the design of the Company collar is premised on replacement of a worse than one in 40 year event with a one in 40 event.[7/]

Because outage rates do not follow a bell shaped curve, the practical effect of the PacifiCorp collar is closer to replacement of a "worse than one in 20 event" with a "one in 19 event." This does not represent an effective way to improve forecasts because it does not reflect reversion to the mean.

Q. IS IT POSSIBLE TO ADDRESS THIS PROBLEM?

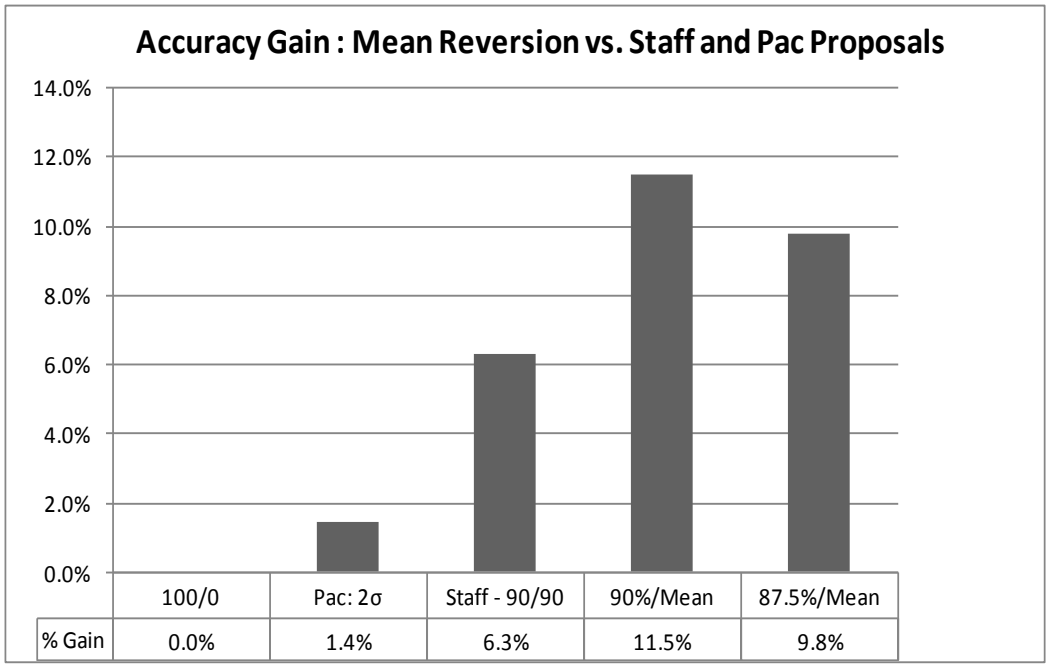
A. Yes. Rather than using the Two Sigma rule, one should simply compute the appropriate percentiles from the actual distribution. Staff did so in their proposal. The Two Sigma rule only applies in the case of the normal distribution and should not be applied here. A percentile, however, is a meaningful and measurable quantity for any sample. Selection of the exclusion percentile ranges then is a major task for collar design.

[6/] Mr. Godfrey also "rounded up" as the 95% confidence interval actually results from moving 1.96 Sigma from the mean. Assuming his distribution actually were normal he would be advocating use of a 97.7% and 2.3% collar range.

[7/] Given only 20 years of data, one may not be able to accurately define a one in 40 event, however.

Q. WOULD A TWO SIGMA COLLAR DESIGN IMPROVE FORECAST ACCURACY?

A. Not really. To test this, I compared the year-ahead outage rate forecast based on using the prior four year rolling average outage rate, with the collar design proposed by Mr. Godfrey. I applied this to the PacifiCorp actual outage rates, by unit for the period 1993 to 2008. I then computed the sum of squared errors between the forecasted outage rate and the actual. This is a standard technique for evaluating forecast efficacy. The results are shown in the figure below. I also compared the Company proposal to use of various other percentile ranges for the collar design and replacement strategies.



Q. PLEASE EXPLAIN THIS FIGURE.

A. I measured the reduction in the sum of squared errors for various scenarios based on the collar range (or exclusion percentage) and the replacement strategy. The far left hand data point is the 100/0 collar scenario. It does not exclude any observation — in effect, doing nothing. It allows everything within the 100th to

0th percentile ranges and replaces nothing (hence the 100/0 moniker). This produces a 0% improvement in forecast error and is the yardstick for evaluating other collars.

The "Pac-2 Sigma" scenario is Mr. Godfrey's proposal, which excludes only observations outside of the plus or minus Two Sigma ranges and replaces them with his proposed 2 Sigma upper and lower limits. As can be seen, the improvement in accuracy is minimal. His proposal is only 1.4% better than the 100/0 case.

The next scenario (labeled Staff-90/90) applies the Staff collar design and replacement strategy to the Company data. I label this as a 90/90 scenario because it replaces observations above the 90th percentile with ones equal to the 90th percentile.[8/] This improves accuracy by more than 6%, or 4 times more than the Company proposal. However, it is based on the use of Company rather than NERC data. I don't know how use of NERC data would affect the results. It does show, however, that given comparable data, the Staff collar design improves accuracy by more than the Company proposal.

Q. DID YOU REPEAT THIS TYPE OF ANALYSIS FOR OTHER COLLAR RANGES AND REPLACMENT STRATEGIES?

A. Yes. I looked at various collars' ranges and replacement strategies. Exhibit ICNU/302 shows these results. It is not necessary to look at a collar "tighter" than 87.5%/12.5% because that would exclude 25% of all observations — i.e., events that occur more than once every four years. Given the use of a four year rolling average, exclusion of events that occur more often than one in four years seems

8/ The lower range would be 10/10 under this convention. I applied both ends of the range, but only used the label for the upper end in order to fit into the graph.

unnecessary. What I learned is that the replacement strategy is at least as important as the collar range. For accuracy improvement, the most optimal replacement strategy is use of the 20 year average or mean.

Q. WHAT COLLAR RANGE AND REPLACEMENT STRATEGY DO YOU RECOMMEND?

A. If the Commission decides to adopt a proposal based on unit specific history for PacifiCorp, I recommend the 90/Mean collar shown above. This uses the 90th and 10th percentiles as the exclusion ranges, and the excluded observations are replaced by the 20 year average. This would improve forecast accuracy by 11.5% or 8 times the Company proposal, and almost twice as much as using the Staff collar design and replacement strategy.

A "tighter collar" (shown as the 87.5/Mean scenario above) would replace more observations (25%) and also diminish accuracy. Consequently, there is no benefit in use of a collar exclusion range tighter than 90/10. However, use of the mean as the replacement strategy is a key element in improving forecast accuracy.

Q. ARE THERE OTHER ADVANTAGES OF THIS PROPOSAL?

A. Yes. This would provide a truly symmetrical technique in that there would be a fair chance for both reductions and increases to abnormal outage rates.

Q. YOU HAVE ALREADY STATED THAT THE STAFF PROPOSAL IS REASONABLE. DO YOU STILL SUPPORT IT?

A. I have supported the Staff proposal as a reasonable compromise. However, it is not the best solution and a compromise is only preferable if it is acceptable to all parties. Clearly, the Company does not view the Staff proposal as acceptable. Given that, I recommend the Commission adopt my proposal for PacifiCorp.

Q. DO YOU HAVE ANY FURTHER RECOMMENDATIONS?

A. If the Commission does decide to use this approach for PacifiCorp it should not rely on PacifiCorp's data without further verification. Instead, the Company should be required to provide supporting event data and all outage computations should be documented and recomputed using excel spreadsheets. These should be provided to parties within 10 days of the final order in this case. This is necessary because in prior cases (involving ramping and other outage rate data) the Company has used undocumented "black box" database programs supporting various outage rate calculations. Subsequent investigation has shown these calculations to have been incorrect.[9/]

Minimum Loading and Deration Issue

Q. DOES YOUR RECENT WYOMING TESTIMONY HAVE A BEARING ON THE MERITS OF THE MINIMUM LOADING AND DERATION ISSUE?

A. No. Mr. Duvall seems to question the need for this correction because I didn't use it in testimony I recently filed in a Wyoming PCAM case. The Wyoming PCAM tariff language requires that the new rates go into effect two months after its February 1, 2009 filing date.[10/] This means there is little time to cover all possible issues, and owing to the true up, excluding an issue is not as significant as would be the case in Oregon. In the docket he is discussing, the decision as to which adjustments to present in testimony was primarily driven by time and resource

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9/ This includes ramping data for gas plants, Cholla ramping data, and an incorrect weekend period (56 vs. 48 hours) in prior cases.

10/ The case was filed February 1, 2009, and interim rates did go into effect on April 1, 2009, at a level that produced the same revenue requirement as the stipulated final rates, which will go into effect later this year. While some additional time was eventually allowed, most of the issues and results were by necessity quantified by April 1, 2009. While the Company did file a preliminary study earlier, confidentiality concerns delayed my access to the power cost model for about two months, and the February 1, 2009 GRID study was substantially different from the preliminary study.

constraints. The minimum loading and deration issue is obviously rather complex, and the Wyoming proceeding did not offer the opportunity to examine the issue in as much depth as the instant case. I assume that for many of the same reasons, Mr. Duvall also excluded various adjustments in Wyoming that he made in UE 207, including modeling of short-term firm transmission, median hydro modeling and a correction to duct firing.

Q. PLEASE DISCUSS MR. DUVALL'S RESPONSE TO SOME OF THE COMMENTS YOU MADE AT THE COMMISSION'S MAY 28 WORKSHOP.

A. On page 17, Mr. Duvall suggests that I defined a new term at the workshop: "the most useful capacity," which he considers arbitrary. In this case, I was making a description rather then providing a definition. I pointed out that the most useful capacity of a resource is the capacity that can follow load, provide reserves, etc. This is determined by the difference between the minimum and maximum capacity. Utilities often complain that capacity from Qualifying Facilities or wind projects is not very useful because it is not dispatchable. A different description might be the dispatchable capacity. This is clearly a case of elevating form over substance on his part.

