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September 8, 2010

Via Electronic and U.S. 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 Second Opening Brief on
behalf of the Industrial Customers of Northwest Utilities in the above-referenced docket.

      Thank you for your assistance.

      Sincerely yours,

      /s/ Jacqueline E. Smith
      Jacqueline E. Smith

Enclosures
cc: Service List

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that I have this day served the foregoing Second Opening Brief on behalf of the Industrial Customers of Northwest Utilities upon the parties on the service list, shown below, by causing the same to be sent by electronic mail to all parties, as well as, deposited in the U.S. Mail, postage-prepaid, to parties which have not waived paper service.

Dated at Portland, Oregon, this 8th day of September, 2010.

/s/ Jacqueline E. Smith
Jacqueline E. Smith

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In the Matter of   )
)   SECOND OPENING BRIEF OF THE
THE PUBLIC UTILITY COMMISSION OF   )   INDUSTRIAL CUSTOMERS OF
OREGON   )   NORTHWEST UTILITIES
)
Investigation into Forecasting Forced Outage   )
Rates for Electric Generating Units.   )

I. INTRODUCTION

Pursuant to the Administrative Law Judge's ("ALJ") August 6, 2010 Ruling, the

Industrial Customers of Northwest Utilities ("ICNU") submits this Opening Brief in the Oregon

Public Utility Commission's (the "Commission" or "OPUC") second phase of the investigation

into forecasting forced outage rates for electric generating units. Consistent with the

Commission's and the ALJ's direction, ICNU's Opening Brief is limited to addressing the issue

of an appropriate "collar" mechanism that should be used to determine the forced outage rate for

coal fired generation facilities.

Although the evidentiary record contains voluminous amounts of complex

statistical analysis, the primary remaining issue is very simple: how to deal with unusually high

or low outages rates ("extreme outage rates" or "outliers") in the four-year forced outage rate

calculation. The four-year forced average outage rate should be normalized by replacing

extreme outages with long-term average outage rates. The overwhelming weight of evidence

and sound ratemaking policy demonstrates that average rates should be used because "extreme

outage events are likely to be followed by 'closer to normal' or average years." ICNU/400, Falkenberg/1.

The Commission should adopt ICNU's forced outage rate ("FOR") collar because it most accurately normalizes outage rates to reflect conditions which are reasonably expected to occur and provides more accurate forecasts. ICNU's collar has been fully vetted and reviewed, can be easily implemented, and is the only collar mechanism that is fully supported by statistical analysis and evidentiary support. The Commission's proposed collar methodology may also produce reasonably accurate forced outage rates because it also removes extreme and unusual outages, and replaces them with average outage rates which are more likely to occur during the time rates in effect. If the Commission adopts its collar, the Commission should make some minor modifications to make it more accurate and easier to implement. ICNU's collar, however, is preferable because both the Commission's collar and Staff's alternative recommendation raise more difficult (though resolvable) implementation questions.

II. BACKGROUND

The Commission opened this proceeding to determine the most accurate forecast for forced outages for ratemaking purposes. Re PGE, Docket Nos. UE 180, UE 181 and UE 184, Order No. 07-015 at 15 (Jan. 12, 2007). The parties had raised concerns about PGE's four-year forced outage rate. Id. at 13-15. After opening the proceeding, the parties submitted forced outage proposals in 2008. In total, there have been six rounds of testimony, and the Commission held a workshop on May 28, 2009.

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In lieu of issuing a final order, the Commission issued a notice that it intended to adopt a hybrid forced outage collar proposal.[1] Re Investigation into Forecasting Forced Outage Rates for Elec. Generating Units, Docket No. UM 1355, Notice (Oct. 7, 2009). The Commission's proposed collar combined elements of Staff's and ICNU's collar proposals, and was fully supported by the evidence in the record. The Commission is not limited to adopting only one of the specific proposals of the parties, but can rely upon the evidentiary record to fashion its own resolution of the issues.