Mr. Duvall also believes that the graph I presented at the workshop (the heat rate chart) was misleading. I disagree. For example, on page 19, line 8, Mr. Duvall argues that this adjustment "makes each thermal unit more efficient than it really is . . . artificially lowering NPC." I already addressed this in my direct testimony where I showed that current GRID modeling overstates heat rates compared to actual, and this adjustment brings heat rates closer to, though still above, actual. ICNU/100, Falkenberg/61, Table 3.

Mr. Duvall also states on page 18, that my chart is misleading because none of PacifiCorp's coal plants have a forced outage rate of 20%. In this case, I question Mr. Duvall's logic. His reasoning seems to be that "one example of the problem isn't occurring now, therefore, the problem must never occur." This is incorrect because the problem is occurring now — it occurs at any outage rate greater than zero.[11/] Since there is no unit that has a zero outage rate, PacifiCorp's method always overstates the heat rate.

Q. PLEASE COMMENT ON MR. DUVALL'S FIGURE 2 ON PAGE 19.

A. Mr. Duvall's figure shows a heat rate curve for a coal unit. I question the accuracy of his figure because, in my method, the average heat rate using the adjusted curves when evaluated at the derated minimum and maximum capacities equals the actual heat rate at the unadjusted minimum and maximum capacities. This fact is not obvious from Mr. Duvall's figure. Confidential Exhibit ICNU/303 demonstrates this is true for all PacifiCorp's generators based on the Company's actual heat rate coefficients.

Mr. Duvall seems to concede this point on page 19 of his testimony when he argues that for any point *between* minimum and maximum loading the adjusted heat rate curve is "more efficient." In other words, he concedes the curves are not too efficient when evaluated at the derated minimums and maximum capacities. Of course, even the Company agrees the maximum capacity should be derated.

The confidential figure below shows the bias that occurs when using the Company's derated maximum capacity (in effect shrinking the size of a unit) while

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11/ My chart shows the overstatement at 10% with an arrow. Many of PacifiCorp's coal plants have an outage rate of 10% or more. Further, PacifiCorp's collar would allow outage rates for a coal plant in excess of 20%.

applying it to a heat rate curve sized for the whole unit. The figure shows the average heat rate for Currant Creek using the coefficients modeled in GRID. In this example, the maximum capacity is [redacted] MW, and there is a hypothetical [redacted] outage rate (this is a figure in the range of outage rates used by the Company in the past few cases). The derated capacity would be only [redacted] MW. Using the same unadjusted heat rate curve, Currant Creek has a heat rate of [redacted] at the derated maximum capacity. In reality, Currant Creek has a full load heat rate of [redacted] at [redacted] MW. *Whenever the GRID simulations show a unit running at maximum derated capacity, it overstates the heat rate and NPC.*

[redacted]

Q. HOW OFTEN DOES THAT HAPPEN?

A. In GRID, units run at their maximum derated capacity 75% of the time. Further, 82% of the energy is generated when units are running at their maximum derated capacity. Consequently, there is no question that the Company method overstates heat rates applied to 82% of all energy generated.

Q. WHAT ABOUT THE SITUATION WHERE UNITS ARE RUNNING AT MINIMUM LOADING?

A. Again, the unadjusted curves used in GRID would overstate the heat rate if the minimum capacity is not also derated. As shown in Exhibit ICNU/303, so long as the minimum capacity is also derated, the adjusted heat rate curve will produce exactly the same average heat rate as in the unadjusted curve at the unadjusted minimum. For many of the units modeled in GRID, when they are not operating at full load, they are operating at minimum loading. This is typically the case with gas-fired units. Based on the Company's filed case in UE 207, GRID shows units running at their minimum or maximum capacity 89% of the time (75% of the time at maximum and 14% of the time at minimum).[12/] Further, 8% of all energy generated in GRID is produced when GRID shows units running at their minimum loading. Consequently, the modeling I propose unarguably results in the "right" heat rate 89% of the time and for 90% of all energy generated.[13/] The Company methodology would use an approach that is almost always wrong.

12/ GRID shows coal units running at maximum 91% of the time and at minimum 3% of the time. In GRID gas units are shown as running at maximum 48% of the time and minimum 36% of the time. The remaining 17% is in between.

13/ 82% of the energy is produced when units are running at maximum, and 8% when running at minimum.

Q. IS MR. DUVALL CORRECT THAT YOUR PROPOSAL IS "MORE EFFICIENT" BETWEEN THE MINIMUM AND MAXMUM UNIT LOADING LEVELS, I.E., THE REMAINING 11% OF THE TIME?

A. No. First of all, Exhibit ICNU/303 also shows that at the mid-point between the derated minimum and derated maximum capacity, the adjusted heat rate equals the unadjusted heat rate at the mid-point of the underated minimum and maximum capacity. This is also true to any other capacity level.

Second, by referring to Table 3 of my direct testimony we can see further proof. The gas units are simulated in GRID as running between the minimum and maximum loading levels far more than coal plants. However, GRID greatly overstates the heat rates for gas units and the heat rate curve adjustment improves the accuracy of the heat rate forecast. In the end, the question is how to produce a more accurate forecast. My proposed adjustment improves the heat rate forecast and should be adopted if only for that reason.

Finally, if Mr. Duvall's contention were that correct, it would not make sense for the Company to apply these same adjustments in its modeling for fractionally owned units.

Q. ON PAGE 17, MR. DUVALL DISPUTES THE ANALOGY TO FRACTIONALLY OWNED UNITS. IS HE CORRECT?

A. No. Mr. Duvall suggests that the Company does not apply the heat rate adjustment to fractionally owned units. However, the GRID algorithm guide says differently:

"Thermal Heat Rate – By Unit by Hour

Equations:

$$\text{Thermal Heat Rate (MMBtu/MWh)} = \frac{(a_0X^0 + a_1X^1 + a_2X^2 + a_3X^3 + \ldots + a_nX^n)}{X}$$

Where

- a_0, a_1, a_2, a_3,… a_n are the thermal heat rate coefficients
- X is the Adjusted Generation Level in MW listed below

Adjusted Generation Level (MW) =
min(Nameplate Capacity, Generation Level) / PacifiCorp Ownership Factor"

GRID Algorithm Guide, V6.2b, page 10.

If one substitutes the "PacifiCorp Ownership Factor" in the equation above with 1-(Forced Outage Rate) you have exactly the same equation that I apply. It does not matter if 10% of a unit is unavailable to the Company due to outages, or 10% is owned by another party (assuming no outages). In a capacity deration model, both would have the same expected value of capacity.

Q. ON PAGE 16 MR. DUVALL STATES THAT, FOR A HYPOTHETICAL 100 MW UNIT THAT IS 80% OWNED BY PACIFICORP, THE DERATED CAPACITY WOULD BE 64 MW INSTEAD OF THE 80 MW HE STATES YOUR EXAMPLE ASSUMES. IS THIS ACCURATE?

A. No. Again, Mr. Duvall has incorrectly described my proposal. In my method the maximum capacity as derated would also be 64 MW. The adjustment process would apply twice for my modeling (once for partial ownership and once for outage rates), the same as PGE does in MONET.

Q. IS THERE ANY POLICY REASON WHY THE COMMISSION SHOULD REQUIRE PACIFICORP TO MAKE THESE ADJUSTMENTS?

A. Yes. PGE has mimicked PacifiCorp's modeling methods. For example, once the OPUC approved the modeling of Non-Running Station Service ("NRSS") for PacifiCorp, PGE quickly adopted the same technique. If the Commission were to now endorse PacifiCorp's modeling, I fear PGE might abandon its approach, raising power costs for all of its customers.

Compromises Concerning Other Issues

Q. DOES MR. DUVALL'S TESTIMONY OFFER COMPROMISES REGARDING OTHER ISSUES IN THIS CASE?

A. Yes. I agree with Mr. Duvall that the matters concerning planned outage modeling are now being addressed in UE 207. This is not intended as an endorsement of the Company's planned outage scheduling methodology and assumptions. However, I am content at present to address the specific issues in the Company's modeling. I continue to believe that actual historical outage schedules provide the best tool to evaluate planned outage schedule issues.

Q. WHERE DO YOU STAND ON MR. DUVALL'S OTHER COMPROMISE PROPOSALS?

A. I agree with the proposal to use the $EFOR_d$ for peaking plants. I agree that use of a weekend weekday outage rate split is reasonable. I also believe that hydro forced outages rates and ramping should be excluded from outage rates in UE 207, but the Company should be free to propose other methods for dealing with these issues in future cases. For new units, I propose to exclude the first two years of historical data, while Mr. Duvall proposes to exclude only the first year of operational data. I have no objections to Mr. Duvall's proposals concerning wind reporting and the impact of capital investment on outage rates. As for updating wind profiles, I agree that is an issue better decided in specific TAM cases.

PGE and Idaho Power Settlements

Q. HAVE THE PARTIES REACHED AN AGREEMENT IN PRINCIPLE AS TO THE RESOLUTION OF ISSUES FOR PGE AND IDAHO POWER?

A. Yes. However, for a variety of reasons, at this time a stipulation has not been finalized. From ICNU's perspective there are presently no major impediments to

settlement. As the circumstances of all three companies are somewhat different, company specific stipulations may be appropriate so long as there is consistency in policy matters and in the basic formulae and techniques used for outage rate modeling. Nothing in this testimony is intended to suggest that the proposals herein should apply to Idaho Power or PGE. ICNU remains committed to the compromises reached with PGE which may be justifiably different from the PacifiCorp situation. For the most part this is because the other companies do not use the same modeling methods which we have opposed in the case of PacifiCorp.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes.