In response to the Commission's notice, Portland General Electric Company ("PGE") and Idaho Power Company ("IPC") withdrew from their respective settlement stipulations which included different collar mechanisms. The Commission concluded that certain parties would be allowed to present additional evidence and argument on coal plant forced outage rates. Specifically, PGE and IPC were allowed to present evidence responding to ICNU's collar proposal, and all parties were provided the opportunity to provide reply testimony. Re Investigation into Forecasting Forced Outage Rates for Elec. Generating Units, Docket No. UM 1355, Order No. 09-479 at 4 (Dec. 7, 2009); Re Investigation into Forecasting Forced Outage Rates for Elec. Generating Units, Docket No. UM 1355, Prehearing Conference Report (June 29, 2010). An evidentiary hearing was held on August 23, 2010, and all parties have an opportunity to fully brief the forced outage collar issue based upon the existing evidentiary record. UM 1355, Order No. 09-479 at 4; Hearing Transcript ("Tr.") at 1.

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[1]   The ALJ has indicated that the Commission intends to issue an order resolving the few other remaining outstanding issues (minimum loading and heat rates for PacifiCorp) at the same time it issues a final order resolving the forced outage collar issue.

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III. ARGUMENT

1.   The Commission Should Adopt a Collar Mechanism that Most Accurately Forecasts Forced Outage Rates and Is Practical to Implement

The purpose of a collar mechanism is to normalize forced outage rates to improve their overall accuracy. The use of a collar is consistent with standard ratemaking normalization in which extreme events are excluded from rates because they are not expected to reoccur during normal conditions. Any collar adopted by the Commission should also be easy to implement and monitor since forced outage rates are adjusted on at least an annual basis in PacifiCorp and PGE's power cost and general rate case proceedings

Normalization of forced outage rates should exclude "extremely long events, and for years that a unit experiences a significant number of small outages that is outside what would be considered normal . . . ." Staff/100, Brown/18. This is consistent with the goal for this proceeding, which is to develop "the most accurate forecast of forced outages at the relevant plants." Re PGE, Docket Nos. UE 180, UE 181 and UE 184, Order No. 07-015 at 15 (Jan. 12, 2007); Tr. at 27 (Brown). The ultimate purpose of the normalization of outage rates is "to determine whether the forced outage rate for the test period is reasonable and likely to occur." Staff/100, Brown/18.

The Commission must first ascertain which outage rates should be considered "extreme" or "outliers" that will be removed from normalized rates. ICNU, Staff, PGE and the Commission's collars exclude those extreme outages that lie outside of the 90th or 10th percentiles of the outage rate distribution. UM 1355, Order No. 09-479 at 1-2; ICNU/400,

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Falkenberg/2; PGE/300, Tinker-Weitzel/16. PacifiCorp, in contrast, has proposed that only a very limited number of extreme outages should be removed. ICNU/300, Falkenberg/10.[2/]

Next, the Commission must determine what outage rates should be used to replace the extreme and outlier outages. The central question is whether the replacement outages should be based on average or normal conditions that are likely to occur during the test period, or whether the replacement outages should be based on slightly less extreme outages. ICNU/400, Falkenberg/36; Tr. at 36-37 (Falkenberg). ICNU's and the Commission's collars both replace extreme outages with normal or average outage rates, while PacifiCorp and PGE propose that extreme outages should be replaced with slightly less extreme outages. UM 1355, Order No. 09-479 at 1-2; ICNU/400, Falkenberg/1-2. Staff also supports replacing extreme outages with average or normal outage rates. Tr. at 12 (Brown).

Other significant issues in constructing an accurate forced outage collar include which data to use when determining outlier outages and replacement outages, whether replacement outages should exclude imprudent outages and outages longer than 28 days, and what time period should be used to calculate the replacement outages. In addition, the Commission should provide guidance regarding the verification or recreation of historic data used for replacement outages, especially if the Commission decides to use data from the entire life of the plant.

[2/]   The characterization of any party's position in this Opening Brief is based on their last filed testimony or pleading. Parties' positions may have changed, as it has been almost a year since parties have stated their position on certain issues.