BEFORE THE PUBLIC UTILITY COMMISSION

OF OREGON

UM 1355

In the Matter of	)
	)
The Public Utility Commission of Oregon	)
Investigation into Forecasting Outage Rates	)
For Electric Generating Units	)
	)

ICNU 301

Testimonies of Mark Mansfield and Richard Woolley

August 13, 2009

Case UE-191
Exhibit PPL/400
Witness: Mark C. Mansfield

BEFORE THE PUBLIC UTILITY COMMISSION

OF THE STATE OF OREGON

PACIFICORP

Rebuttal Testimony of Mark C. Mansfield

GENERATION OUTAGE RATES

July 25, 2007

Q. Please state your name, business address and position with the Company.

A. My name is Mark C. Mansfield. My business address is 1407 West North Temple Street, Room 310, Salt Lake City, Utah. My position is Vice President of Thermal Operations for PacifiCorp Energy.

Qualifications

Q. Please describe your education and business experience.

A. I have a Bachelor of Science degree in Mechanical Engineering and a Master of Business Administration degree. I am also a registered professional engineer in the State of Utah. I have worked in the electric industry for 24 years and in the process control industry for an additional eight years.

During my career with PacifiCorp, I have served as an Engineer at the Carbon Plant, Maintenance Supervisor at the Carbon Plant, Maintenance Superintendent at the Hunter Plant, and Director of Technical Support for PacifiCorp Generation in Salt Lake City. I have served as the Managing Director of the Naughton Plant, Huntington Plant, and Hunter Plant. In 2006, I became Vice President of Safety, Environmental and Operations Support for PacifiCorp Energy. In 2007, I was appointed to my current position.

Summary of Testimony

Q. Please summarize your rebuttal testimony.

A. My rebuttal testimony responds to certain issues raised by ICNU witness Falkenberg regarding (1) PacifiCorp outage rates, and (2) the treatment of certain generating unit outages. My testimony makes the following points:

- Earlier this year, the Commission: (1) reaffirmed the use of a four-year rolling

average to calculate the forced outage rate; and (2) agreed to review proposals to modify this approach in a future generic docket. ICNU's proposal to change the forced outage rate to exclude outage costs that it claims were caused by management or personnel errors, avoidable mistakes and/or manufacturer design flaws raises policy issues that belong in the generic docket, not in this TAM filing.

- In response to Mr. Falkenberg's testimony about PacifiCorp thermal plant performance, my testimony shows that:
  - Mr. Falkenberg's Exhibit ICNU/109 implies that PacifiCorp's forced outage rate is increasing, when in fact this rate has decreased over the past several years;
  - Mr. Falkenberg asserts that the increase in the forced outage rate has lowered PacifiCorp's thermal capacity. In fact, during the period covered in Mr. Falkenberg's Exhibit ICNU/109, the total net generation output by the plants was improved. This demonstrates the problems inherent in Mr. Falkenberg's use of one performance factor to assess overall system performance.
- In response to Mr. Falkenberg's testimony that certain generating unit outages should be excluded from ratemaking calculations because they were the result of "imprudent operation and management," my testimony shows that:
  - Specific outages identified by Mr. Falkenberg were correctly reported and are not evidence of "imprudent operation and management."
  - Outages that involve personnel or maintenance error should not be

excluded from the calculation of net power costs.

– Selectively removing forced outages in order to improve PacifiCorp thermal system equivalent availability and capacity factor in the calculation of net power costs is unreasonable given that PacifiCorp's system equivalent availability factor and capacity factor are already better than the industry average.

Commission Policy on Outage Rates

Q. Does PacifiCorp's TAM filing reflect the Commission's current approach to calculating forced outage rates?

A. Yes. In *In re Portland General Electric*, Order No. 07-015 at 13 (2007), the Commission affirmed the use of a four-year rolling average to calculate the forced outage rate: "We continue to believe that past performance is the best predictor of a plant's outage rate. For this reason, we adhere to our long-standing practice of using actual plant outage rates to predict future activity of that plant." Outage rates in this case are based upon use of this long-standing methodology.

Q. Does the Commission plan to open a generic docket on this issue?

A. Yes. Also in Order No. 07-015, the Commission agreed to open a generic proceeding to consider proposals to change or modify the outage rate calculation. Given the established nature of the current approach and importance of this issue, the Commission's decision to adhere to its current approach but open a generic docket to consider modification proposals is a balanced outcome, one that is fair to all parties.

Q. Does ICNU propose a change to the current approach to calculating outage rates in this case?

A. Yes. ICNU proposes to exclude outage costs that it alleges were caused by management or personnel errors, avoidable mistakes and/or manufacturer design flaws. This effectively lowers the outage rates in this case calculated using the four-year average.

Q. Does ICNU's adjustment raise policy issues that the Commission should address in its upcoming generic docket on forced outage rates instead of this case?

A. Yes. There are several important policy issues implicated by ICNU's adjustment, all of which require consideration in the Commission's generic docket. First, ICNU proposes to reduce PacifiCorp's forced rate by any outage that it claims was PacifiCorp's fault. ICNU ignores data, however, that shows that PacifiCorp's overall plant performance exceeds industry average. PacifiCorp submits that it is poor regulatory policy to lower outage rates by charging isolated mistakes or errors to a utility, when the utility's overall system of plant management is prudent. Such a policy could easily lead to an approach to plant maintenance that reduces outages but raises costs.

Second, ICNU's proposal to charge the utility with outages due to manufacturer problems raises similar but even more complicated policy issues. ICNU cites the Trojan precedent as support for this proposal. I understand that this case did not address outage rates or normal coal and gas plant maintenance and repair issues. I also understand that ICNU's proposal that the Commission

impute a prudence disallowance to PacifiCorp based upon a manufacturer error significantly lowers the traditional prudence standard in Oregon.

Third, ICNU has relied on selected portions of selected PacifiCorp root cause analysis reports to establish an adjustment to outage rates. There are at least three significant policy issues implicated by the manner in which ICNU uses the reports in this case: (1) ICNU takes reports that are developed and maintained for prudence purposes and inappropriately uses them to establish imprudence; (2) ICNU's use of the outage reports in this manner could discourage utilities from carefully reviewing and remediating specific outage incidences; and (3) ICNU's use of raw, computer-generated report data exacerbates these issues, because the unsynthesized data it cites is misleading in this context.

For all of these reasons, the Commission should reject the application of ICNU's adjustment to the outage rate calculation in this case and instead direct ICNU to raise its proposal in the upcoming generic docket on outage rates.

PacifiCorp Outage Rates

Q. Is Mr. Falkenberg's method of using outage rates to judge PacifiCorp generating plant performance an accurate indicator of performance?

A. No. No single parameter can be used alone as a measure of overall system performance. Unit ratings, planned outage rate, equivalent forced outage rate, equivalent availability factor, capacity factor, and net generation must all be taken into consideration when measuring system performance.

Q. Looking at all of these factors, is PacifiCorp's overall system performance at or better than industry average?

A. Yes. The following table provides a comparison of performance using five standard North American Electric Reliability Corporation (NERC) availability definitions. The table compares PacifiCorp coal-fired unit performance for the last three years to the average performance of an equivalent system in the NERC availability database, using NERC 2004 data as a baseline.[1]

	NERC Equivalent System for 4-years Ending 12/31/2004	PacifiCorp Coal-fired Units for 4-years Ending 12/31/2004	PacifiCorp Coal-fired Units for 4-years Ending 12/31/2005	PacifiCorp Coal-fired Units for 4-years Ending 12/31/2006
Forced Outage Rate	4.82%	6.25%	5.91%	5.47%
Equivalent Forced Outage Rate	7.05%	10.02%	10.03%	9.59%
Planned Outage Factor	7.45%	3.30%	3.47%	3.38%
Equivalent Availability Factor	84.02%	85.54%	85.47%	85.87%
Capacity Factor	71.79%	82.29%	82.51%	82.84%

The table shows that PacifiCorp's forced outage rate is declining and now near the industry average. At the same time, PacifiCorp's planned outage factor and equivalent availability factor, which results from the combination of forced outages and planned outages, are consistently better than the industry average. Likewise, the capacity factor, which is a measure of actual output, shows that PacifiCorp thermal units are significantly better than the industry average.

[1] NERC data for four-years ending 2005 is similar: Forced outage rate: 4.8%; Equivalent Forced Outage Rate: 7.0%; Planned Outage Factor: 7.0%; Equivalent Availability Factor: 84.6%; Capacity Factor: 72.2%. NERC data for four-years ending 2006 is not yet available.

Q. Mr. Falkenberg uses Exhibit ICNU/109 to demonstrate that PacifiCorp's outage rates are increasing and claims "that the increase in outage rates has also led to the need for additional thermal capacity." Can you comment on these points?

A. First, the data above demonstrates that PacifiCorp's forced outage rates have *decreased* over the last three years, while its planned outage rates have remained flat. While Mr. Falkenberg relies on comparisons between current and ten-year-old outage rates to attempt to demonstrate a trend toward increasing outage rates, more recent and relevant data demonstrate the opposite trend.

Second, Exhibit ICNU/109 is based on the test year data that was used for the 1999 General Rate Case and the current proceeding. The test periods for availability data for these general rate cases are the four-year period ending December 31, 1998, and the four-year period ending December 31, 2006. The total actual output from generating units identified in Mr. Falkenberg's exhibit was actually greater for the period ending December 31, 2006, than the period ending December 31, 1998, as shown below, undermining Mr. Falkenberg's assertion that increasing outage rates have created the need for additional thermal capacity.

PacifiCorp Coal-fired Generating Units		
	4-years Ending 12/31/1998	4-years Ending 12/31/2006
Total Net Generation from Coal-fired units	175.9 million MWh	178.5 million MWh

The improvement in output resulted from a positive combination of system performance and market conditions. This is an example of how no single factor can be used to judge system performance. In this case, overall energy output of

the thermal units was improved and is indicative of PacifiCorp maximizing the utilization of its generating assets.

Exclusion of "imprudent and unreasonable outage costs"

Q. Do you agree with Mr. Falkenberg's conclusion that the selected outage reports provide evidence of "imprudent operation and management of PacifiCorp's resources"?