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2.   Extreme Outages Should Be Excluded Because They Are Not Likely to Occur During the Time Rates Are In Effect

The Commission's collar and all parties except PacifiCorp[3] propose that extreme outages be defined as those lying outside of the 90th or 10th percentiles. Basing extreme outages upon a 90/10 probability is supported by analysis of actual outage data, and will result in more accurate forecasts "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." ICNU/300, Falkenberg/1, 13; Staff/300, Brown/6-8. Extreme outages are not removed because they are imprudent, but rather to normalize outage rates by excluding abnormal results that are not likely to occur during the time rates are in effect. Staff/300, Brown/6-8, 13-15; ICNU/300, Falkenberg/1, 6-7, 13. Net power costs should not assume that a Boardman or Hunter type outage will occur every four years, but instead should forecast what forced outages will occur under normal conditions. ICNU/400, Falkenberg/33.

Both extremely good and bad outage years should be removed from the forced outage rate to achieve proper parity and equity. Staff/100, Brown/19-20. Removal of extreme events should be symmetrical so that there is "a fair chance for both reductions and increases to abnormal outage rates." ICNU/300, Falkenberg/13.

3.   Replacement Outages Should Be Based on Average or Normal Outage Conditions

Extraordinary outages should be replaced with an outage rate based on normal or average outage rate conditions. ICNU/300, Falkenberg/7, 13; ICNU/400, Falkenberg/1-2, 33.

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[3]   PacifiCorp proposed to exclude only a limited number of very extreme outages based as more than 97.5% and below 2.5%, based on a "two sigma" standard. ICNU/300, Falkenberg/10. ICNU's Opening Brief in the first phase of this proceeding explained why PacifiCorp's proposal should be rejected because it was inaccurate, unrealistic and not meaningful. ICNU Opening Brief at 12-13.

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Sound ratemaking theory, historical evidence and statistical analysis demonstrate that "extreme outage events are likely to be followed by 'closer to normal' or average years." ICNU/400, Falkenberg/1-2. This means that "extreme outages should be replaced with average outage rates instead of 'slightly less extreme' outages recommended by PGE and PacifiCorp." Id. at Falkenberg/1-2; ICNU/300, Falkenberg/6-7, 13.

Replacement of extreme outages with average outage conditions is consistent with standard and well-accepted ratemaking principles. Rates are typically normalized to exclude figures which are not representative of the test period and replace them with "a representative annual cost during the period the rates are in effect." Leonard Saul Goodman, The Process of Ratemaking, Vol. I, 470-71 (1998).

A review of the historical data demonstrates that outage rates return to normal and abnormal outage events are likely to be followed by ones very close to the average. ICNU/300, Falkenberg/6; ICNU/400, Falkenberg/4. ICNU's collar was based on 20 years of coal outage data that showed that "the year after the 'best' or 'worst' year for any unit is closer to" average operations than the year with the extreme event.[4] ICNU/300, Falkenberg/7; Tr. at 14 (Brown). Operational history shows that "the year after the 'worst' or 'best' years reverts almost all the way back to the mean." Id. ICNU/300, Falkenberg/7. Therefore, the best way to predict the forced outages that will occur in future years is to replace the most extreme with outages based on the 20 year average or mean. Id. at 13; ICNU/400, Falkenberg/4, 16-17, 24, 29, 31, 34. The Commission's collar is based on this principle in that it recognizes that forced outage rates "may

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[4] ICNU's, PacifiCorp's and PGE's proposed collars are based on an analysis of 20 years of data from PacifiCorp generating units. ICNU/400, Falkenberg/10 n.20; ICNU/300, Falkenberg/6. In response to concerns raised by PGE, ICNU reviewed 30 years of PacifiCorp outage data, which supported the conclusion that the most accurately predictive outage rates should replace extreme outages with average outages. ICNU/400, Falkenberg/11.

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be made yet more accurately predictive" if replacement outages are based on a mean annual forced outage rate. UM 1355, Notice of Intent to Modify Stipulations at 3.