A. No. Mr. Falkenberg incorrectly infers that imprudent operation and management is evidenced by incidents that involve personnel error. PacifiCorp strives to reduce personnel error by contractors and employees, but it nonetheless occurs, as it does in any business. While personnel error cannot be totally eliminated, the negative impact on production is reduced by emphasizing continuous improvement.

Q. What has been the Company's approach to continuous improvement?

A. The process of continuous improvement includes tracking unit availability, analyzing causes of failures, and taking appropriate corrective action. The NERC Generating Availability Database is used to track availability. PacifiCorp has a number of programs that focus on analyzing failures and implementing corrective actions. As PacifiCorp identifies areas that need improvement, corrective action plans are developed. Examples include our Electric Power Research Institute (EPRI) based boiler tube failure reduction program for our boilers. We have a chemistry management program that uses the EPRI cycle chemistry improvement program to address plant chemistry issues. Our high energy piping condition assessment program includes on-going inspections, maintenance and analysis of

critical piping issues.

Q. As a part of these efforts, is PacifiCorp in the process of implementing a more structured root cause analysis program for the analysis of significant plant incidents?

A. PacifiCorp is in the process of rolling out a new, standard root cause analysis method. PacifiCorp is now using a method called *Behavior Justification*, which it has recently been working to automate using *Reason* software. This software automatically creates reports that string together raw inputs on possible root causes. The reports must be manually reviewed and synthesized for accuracy.

Q. Are the reports in Exhibit ICNU/111 from PacifiCorp's new root cause methodology?

A. Yes. Mr. Falkenberg is using some of the first unsynthesized reports generated by PacifiCorp's new root cause analysis approach to claim that outages are imprudent and outage costs should be disallowed. This is problematic because PacifiCorp has not yet had a chance to fully implement the program and refine the reports it generates. However, the fact that PacifiCorp maintains an extensive database on unit outages and can provide the reports from these programs for Mr. Falkenberg's review—even if these reports remain somewhat rough— is evidence that PacifiCorp is a prudent operator.

Q. Please comment on Mr. Falkenberg's assertion that the Root Cause Analysis reports in Exhibit ICNU/111 demonstrate that PacifiCorp's increased outage rates are due to poor operation and maintenance.

A. Mr. Falkenberg's use of selective portions of selective unsynthesized root cause

reports to demonstrate PacifiCorp's imprudence is unfair and misleading. As just noted, these reports are a developing remedial tool, inappropriately applied to a forensic analysis of a particular outage. Additionally, Mr. Falkenberg points to several passages in the reports that address budget-driven decisions to delay certain repairs or part replacements and concludes that "cost cutting measures were implemented that placed earnings above long-term reliability." This conclusion is irresponsible given that: (1) PacifiCorp's reliability statistics are consistently at or above industry standards; (2) prudent plant operation and maintenance recognizes and indeed requires budgetary limitations on how much is spent on plant repair and upkeep; and (3) ICNU regularly advocates for various forms of cost control in its efforts to keep its customers' rates as low as possible. For example, in PacifiCorp's last rate case, UE 179, ICNU proposed a large disallowance in PacifiCorp's proposed generation overhaul costs. (ICNU/116, Falkenberg/2.)

Q. How does PacifiCorp's record with respect to personnel errors compare with that of other utilities?

A. The percent equivalent availability factor attributed to personnel error in the industry is small. The percent equivalent availability factor attributed by PacifiCorp to personnel errors is in-line with the industry.

PacifiCorp Coal-fired Generating Units		
	Equivalent Coal-fired NERC Industry Level Data	PacifiCorp Coal-fired Plants
Percent Equivalent Availability Factor Lost Due to Personnel Error NERC Codes 9900-9940	0.06%	0.06%

Q. Mr. Falkenberg points out that outages he has determined to be due to personnel or maintenance errors were not reported to NERC as being due to personnel or maintenance error. How does PacifiCorp determine how to report outage causes?

A. PacifiCorp plant personnel determine the cause and duration of each derating and forced outage and enter that information into the PacifiCorp Availability Information System (AIS) database. The AIS database uses standard NERC cause codes. Each incident is coded with the most appropriate NERC cause code based on available information. The information in the AIS database is reported to NERC.

Q Is there any reason to believe that PacifiCorp intentionally under reports the number of incidents caused by personnel error?

A. Absolutely not. Accurate information is essential to good analysis of the causes of deratings and outages. Plant personnel determine the most appropriate code using available information. The data entered into the database is reviewed and validated monthly for consistency and accuracy.

Q. Mr. Falkenberg identifies a number of specific outages that he claims were due to "personnel or maintenance errors or other avoidable problems" that were attributed to another cause. What is your perspective on these outages?

A. Plant personnel assigned the appropriate NERC cause code to each outage given the nature of the event. Personnel error or maintenance error may have played a part in the incidents; however, that does not mean the incidents were incorrectly coded or reported. PacifiCorp uses the NERC guidelines for reporting into the

NERC Generating Availability Data System. The guidelines recommend selecting the code that best describes the cause or component responsible for the event. The NERC guidelines specifically recommend not assigning the cause to an auxiliary component or operation that triggered the failure of a major component or system.

Q. Mr. Falkenberg claims that outage incidents reported to NERC as being due to operator or personnel errors contribute to imprudent and unreasonable costs. Do you agree?

A. No. Personnel errors alone are not an indication of imprudence. PacifiCorp records the cause of each outage incident as accurately as practical in the PacifiCorp Availability database, which is essential to having good information for making decisions on how to improve plant performance. PacifiCorp recognizes that personnel error does contribute to some outages. PacifiCorp is committed to minimizing these incidents by maintaining an emphasis on continuous improvement.

Q. Do you agree that selected outages should be removed from calculation of net power costs?

A. No. PacifiCorp's equivalent availability factor and capacity factor are better than industry averages.

Four-year period ending	NERC Equivalent System		PacifiCorp Coal-fired System	
	Equivalent Availability Factor	Capacity Factor	Equivalent Availability Factor	Capacity Factor
2004	84.02%	71.79%	85.54%	82.29%
2005	84.56%	72.25%	85.47%	82.51%

PacifiCorp coal-fired plant capacity factor is only 3 percent less than the equivalent availability, which indicates that the coal fired units operate near the maximum available capacity all the time. Also, the small spread between equivalent availability factor and capacity factor compared to the average industry spread shows that PacifiCorp is able to achieve a higher than average utilization of its thermal generating assets. Mr. Falkenberg recommends that certain outages be removed in order to further "improve" the system availability and capacity factor and consequently reduce net power costs. Mr. Falkenberg's recommendation is unreasonable and unwarranted given that PacifiCorp's equivalent availability and capacity factors are better than industry averages.

Q. PacifiCorp's capacity factor for the four-year period ending in December 31, 2005 is approximately 10 percent greater than the NERC average. What is the approximate value associated with PacifiCorp's above average capacity during this period?

A. The value of the power associated with PacifiCorp's coal plants running at above-industry-average capacity factors for the four-year period ending December 31, 2005 is approximately $292 million. These savings have helped PacifiCorp maintain relatively low net power costs compared to other utilities.

Q. Please summarize the Company's position regarding the removal of outages from the availability calculations for ratemaking purposes.

A. All outages should remain in the availability calculations used in the net power costs model. PacifiCorp is focused on continuous improvement. Our objective is to maximize the generation from the thermal units with attention to safety and

environmental compliance. Consequently, PacifiCorp maintains a constant emphasis on minimizing deratings and outages. Even so, it is not possible to eliminate all personnel error. Removing outages attributed to personnel error from the net power costs model inputs will result in unreasonably high thermal unit output. The historic forced outage rate should be the basis of the outage rate used in the net power costs model.

Q. Does this conclude your rebuttal testimony?

A. Yes.

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

A. My name is Mark C. Mansfield. My business address is 1407 West North Temple Street, Room 310, Salt Lake City, Utah. My position is Vice President of Thermal Operations Support for PacifiCorp Energy.

Qualifications

Q. Please describe your education and business experience.

A. I have a Bachelor of Science degree in Mechanical Engineering and a Master of Business Administration degree. I am also a registered professional engineer in the State of Utah. I have worked in the electric industry for 24 years and in the process control industry for an additional eight years.

During my career with PacifiCorp, I have served as an Engineer at the Carbon Plant, Maintenance Supervisor at the Carbon Plant, Maintenance Superintendent at the Hunter Plant, and Director of Technical Support for PacifiCorp Generation in Salt Lake City. I have served as the Managing Director of the Naughton Plant, Huntington Plant, and Hunter Plant. In 2006, I became Vice President of Safety, Environmental and Operations Support for PacifiCorp Energy. In 2007, I was appointed to my current position.

Purpose of Testimony

Q. Please summarize your rebuttal testimony.

A. My rebuttal testimony responds to certain issues raised by CCS witness Mr. Falkenberg regarding PacifiCorp's outage rates. My testimony addresses the following issues raised by Mr. Falkenberg:

- That PacifiCorp's outage rates have substantially increased over the past decade, and
- That the Jim Bridger plant outages be adjusted to the North American Electric Reliability Corporation (NERC) average.

PacifiCorp Outage Rates

Q. Has the outage rates for PacifiCorp increased as Mr. Falkenberg asserts?

A. Yes. However, outage rates are only one of many statistics one should evaluate when looking at fleet and plant performance and upon closer examination of the data the fleet performance for PacifiCorp has been improving over the last four years.

Q. What other statistics should be considered?

A. PacifiCorp looks at capacity factor, equivalent availability and planned outage factor. Also PacifiCorp disagrees with the way Mr. Falkenberg uses the North American Electric Reliability Corporation/Generating Availability Data System (NERC/GADS) data.

Q. Please explain why PacifiCorp disagrees with Mr. Falkenberg use of the NERC/GADS data, isn't this data nationally recognized?