4.   The Commission Should Reject PGE's Criticisms of the ICNU Collar

PGE submitted testimony raising a number of critiques of the evidence that forced outage rates should be based on average outage rate conditions. PGE/300, Tinker-Weitzel/1-18. Mr. Falkenberg submitted exhaustive and comprehensive responsive testimony addressing these issues. This evidence demonstrates that the historic evidence and statistical theory establish that the most accurate predictions will replace extreme outages with average outages rather than those that are slightly less extreme. ICNU/400, Falkenberg/1-43; ICNU/401, Falkenberg/1-6. PGE's four main criticisms are that: 1) outage rates do not return to normal after extreme events; 2) ICNU inappropriately relied upon after the fact data to prove the accuracy improvements of its collar; 3) the accuracy improvements of using average replacement outages in the forced outage rate are not statistically significant; and 4) a different statistical method should be used to test accuracy improvements. ICNU/400, Falkenberg/2-3; PGE/300, Tinker-Weitzel/1-5. The Commission should reject PGE's criticisms because its testimony fails to refute the evidence that the ICNU and Commission collars are more accurately predictive of future outage rates.

The Commission should also adopt the ICNU or Commission collars even if the Commission agrees with PGE's testimony. While PGE criticized ICNU's collar, PGE did not provide any basis that PGE's approach provides <u>more</u> accurate results. ICNU/400, Falkenberg/4, 19; Staff/400, Brown/9. PGE's best argument is that "a statistical analysis can't decide which alternative is best, not which is better." ICNU/400, Falkenberg/4. PGE has failed to address the other public policy and logical grounds favoring the use of ICNU and Commission collars.

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A. Forced Outage Rates Return to Normal Following an Extreme Outage

PGE argues that replacement outages should not be based on average outage rates because forced outage rates are "non-stationary,"[5/] or change over time. PGE/300, Tinker-Weitzel/5, 14-15. PGE claims that its views are based on "common sense." Id. PGE also inaccurately asserts that a four-year forced outage rate is used because more recent data is best for forecasting forced outage rates. Id. at Tinker-Weitzel/14-15; ICNU/400, Falkenberg/9-10. PGE, however, mischaracterizes the reasons for the use of a four-year forced outage rate and fails to present any analysis supporting its claim that forced outage rates are non-stationary and change significantly over time. ICNU/400, Falkenberg/11-12. Actual analysis of historic outage rates demonstrates that forced outage rates for mature plants are normally stationary and relatively constant over time. Id. at Falkenberg/14-19; ICNU/401, Falkenberg/1-6.

Common sense indicates that the forced outage rates for mature coal plants should not significantly change over time, but should remain relatively constant. Coal plants are likely to have unexpected and variable outage rates during the first year or two of operations and in their final years of operation, but after a plant matures, the outage rate "is likely to be flat, until the end of a unit's lifetime." ICNU/400, Falkenberg/15 n.29. This is referred to as a "bath tub curve," and is the "conventional assumption for outage rate modeling in planning studies." Id. For example, PGE uses "constant unchanging outage rates for its Integrated Resource Plan ('IRP')." Id. at Falkenberg/12; ICNU/402, Falkenberg/3-5. If PGE actually believed that

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[5/]   A stationary series "is one where the means and variances do not change significantly over time. A non-stationary series is one where the means and variances do change significantly over time." ICNU/400, Falkenberg/2 n.4; Staff/400, Brown/5. In a stationary series, an unexpected event (like an extreme outage) will not have a significant permanent impact. ICNU/400, Falkenberg/8-9. For example, the performance of a complex machine is stationary when a broken part temporarily harms performance, but performance returns to normal once the part is fixed. Id. at Falkenberg/9.

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outage rates are "changing over time, it would seem they should at least try to forecast the direction of change for IRP purposes." Id. at Falkenberg/12.

Stationary series like outage rates often have short-term trends; however, eventually the trends for most units revert back to the long-term average. ICNU/400, Falkenberg/15; Staff/400, Brown/6 (discussing trends in ten-year forced outage data sets). In other words, short-term trends have appeared in forced outage data, but there is no evidence of permanent trends in the long-term forced outage data. Id. at Falkenberg/15. There are numerous factors which can degrade performance over time, while there are others that maintain or improve the outage rate, but these factors appear to offset over the long-term to maintain a similar overall outage rate for most coal units. Id. at Falkenberg/12. This does not mean that there are no changes or trends over time, but that for most plants they have not been shown to be significant during the years of mature plant operations.

A review of the historic data in this case confirms that forced outage rates have not significantly varied over time, and outage rates return back to the average following an extreme event. ICNU/400, Falkenberg/13-19; ICNU/401, Falkenberg/1-6; ICNU/402, Falkenberg/6-7. For example, data from the North American Electric Reliability Corporation ("NERC") shows that average equivalent availability for coal plants has remained relatively constant over the past decade. ICNU/400, Falkenberg/12. More importantly, a rigorous analysis of monthly, semi-annual and annual coal plant data in this proceeding shows that forced outage series are stationary and therefore revert back to the average after extreme events. Id. at 14; ICNU/401, Falkenberg/1-6.

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In fact, there is little difference in forecast accuracy between the use of a twenty-year average and the use of a four-year average. ICNU/400, Falkenberg/16-17. In other words, a four-year average and a long-term average are nearly the same in terms of their ability to predict outage rates. Id. ICNU, however, does not recommend that the Commission utilize twenty-year forced outage rates instead of a four-year outage rate because there is a long history of use of the four-year average, there is only a slight accuracy difference, and it would require more data and analysis in the annual power cost proceedings. See id. at Falkenberg/18. A problem with the use of a four-year average, however, is that it gives too much weight to outlier observations. Id. The ICNU or the Commission collars are reasonable methods to address these unlikely to occur extreme events.

B.   ICNU's Use of Future Data Is Reasonable and Does Not Bias the Results

PGE claims that ICNU's collar is flawed because it uses data from the entire period to calculate the replacement outage rate. PGE/300, Tinker-Weitzel/1-2, 7. Essentially, "ICNU used the full twenty-year average for replacement of all outlier years that occurred throughout the twenty year data set. For example, if an outlier occurred in 1997, Mr. Falkenberg replaced that outage with the twenty-year average of 1989-2007." Staff/400, Brown/8. Staff also criticizes the use of future information in the replacement value as a means to verify the accuracy of a forecast. Id. at Brown/9.

The concerns regarding the use of "future" data are overblown. The use of data from the entire twenty-year period is "a very useful empirical analysis explaining the actual behavior of outage rates in the years following extreme outage rate occurrences." ICNU/400, Falkenberg/3, 5-8. Both PGE and PacifiCorp used future or "ex-ante data in the analyses they

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presented of the collar mechanisms." Id. at Falkenberg/6. At the very most, the use of ex-ante

data suggests it would not be accurate to characterize the accuracy comparisons presented in

ICNU/300 as "backcasts," but rather as purely empirical analyses testing the behavior of outage

rates after extreme events occurred, much like econometric models used for load forecasting. Id.

at 5. Regardless, the use of ex-ante data did not introduce any bias because the removal of the

data does not alter the conclusion that extreme outages are followed by outages closer to the long

term average and are not followed by additional extreme outages. Id. at 3, 6-8.

C.   **The Forecast Accuracy Improvements in the ICNU Collar Are Statistically Meaningful**

PGE alleges that the forecast accuracy improvements of ICNU's collar are not

statistically significant. PGE/300, Tinker-Weitzel/2; ICNU/400, Falkenberg/2-3. PGE's

accuracy improvement analysis relies upon "permutation tests" that contains basic errors that

invalidated their results. ICNU/400, Falkenberg/3, 19. Correcting these errors in the

permutation test, and use of conventional statistical analysis demonstrates that the accuracy

improvements in ICNU's collar are statistically significant and are not coincidental. Id. at

Falkenberg/3, 19-29.

D.   **PGE's Own Novel Statistical Method Supports the ICNU Collar**

PGE argues that Mr. Falkenberg's use of the Summed Square Error ("SSE")[6]

methodology is not the best for ascertaining which collar is most accurate, but that the

Commission should instead rely upon the Relative Geometric Root Mean Square Error

("RGRMSE") method. PGE/300, Tinker-Weitzel/4; ICNU/400, Falkenberg/3-4, 29-40.

Although ICNU does not believe the RGRMSE is the proper methodology to test the accuracy of

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[6]   This method is also referred to as the Root Mean Square Error ("RMSE"). E.g. ICNU/400, Falkenberg/3.