A. In Mr. Falkenberg's exhibits Ex4.13p1 and Ex4.13p2 he cites NERC/GADS data for all sizes of coal-fueled plants. This population of plants contains plants that have very low capacity factors or are in economic standby for significant hours of the referenced timeframe. Therefore, since they do not operate for significant hours during the timeframe it is natural for them to have lower outage rates.

When PacifiCorp compares its performance against the NERC/GADS data

it creates a peer group by simulating a fleet of similarly sized units. This is accomplished by creating an equivalently configured system from the NERC/GADS database so that the number of units and the type of units within a given fuel category and size are the same as the PacifiCorp fleet. Therefore, the makeup of our fleet from year to year is duplicated by using an equivalent system configuration, using the NERC/GADS database. For example, the PacifiCorp fleet has 1 coal-fired unit in the 1-99 MW range, 4 coal-fired units in the 100-199 MW range, 2 coal-fired units in the 200-299 MW range, 8 LM 6000 gas units, 1 geothermal unit, etc. The NERC/GADS capacity range averages are then weighted to simulate the PacifiCorp fleet.

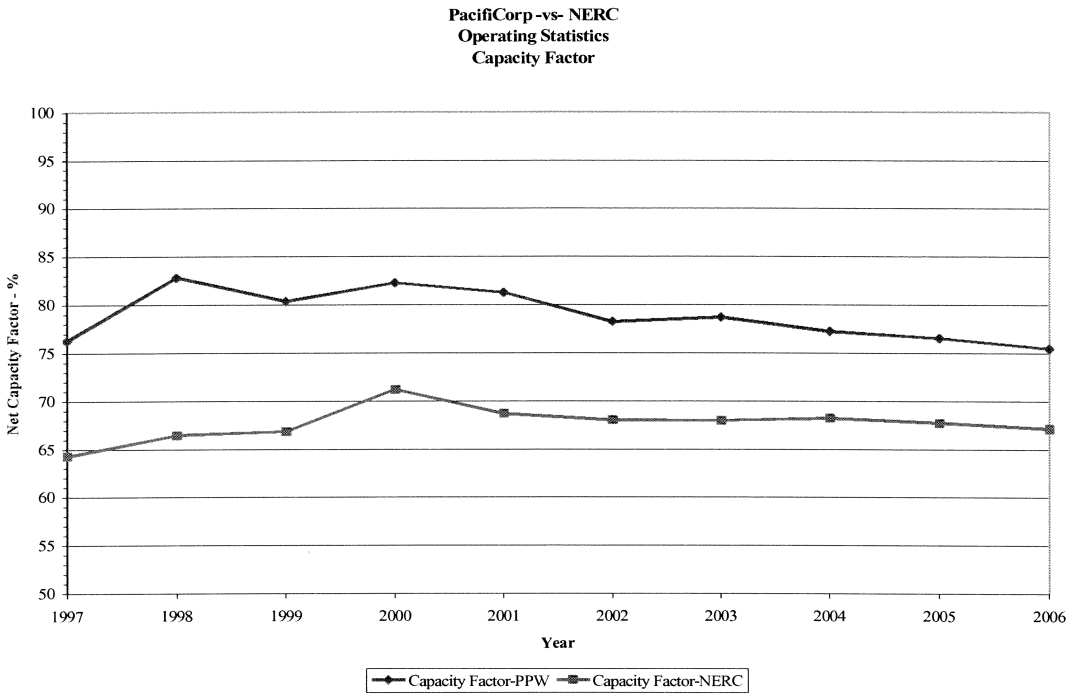
Q. Why is it important to compare the PacifiCorp fleet to a NERC peer group?

A. Plants with different capacities have different operating characteristics and challenges. By looking at the NERC data for all sizes of coal-fueled plants is like looking at gas mileage for all classes of motor vehicles from two-cycle motor scooters to large SUVs. If one is trying to compare the value of their vehicle, it is best to compare it to vehicles similar in size and what the vehicle is going to be used for. By looking at the data for all classes of vehicles the data could be biased if there where greater numbers of smaller vehicles compared to your vehicle.

Q. Why should capacity factor be considered, isn't that a function of market conditions?

A. Capacity factor is the measure of actual output compared to the possible output. Therefore, the higher the capacity factor the more the plant has operated at or near its maximum capacity. PacifiCorp fleet has a capacity factor that is greater than

the NERC/GADS peer group as can be seen in the graph below.



By operating the fleet at these high capacity factors PacifiCorp is able to provide greater benefit to its customers by supplying a low cost source of energy. Looking at the four-year average ending December 31, 2006, the PacifiCorp fleet had a capacity factor of 76.97 percent versus the NERC peer group with a capacity factor of 67.74 percent. The difference in capacity factor represents approximately 724 MW of capacity. This represents a substantial benefit to PacifiCorp's customers.

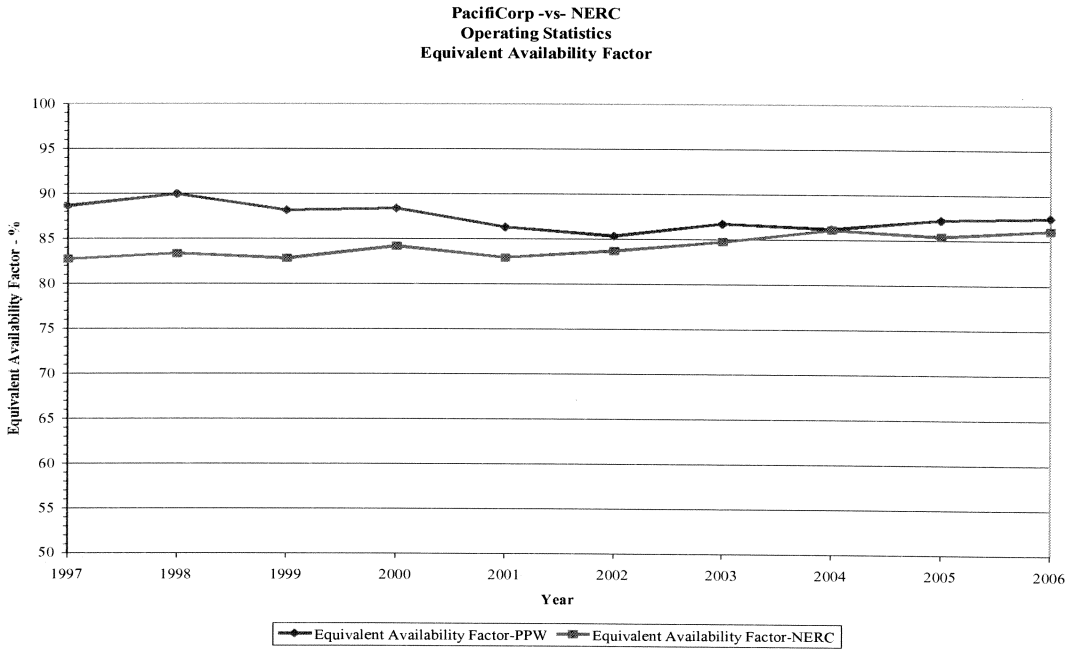
Q. **PacifiCorp's capacity factor for the four-year period ending December 31, 2006 is 9.23 percent greater than the NERC peer group average. What is the approximate value associated with PacifiCorp's above average capacity during this period?**

A. The value of the power associated with PacifiCorp's fleet running above the

NERC peer group capacity factor for the four-year period ending December 31, 2006 is approximately $272 million. These savings have helped PacifiCorp maintain relatively low net power costs compared to other utilities.

Q. Why is equivalent availability an important statistic when comparing plant performance?

A. Equivalent availability is a measure of the optimal energy that could have been generated during a given report period. This eliminates the bias of market conditions. It can be seen from the graph below that the PacifiCorp fleet out performs its NERC peer group.



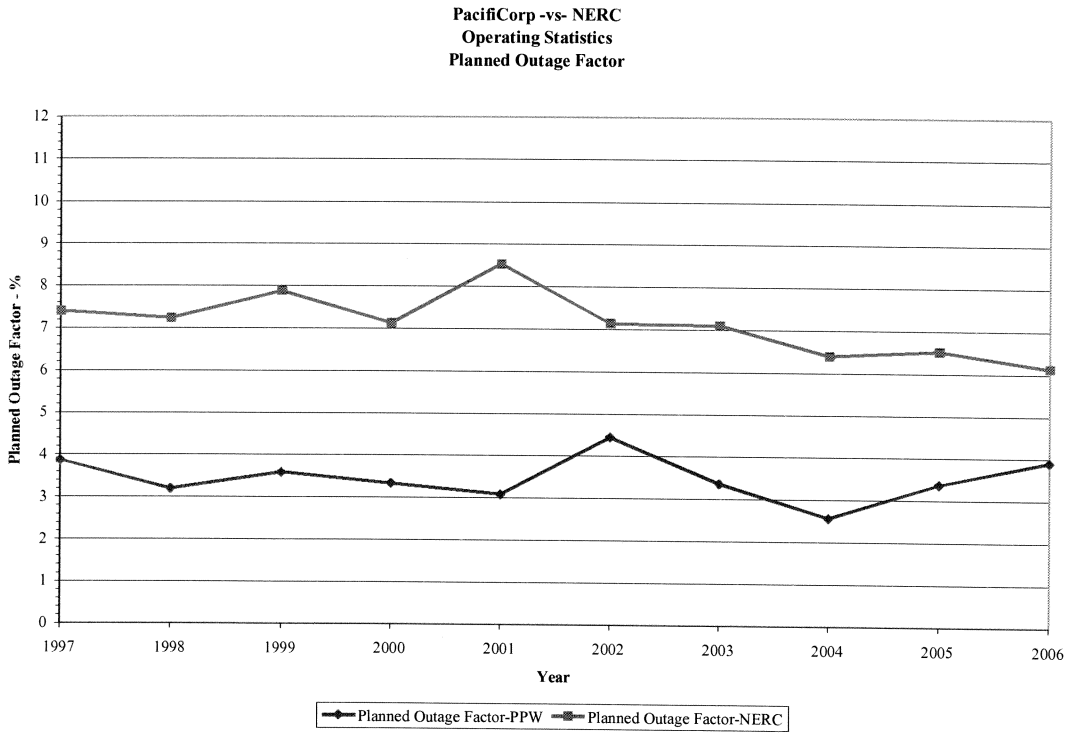
Equivalent availability also takes into account all the reasons a plant could be off-line, i.e. planned outages, planned de-rates, forced outages, maintenance outages, equivalent forced de-rates and equivalent maintenance de-rates. By looking at equivalent availability it removes the bias of placing an outage or

restriction in a different category than the peer group. For example, it does not matter if an outage is classified as maintenance or forced; they are all treated equally in equivalent availability.

Looking at the above graph it can be seen that the PacifiCorp fleet is improving its performance against the NERC peer group over the last four years.

Q. Explain the significance of comparing planned outage factor.

A. The planned outage factor simply takes the amount of planned outage hours over the period hours. This is a measure of the percentage of time the planned was off-line for a scheduled maintenance outage. The PacifiCorp fleet has less planned outage hours than its NERC peer group as can be seen by the graph below.



Looking at the four-year average ending December 31, 2006, the PacifiCorp fleet had a planned outage factor of 3.29 percent as compared to a

planned outage factor of 6.54 percent for the NERC peer group. This difference equates to a difference of 5.82 TWh of generation (using the average fleet capacity of 6,640 MW and the fleet capacity factor of 76.97 percent) over the four-year period.

Jim Bridger Outage Rate

Q Please describe the performance of the Jim Bridger plant over the four-year period from 2003 to 2006.

A. The Jim Bridger plant has improved its operating performance over the four-year period. The equivalent availability has improved from 80.83 percent to 85.37 percent. The equivalent unplanned outage factor has improved from 14.86 percent to 11.09 percent. And finally the capacity factor has increased from 78.04 percent to 81.06 percent.

While its equivalent unplanned outage factor is approximately 2 percent higher and its equivalent availability is approximately 3 percent lower than the NERC peer group, its capacity factor is approximately 12 percent higher than the NERC peer group.

Q. Please explain why PacifiCorp does not think it is fair to reduce the Jim Bridger plant's outage rate to the NERC/GADS average.

A. PacifiCorp feels that this would be a one-sided adjustment. PacifiCorp operates its generation assets as a fleet to maximize the benefit to its customers. Mr. Falkenberg is willing to penalize PacifiCorp for one plants performance in some of the performance statistics, but does not make any allowance for the benefits mentioned above achieved by the fleet.

Q. Please summarize your rebuttal testimony.

A. PacifiCorp feels that it has demonstrated that it is not prudent to look at any one statistic when comparing performance of its assets. Furthermore, PacifiCorp feels it as demonstrated the fleet is being operated in a beneficial manner for its customers by utilizing its assets effectively and efficiently. Finally, PacifiCorp feels that it is not fair to normalize a single plant to the NERC/GADS average, when the fleet as a whole is performing better than its peer group.

Q. Does this conclude your rebuttal testimony?

A. Yes.

Q. Please state your name, business address and position with the Company.

A. My name is Richard C. Woolley. My business address is 201 South Main, Suite 2200, One Utah Center, Salt Lake City, Utah. My position is Vice President of Thermal Production and System Coordination for PacifiCorp.

Qualifications

Q. Please describe your education and business experience.

A. I have a Bachelor of Engineering degree and Master of Business Administration degree. During my career with PacifiCorp, I have served as an Operations Superintendent, a Maintenance Superintendent, and a Plant Manager at both Centralia Plant and Wyodak Plant. In conjunction with the sale of Centralia Plant, I joined Trans Alta as Vice President of Centralia Plant and Mine Operations. In 2002, I rejoined PacifiCorp as Managing Director of Process Support and became Vice President of Thermal Production and System Coordination in 2004 with responsibility for all thermal generation assets.

Summary of Testimony

Q. Please summarize your rebuttal testimony.

A. My rebuttal testimony responds to certain issues raised by ICNU witnesses Schoenbeck and Falkenberg regarding (1) the appropriate level of steam plant maintenance costs to be reflected in rates, and (2) the treatment of certain generating unit outages. My testimony makes the following points:

? In response to Mr. Schoenbeck's contention that FY2003 maintenance costs are not representative of annual maintenance costs, my testimony shows that:

? FY2003 operation and maintenance ("O&M") expenses are a conservative

estimate of O&M expenses for the rate effective period given that expenses are trending upward. This upward trend is due to the simple reason that our thermal plants are aging.

- Using the number of days of scheduled overhaul maintenance to gauge or trend the level of maintenance performed from year to year – as suggested by Mr. Schoenbeck – is an inaccurate measure of maintenance activity.

- In response to Mr. Falkenberg's testimony that certain generating unit outages should be excluded from ratemaking calculations because they were the result of "imprudence" and/or personnel error, my testimony shows that:
  - Neither the Hunter Unit 1 generator failure nor the Hunter Unit 3 outage for balancing the turbine-generator was due to imprudence, and neither should be excluded.
  - Outages caused by personnel error should not be excluded inasmuch as these personnel errors cannot be completely eliminated.
- In response to Mr. Falkenberg's testimony that certain generating unit outages should be excluded from ratemaking calculations because the events are abnormal, are non-representative of future conditions, or are catastrophic in nature, my testimony shows that:
  - PacifiCorp thermal plant main transformer failure rates are not out-of-line with industry experience, and these outages should not be excluded.
  - PacifiCorp's unplanned outage rate includes unusual and catastrophic outage events. Although specific events cannot be predicted, the overall

unplanned outage rates can be estimated based on past experience. All outages should be included in the rate making calculations.

? PacifiCorp's thermal unit availability and capacity factor are significantly better than the industry average.

PacifiCorp Maintenance Expenses

Q. Based on Mr. Schoenbeck's analysis of the number of overhaul days, he draws the conclusion that maintenance expense should not be set on the basis of a single year's experience. Do you agree with his approach?

A. No. Mr. Schoenbeck's table of Overhaul Days cannot be used to determine a pattern of scheduled maintenance because the table does not take into consideration the difference in unit ownership and difference in unit capacities. Furthermore, there is no quantifiable relationship between number of overhaul days and overhaul maintenance expenses because the overhaul scopes of work vary widely from unit to unit and year to year. Clearly the cost of overhauls on large units will be greater than on small units. Overhaul frequency is currently averaging around four years and is generally driven by the boiler component requirements. Other equipment like the turbines and generators may only need inspection and repair every 6 to 10 years and must be integrated into the four year overhaul cycle. A thirty day outage for boiler maintenance will require a fraction of the expense per day of one that includes boiler and other large equipment such as the turbines and generators. This will not be apparent when viewing only the number of outage days.

Q. Do you agree with Mr. Schoenbeck's statement that the table of Major Overhaul Costs "confirms the fact that FY2003 was an above normal major overhaul year"?

A. No. Three years of data is insufficient to form an opinion of normal overhaul costs or trends. Confidential Exhibit No.___ (RCW-2C) restates the expenses from Mr. Schoenbeck's table, Major Overhaul Costs for Large Thermal Plants, and adds PacifiCorp plan expenses for future years. Historical and plan expenses are stated in FY2004 $ for comparison purposes. FY2003 overhaul expenses were $27,143,000. Confidential Exhibit No.___ (RCW-2C) shows that overhaul expenses are expected to range from $18,160,000 to $30,396,000. FY2003 overhaul expenses are in line with typical annual overhaul expenses.

Q. Can major overhaul costs alone be used as an indicator for maintenance expenses or O&M expenses?

A. No. Overhaul expenses are only 7 percent – 12 percent of total annual non-fuel O&M expense. Confidential Exhibit No.___ (RCW-C3) shows the magnitude and trend of total O&M expenses. The expenses are based on the PacifiCorp SAP accounting system. Plant maintenance expenses are not budgeted separately in SAP so non-fuel O&M expenses are provided. Confidential Exhibit No.___ (RCW-C3) shows that non-fuel O&M expenses are gradually increasing. Maintenance expenses, which are a component of non-fuel O&M, are increasing because generating units are aging. The weighted average age of PacifiCorp's thermal units is 29 years. Most units are in the second half of their life cycle and the number of age related problems is increasing. The actual FY2003 non-fuel

O&M expenses are less than the average planned non-fuel O&M expenses for FY2005-FY2008 and less than the 10-year average non-fuel O&M expenses for the planned years. FY2003 non-fuel O&M expenses are thus a conservative estimate for the non-fuel O&M expenses for the rate effective period.

Q. Is it appropriate to use an average of four actual years of maintenance expense to capture the cyclical aspect of maintenance schedules, as Mr. Schoenbeck recommends?

A. No. PacifiCorp maintenance expenses are increasing. Mr. Schoenbeck acknowledges that "substantial increases in maintenance expense have occurred each year." Using an average of maintenance expenses for four recent years thus will understate average maintenance expenses for the rate effective period. FY2003 maintenance expense is a better indicator of expenses that can be expected in the rate effective period of this rate case.

Exclusion of Outages Related to "Imprudence" and Personnel Error

Q. As part of Mr. Falkenberg's proposal to remove "outages that are imprudent, non-representative, or abnormal" from the ratemaking calculations, he proposes to exclude the Hunter Unit 1 generator outage "as a very extreme and unusual event, and one whose prudence has not been established." What is PacifiCorp position on Hunter 1 generator outage?

A. Mr. Widmer's testimony explains PacifiCorp reasons for including Hunter 1 in the rate making calculation. The cost of repair and length of outage for the Hunter 1 generator was large in comparison to most forced outages. It is impossible to predict or detect every component failure and, consequently, forced outages

occur. Occasionally, a large forced outage will occur because the component failure will cause damage that requires a long repair time. The length of a forced outage is no indication of PacifiCorp's imprudence.