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the various collar methods, the issue is a classic "tempest in a teapot" because both methods

support the conclusion that replacing extreme outages with average outage conditions in the

forced outage rate is the most accurately predictive.

The RGRMSE is a novel statistical analysis that (like the permutation test) PGE

has never previously relied upon for any reason. ICNU/400, Falkenberg/37; ICNU/402,

Falkenberg/8. PGE appears to have used this new methodology on an "ad hoc" basis for the sole

purpose of challenging the ICNU collar. See id. at Falkenberg/38. The SSE methodology, not

the RGRMSE, is the properly methodology that is used for forecasting load and power costs,

which is the ultimate purpose of establishing a forced outage rate. Id. at Falkenberg/38-39.

More importantly, PGE failed to recognize the RGRMSE analysis supports "a

'closer to normal' replacement strategy" rather "than a 'slightly less extreme' replacement

strategy." Id. at Falkenberg/31. Mr. Falkenberg utilized the RGRMSE to compare whether the

ICNU collar or the PGE collar produces the most accurate results, and the RGRMSE supports a

conclusion that extreme outages should be replaced with outages closer to the historic average.

Id. Specifically, the RGRMSE supports using replacement outages at the 54th and 46th

percentile instead of the 90th and 10th percentile as PGE has proposed. Id. at Falkenberg/31-32.

This is much closer to ICNU's proposal to replace extreme averages with the twenty-year

historic mean (i.e., the 50th percentile) than PGE's collar.

5.   **Outage Data Used For a Collar Should Be Easily Verifiable**

The Commission should rely upon certifiable outage data that is not capable of

easy manipulation. Staff's original collar and PGE's proposed collar rely upon NERC data to

exclude all extreme outages above the 90th percentile and below the 10th percentile, and to

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calculate the replacement outages. Staff/100, Brown/18-20; Staff/300, Brown/8-10; PGE/300, Tinker-Weiztel/15-16; ICNU/400, Falkenberg/5 n.11. ICNU and PacifiCorp, in contrast, relied upon the historic plant availability to determine outliers and replacement outages. ICNU/400, Falkenberg/5 n.11; ICNU/300, Falkenberg/2. ICNU maintains the same position outlined in ICNU's earlier briefing: unit specific data most accurately predicts future events, but that NERC data can also be used to develop a collar because it is objective and would further the goal of improving forced outage accuracy. ICNU Opening Brief at 9-12; ICNU/300, Falkenberg/2.

The Commission's collar combines the use of both NERC and unit specific data. The Commission relies upon NERC data to ascertain which outages should be considered extreme. UM 1355, Notice at 3; Order No. 09-479 at 1-2. This is an appropriate manner to determine outlier outages because it is reasonable to use NERC data when determining which outages should be considered extreme. See ICNU Opening Brief at 12.

The Commission's collar calculates replacement outages based on the mean annual forced outage rate from the unit's entire historical data. UM 1355, Notice at 3; Order No. 09-479 at 1-2. This is similar to the ICNU proposal for calculating the replacement outages, but relies upon the unit's entire historic data instead of 20 years of historic data. The use of the entire unit's historical data is a reasonable way to forecast the outages that will occur during the period rates will be in effect. ICNU/400, Falkenberg/1-4.

The Commission, however, should make a few modifications to its use of historic data to best improve forced outage accuracy and ensure that its collar is easy to implement. As the Commission has noted, historic data may not be available. The Commission has stated that it will resolve this problem by concluding "that there is a rebuttable presumption that all such

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records are available, or recreatable" and that the utilities have the burden of proof to demonstrate that the information exists or can be recreated. UM 1355, Order No. 09-479 at 3.

ICNU is concerned that allowing the utilities to recreate historic data will be a subjective process that can be manipulated and may increase the difficulty in verifying the reasonableness of the information. ICNU recommends that the utilities make their best reasonable efforts to locate historical information, but that the utilities not be provided the discretion to recreate any historic data.

The use of historic data in excess of 20 years may potentially raise other implementation issues. First, the utilities should be required to demonstrate that forced outage reporting systems currently being utilized are the same or substantially the same as older historic data. Older information will have limited use if not comparable to the current information. Second, the utilities should be required to produce outage records and documentation verifying that older historic outages were not the result of utility imprudence or negligence. Older imprudent outages should be relied upon to forecast forced outage rates.