Moreover, Mr. Falkenberg's adjustment seems to presume that PacifiCorp has been found to be imprudent in connection with the Hunter 1 outage. This issue was thoroughly litigated in two separate proceedings, and in neither case was the Company found to be imprudent. In Oregon Docket UM 995, the OPUC stated as follows:

> We find that PacifiCorp's investigation of the Hunter 1 failure has been thorough and comprehensive. We find no evidence that the failure was due to a loose core, and no evidence that PacifiCorp overlooked signs of a loose core in its 1992 and 1999 inspections or at any other point. We find ICNU's other proffered explanations of the failure inconsistent with the preponderance of evidence in the record. On this record, we must agree with PacifiCorp that the cause of the Hunter 1 failure is undetermined. (Order No. 02-469, p. 81.)

In Docket No. 20000-ER-02-184, the Wyoming PSC rejected allegations that the Company's imprudence led to the Hunter outage.

> The credible evidence in this case did not allow a clear or unqualified finding of prudence or imprudence on the part of PacifiCorp; and we could not, and did not, base our decision on a simple finding of prudence or imprudence. We found credible evidence on the subject presented by both sides in this controversy. Our solution in this situation was to treat the Hunter No. 1 outage costs as we would the impact of any other generator outage considered in a general rate case, directing that the effect of the outage be included in the four-year rolling average of historical outage rates and maintenance to determine the thermal availability information factored into normalized net power costs. (Order Denying Rehearing, ¶ 19.)

Q. Do you agree with Mr. Falkenberg that PacifiCorp "admitted to imprudence" in the Jim Bridger Unit 4 outage in June 2000?

A. No. In response to a question from Wyoming PSC Chairman Ellenbecker,

PacifiCorp witness Barry Cunningham in Docket No. 20000-ER-02-184 acknowledged that PacifiCorp performed an investigation of the Jim Bridger Unit 4 outage and found that the failure resulted, in part, from personnel error. Simply because personnel error contributed to the incident does not mean or imply that PacifiCorp was imprudent.

Q. Do you agree that "because this outage was the result of imprudence, it should be removed from calculation of net power costs"?

A. No. Power plants are operated and maintained by people and unfortunately people make errors. Personnel errors do occur and cannot be completely eliminated. The number and frequency of personnel errors can be minimized by good training, good procedures, continuous emphasis on safety, and learning through investigation of failures. Mr. Cunningham was able to respond to Chairman Ellenbecker's question in detail because PacifiCorp had conducted a thorough investigation of the Jim Bridger incident and had determined that personnel error had contributed to the failure. The fact that PacifiCorp investigated the incident and identified personnel error as a contributing factor is, if anything, evidence that PacifiCorp is a prudent operator. The investigation is also evidence that PacifiCorp emphasizes continuous improvement through learning from past experience. The fact that personnel error contributed to the Jim Bridger Unit 4 June 2000 failure is no evidence of PacifiCorp's imprudence and is no reason for removing the outage from the rate making calculations.

Q. Mr. Falkenberg claims that outage incidents "under the categories of "Operator Errors", "Maintenance Errors", "Subcontractor Errors" or "Other Safety Problems"…are imprudent outages and customers should not bear the associated costs." Do you agree?

A. No. Personnel errors alone are not an indication of imprudence, for the same reasons as I expressed earlier in my testimony. Recording the cause of each outage incident as accurately as practical in the PacifiCorp Availability database is essential to having good information for making decisions on how to improve plant performance. PacifiCorp recognizes that personnel error does contribute to some outages. PacifiCorp is committed to minimizing these incidents by maintaining an emphasis on continuous improvement.

Q. How does PacifiCorp's record with respect to personnel errors compare with that of other utilities?

A. PacifiCorp examined data from the NERC GADS data base for the population of coal-fired units with capacity factors greater than 70 percent for the period of 1983-2002. The loss of Equivalent Availability Factor ("EAF") for the cause codes related to personnel error among this population is 0.06 percent per unit-year. The PacifiCorp rate for the same cause codes and period is 0.04 percent per unit-year. PacifiCorp also evaluated the loss data for all coal-fired units for the five-year period, 1998-2002. The loss of Equivalent Availability Factor for the industry was 0.06 percent per unit-year and the rate for PacifiCorp is 0.03 percent per unit-year. PacifiCorp's performance is thus in line with – and in fact is slightly better than – the industry standard. Both the fact that PacifiCorp records

incidents as caused by personnel error and the fact that PacifiCorp's recorded rates are in line with industry indicate that PacifiCorp is a prudent operator. There is no basis for removing the outage incidents reported under the categories of "Operator Errors", "Maintenance Errors", "Subcontractor Errors" or "Other Safety Problems" from the ratemaking calculations.

Q. Mr. Falkenberg would also exclude the November 1999 Hunter Unit 3 outage to balance the generator "is an instance of imprudence." Do you agree with this treatment?

A. No. Weights are attached to the generator rotor at various locations to balance the rotor when it is rotating. The balance weights in the generator were consolidated by PacifiCorp personnel during the 1998 overhaul in order to make room for additional weights in the event balancing was required in the future. At the time the balance weights were consolidated, the balance weights were reinstalled in a more accessible machined groove in the retaining ring after checking with the manufacturer's field engineer at the Hunter Plant site. The generator had higher than normal vibration after return to service. The consolidated balance weights were relocated to the original machined groove in the rotor during the November 1999 outage. The relocation of the weights resolved the vibration problem. The incident is not an example of imprudence. In fact, PacifiCorp was being proactive in consolidating the balance weights in order to be prepared for any future balancing. PacifiCorp personnel did consult the manufacturer's field engineer when relocating the balance weights. Clearly, an error was made in relocating the weights although it was not obvious at the time and took many months to

understand and determine the nature of the problem. This incident falls in the category of personnel error and, as previously discussed in this testimony, should remain in the rate making calculations.

Exclusion of "Unusual," "Non-Representative," or "Catastrophic" Outages

Q. Do you agree with Mr. Falkenberg's observation that the level of Hunter transformer related outages "is extremely high compared to other PacifiCorp plants, and to the utility industry in general"?

A. No. Mr. Falkenberg's statement that the "level of outages is extremely high compared to other PacifiCorp plants" is misleading. The total number of PacifiCorp outages related to main transformers for the period of 1983-2002 was 65.

Plant	Number of Outages	Duration, Hours
Cholla	2	1164
Carbon	5	203
Craig	2	197
Dave Johnston	6	61
Gadsby	3	523
Hayden	1	29
Huntington	11	367
Hunter	16	1505
Jim Bridger	8	1204
Naughton	6	248
Wyodak	5	521
Total	65	6022

Sixteen of the outages occurred at the Hunter Plant. It is not unusual to have problems with a specific model or manufacturer's equipment at one plant and not have problems with similar equipment at other plants. The fact that Hunter Plant had more problems with the Unit 1 and 2 main transformers than most PacifiCorp

plants is not unusual. Mr. Falkenberg's statement that the PacifiCorp "level of outages is extremely high compared" "to the utility industry in general" is an exaggeration. PacifiCorp plants operate at high capacity factors and, consequently, the equipment operates continuously near maximum capacity. PacifiCorp examined the North American Electric Reliability Council ("NERC") statistics for the population of coal-fired generating units built between 1950 and 1983 that operate at greater than 70 percent capacity factor. This population of 296 generating units is representative of operation similar to PacifiCorp plants. The average EAF loss due to main transformers for this group for the period of 1998-2002 is 0.2 percent. The average EAF loss due to main transformers for PacifiCorp for the same period is 0.4 percent. While the PacifiCorp losses are greater than the industry, these losses are a very small part of the total EAF losses for the PacifiCorp units.

Q. Mr. Falkenberg recommends that outages related to transformer failures at Hunter Plant be removed from the ratemaking calculations because the problem was unusual and is not expected to recur. Do you agree with Mr. Falkenberg's reasoning and recommendation?

A. No. Mr. Falkenberg's reasoning could be used to exclude many unusual outages whose cause is corrected and are not expected to recur. Mr. Falkenberg acknowledges that "there are always outages at generators, and costs associated with solving them." PacifiCorp was proactive in correcting the transformer problem and costs associated with correcting the problem are included in the base rates. However, the process and efforts involved in resolving this problem were

no different than are applied to resolving other emergent problems. The characteristics and nature of these main transformer problems do not make them unique from other problems that plant personnel resolve in the course of doing business. There is no basis for claiming that the main transformer problems are unique and should be removed from the rate making calculations.

Q. Mr. Falkenberg recommends removal of three other outages that were identified in the Oregon UE 134 case and in the Utah Hunter/Excess Power Cost case. Should these outages be removed from the rate making calculations on the basis that the outages were unusual and catastrophic?

A. Mr. Widmer's testimony discusses the ratemaking treatment of these items. Each of these three forced outages was relatively long. Two of the forced outages occurred on jointly owned plants operated by other utilities. PacifiCorp share of Colstrip Unit 4 operated by PPL Montana is 74 MW. The outage duration was 16 days to repair generator damage caused by a loose baffle. PacifiCorp's share of Hayden 1 operated by Xcel is 45 MW. The outage duration in this case was 76 days to repair a crack in a steam turbine rotor. PacifiCorp owns and operates the Dave Johnston Unit 3 and the outage duration cited here was 43 days to repair a ground in the generator field winding. In all three incidents the outages occurred on large rotating equipment that is highly stressed and is aging. The occurrence of an occasional forced outage of long duration in large fleet of generating units can be expected and is not unusual or abnormal. While PacifiCorp and the operators of its jointly owned plants try to minimize the risk of such failures, it is not possible to completely eliminate the failures. For this reason, forced outages

of long duration should not be removed from the rate making calculation. Removal of the forced outages of long duration implies that no forced outages of long duration will occur in the future and that is not realistic.

Q. How does PacifiCorp's record regarding Equivalent Availability Factor and Capacity Factor compare with other utilities'?

A. PacifiCorp's equivalent availability factor and capacity factor are significantly better than the industry averages. Thus, even after taking into account "unusual," "non-representative," or "catastrophic" outages, PacifiCorp is able to achieve a higher than average utilization of generating assets.