The Commission should also modify the use of historic information to exclude the first years of a unit's operation. ICNU's collar and all of the evidence regarding accuracy improvements relying upon the use of historic data are based on reviewing the outage rates of mature plant. Outages rates, however, are likely to vary during the initial operations of the plant operation and in the final years resulting in a "bathtub curve." ICNU/400, Falkenberg/15 n.29. As this proceeding is attempting to ascertain the forced outage rate of mature plants, outages during the first two years of operation should be excluded from any collar mechanism.

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Ultimately, ICNU recommends that the Commission simply rely upon the last 20 years of historic information to determine the replacement outage rate rather than the entire historic plant life. Issues related to verification of data, the potential inclusion of imprudent outages, and the "bathtub" curve may make using the entire historic period information more difficult and controversial. In addition, ICNU's analysis demonstrated that there is little forecast accuracy improvement between a four-year forced outage rate and a twenty-year forced outage rate. ICNU/400, Falkenberg/16. Therefore, there may be little practical benefit in using a longer-term average. Id; see also ICNU/400, Falkenberg/24.

6. **The Commission Should Exclude Both Imprudent and Long Outages from the Four-Year Average**

Imprudent outages and outages with long durations should be excluded from normalized rates. ICNU's collar is consistent with Commission precedent that caps all long outages at 28 days and removes imprudent outages. In calculating the replacement outages, the Commission's collar removes imprudent outages, but it does not appear to address the abnormally long outages. UM 1355, Order No. 09-479 at 3. ICNU recommends that the Commission either adopt the ICNU collar, or modify its collar to cap outage durations at 28 days.

In setting normalized power costs, including forced outage rates, the Commission has historically removed the costs associated with imprudent outages and extremely long outages. The Commission previously held that imprudent outages, including those related to management failure "should be removed from the calculation of the four-year rolling average." Re PacifiCorp, Docket No. UE 191, Order No. 07-446 at 20 (Oct. 17, 2007). Similarly, the Commission has held that an outage of long duration, "no matter what the cause, is anomalous,

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and raises issues regarding its inclusion in normalized rates." Id. at 21. Outages should continue to be capped at 28 days. Id.

ICNU, PGE and PacifiCorp collars capped long outages at 28 days as well. ICNU/400, Falkenberg/2 n.3, 32-34. The accuracy improvements that occur because of the capping of long outages is a key component of ICNU's collar. Id. at 2 n.3. For example, capping the long outages at 28 days by itself "improved forecast accuracy by more than 9% compared with use of a simple, unadjusted four-year moving average." Id. If the Commission does not adopt ICNU's collar, then it should clarify or modify its collar to cap these long outages at 28 days to create a four-year average which is the most accurately predictive.

IV.   CONCLUSION

The Commission should adopt the ICNU collar, or in the alternative, a slightly modified version of the Commission's own collar, because they will most accurately predict future forced outages. Despite the voluminous amount of statistical evidence, in the end, the Commission should not lose track of the fact that the:
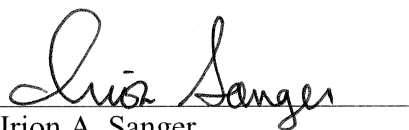
> [M]ost important question here is not whether the FOR series is stationary   or whether use of ex-ante data produced biased results. Instead, the question quite simply is this: What is the best strategy for replacement of outliers? Will 'extreme' results foreshadow a transition to a more extreme era, 'a new normal,' or will things return to the 'old normal?'   In other words, should a 'closer to normal' strategy be followed or should a 'slightly less extreme' replacement strategy be used?

ICNU/400, Falkenberg/36; Tr. at 36-37 (Falkenberg). The evidence in this proceeding and sound public policy unequivocally provide the answer that a collar mechanism that replaces extreme outages with average outages will produce the most accurate forced outage forecasts.

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Finally, any collar mechanism should remove imprudent outages, limit abnormally long outages,

and rely upon verifiable and easy to utilize outage data.

Dated this 8th day of September, 2010.

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