	Industry		PacifiCorp	
Calendar Year	EAF	CF	EAF	CF
1999-2002	*83.58%*	*69.30%*	*86.83%*	*80.02%*

Q. Please summarize the Company's position regarding the removal of outages from the availability calculations for ratemaking purposes.

A. Outages should not be removed. Exclusion of "unusual", "non-representative", or "catastrophic" outages assumes that similar outages will not occur. Although PacifiCorp strives to reduce unplanned outages, with the Company's aging fleet and high capacity factors it is illogical and unreasonable to assume that no "unusual", "non-representative", or "catastrophic" outages will occur. Unadjusted recent forced outage rates provide a probable value of forced outage rates for future years. Additionally, PacifiCorp's overall performance, as measured by its Equivalent Availability Factor and Capacity Factor, indicates there is no basis for adjusting the forced outage rate.

Q. Does this conclude your rebuttal testimony?

A. Yes.

Exhibit RCW-1

Exhibit RCW-1R
Overhaul History & 2004 Ten-Year Plan - O&M Our Share ($000)

Fiscal Years - SAP O&M Expenses

	Actual Expenditures - Actual $				Actual Expenditures - 2004 $				2005 Ten-Year Plan - All Years in 2004 $						
	2001	2002	2003	2004	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Carbon2	-	303	-	307	-	311	-	307	1,275	300	-	1,622	-	300	-
Cholla4	3,150	-	-	705	3,275	-	-	705	4,981	-	-	-	7,864	-	-
Colstrip3	-	755	-	100	-	774	-	100	736	-	25	713	-	25	713
Colstrip4	1,067	-	100	588	1,109	-	101	588	74	25	713	-	25	713	-
Craig1	-	-	449	1,410	-	-	456	1,410	-	98	541	-	98	541	-
Craig2	500	1,200	-	711	520	1,231	-	711	758	-	98	541	-	-	639
DaveJohnston1	115	73	1,435	1,680	120	75	1,456	1,680	-	600	-	-	2,104	-	629
DaveJohnston2	949	65	-	-	987	67	-	-	492	-	3,313	-	629	295	-
DaveJohnston3	767	-	-	-	797	-	-	-	98	2,778	-	777	-	3,173	-
DaveJohnston4	212	855	-	4,794	220	877	-	4,794	-	1,013	-	5,381	-	910	246
Hayden1	98	-	80	414	102	-	81	414	-	-	393	-	-	393	-
Hayden2	-	145	-	-	-	149	-	-	195	-	-	187	-	-	187
Hunter1	2,185	513	-	-	2,272	526	-	-	5,338	-	-	899	1,152	4,471	-
Hunter2	202	537	2,600	803	210	551	2,638	803	-	-	978	2,639	578	678	2,372
Hunter3	995	4,085	878	650	1,034	4,189	891	650	-	1,475	4,907	-	959	-	5,058
Huntington1	193	6,689	806	-	201	6,859	818	-	910	8,743	959	-	2,323	4,376	-
Huntington2	716	-	6,741	-	744	-	6,841	-	-	-	8,945	-	959	2,300	3,912
JimBridger1	401	501	4,034	854	417	514	4,094	854	-	-	4,294	-	496	-	3,105
JimBridger2	392	3,294	131	424	407	3,378	133	424	-	3,712	-	496	-	3,042	-
JimBridger3	131	218	377	4,255	136	224	383	4,255	-	496	-	3,335	-	496	-
JimBridger4	2,065	823	474	119	2,147	844	481	119	4,107	-	483	-	3,299	-	483
Naughton1	-	-	4,570	85	-	-	4,637	85	977	988	-	4,748	-	-	1,067
Naughton2	-	570	3,762	370	-	584	3,817	370	-	-	4,748	-	1,022	-	4,748
Naughton3	317	-	311	5,680	329	-	315	5,680	-	1,103	-	6,521	-	1,202	-
Wyodak	3,014	-	-	54	3,133	-	-	54	641	4,293	-	-	-	589	4,691
Total Partner	17,468	20,626	26,748	24,003	18,160	21,150	27,143	24,003	20,583	25,624	30,396	27,859	21,509	23,502	27,850

PacifiCorp
Exhibit PP&L_____. 1R(RCW- 1R)
Docket No. UE 032065
Witenss: Richard C. Woolley

Exhibit RCW-2
Generation
2005 Ten-Year Plan - O&M Our Share ($000) - without Currant Creek

Fiscal Years - SAP O&M Expenses

	Actual Expenditures - Actual $				Actual Expenditures - 2004 $				2005 Ten-Year Plan - All Years in 2004 $							
	2001 Actual	2002 Actual	2003 Actual	2004 Actual	2001 Actual	2002 Actual	2003 Actual	2004 Actual	2005 Budget	2006 Budget	2007 Plan	2008 Plan	2009 Plan	2010 Plan	2011 Plan	2012 Plan
Hunter	26,866	32,373	33,441	34,570	27,931	33,196	33,935	34,570	33,736	29,774	36,057	33,710	32,677	35,154	37,443	30,874
Huntington	21,670	29,918	32,979	29,751	22,528	30,679	33,466	29,751	26,932	34,240	35,447	25,443	28,772	32,086	29,275	26,321
DaveJohnston	25,470	27,493	28,420	36,625	26,479	28,192	28,840	36,625	30,989	36,016	34,956	38,045	34,620	36,264	32,762	36,963
Wyodak	10,157	8,400	8,416	9,822	10,560	8,614	8,541	9,822	10,289	14,101	10,160	9,573	9,600	10,604	14,498	9,677
JimBridger	30,412	33,457	37,468	40,219	31,617	34,308	38,021	40,219	40,480	41,096	41,722	40,973	40,847	40,604	40,823	41,596
Naughton	19,907	21,250	31,028	28,100	20,696	21,790	31,487	28,100	23,434	25,399	27,732	34,068	24,005	24,480	28,798	29,320
Carbon	9,639	8,819	9,876	10,792	10,021	9,044	10,022	10,792	12,260	10,551	10,433	11,750	11,834	10,398	10,433	11,745
Gadsby	4,266	31,242	6,962	8,027	4,435	32,037	7,065	8,027	7,981	8,340	8,384	9,666	9,475	9,475	8,455	8,384
LittleMt	(40)	563	1,174	722	(41)	578	1,191	722	805	810	795	795	1,290	786	786	786
Blundell	1,398	2,325	1,586	1,872	1,453	2,384	1,609	1,872	2,055	2,131	2,455	2,044	2,039	2,039	2,047	2,088
WValley	-	10	14,794	18,973	-	10	15,013	18,973	19,737	20,105	20,120	20,179	20,120	20,120	20,179	20,120
Craig	7,035	7,926	7,075	8,865	7,314	8,128	7,180	8,865	7,489	7,214	7,755	7,657	7,214	7,657	7,657	7,116
Hayden	3,239	3,094	3,019	3,781	3,367	3,173	3,063	3,781	3,628	3,480	3,824	3,608	3,421	3,912	3,706	3,514
Cholla	15,916	15,481	15,326	16,691	16,546	15,875	15,552	16,691	21,475	16,796	16,747	16,679	26,842	19,200	19,632	19,585
Hermiston	6,790	5,899	7,750	6,951	7,059	6,049	7,865	6,951	6,290	10,299	8,878	6,984	10,008	10,083	7,211	10,731
Colstrip	4,785	5,002	4,818	5,327	4,974	5,129	4,890	5,327	5,411	4,685	5,300	5,275	4,685	5,300	5,275	4,710
JamesRiver	229	2	3	812	238	2	3	812	10	49	767	49	49	472	49	49
FooteCreek	1,639	1,651	1,866	1,667	1,704	1,693	1,894	1,667	1,756	2,012	2,062	2,113	2,756	2,712	2,767	2,823
Hydro	23,212	25,072	26,806	30,438	24,132	25,710	27,202	30,438	31,840	34,919	35,671	36,328	37,154	36,204	36,105	34,242
Engr	3,842	7,897	6,644	5,544	3,995	8,097	6,742	5,544	7,041	6,136	6,658	6,628	6,628	6,628	6,628	6,628
HyRel	-	489	(173)	(381)	-	501	(175)	(381)	(106)	36	46	36	46	-	-	-
ResD	733	733	445	6,024	762	752	451	6,024	1,297	1,580	1,580	1,580	1,580	1,580	1,580	1,580
Safety	3,631	1,502	2,211	2,131	3,775	1,541	2,243	2,131	3,302	3,302	3,302	3,302	3,302	3,302	3,302	3,302
AdminG	2,124	208	9,244	3,114	2,208	213	9,380	3,114	13,080	9,196	11,202	11,202	11,202	11,202	11,202	11,202
Total	222,919	270,807	291,180	310,437	231,753	277,693	295,479	310,437	311,212	322,267	332,056	327,688	330,166	330,263	330,616	323,359

Average for FY2005 - FY2008 = $323,306

Average for FY2005- FY2014 = $328,253

PacifiCorp
Exhibit PP&L_____2R(RCW-2R)
Docket No. UE 032065
Witness: Richard C. Woolley

BEFORE THE PUBLIC UTILITY COMMISSION

OF OREGON

UM 1355

In the Matter of	)
	)
The Public Utility Commission of Oregon	)
Investigation into Forecasting Outage Rates	)
For Electric Generating Units	)
	)

ICNU 302

Collar Forecast Accuracy Improvement and Replacement Stategy

REDACTED VERSION

August 13, 2009

Confidential Exhibit 302
Collar Forecast Accuracy Improvement and Replacement Stategy

[redacted]

BEFORE THE PUBLIC UTILITY COMMISSION

OF OREGON

UM 1355

In the Matter of	)
	)
The Public Utility Commission of Oregon	)
Investigation into Forecasting Outage Rates	)
For Electric Generating Units	)
	)

ICNU 303

Heat Rate Adjustment

REDACTED VERSION

August 13, 2009

[redacted]