



Oregon

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Public Utility Commission

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August 13, 2010

Via Electronic Filing and U.S. Mail

OREGON PUBLIC UTILITY COMMISSION
ATTENTION: FILING CENTER
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SALEM OR 97308-2148

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

Enclosed for electronic filing in the above-captioned docket is the Public Utility
Commission Staff's Reply Testimony.

/s/ Kay Barnes

Kay Barnes

Regulatory Operations Division

Filing on Behalf of Public Utility Commission Staff

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c: UM 1355 Service List (parties)

**PUBLIC UTILITY COMMISSION
OF OREGON**

UM 1355

STAFF REPLY TESTIMONY OF

Kelcey Brown

**In the Matter of
THE PUBLIC UTILITY COMMISSION OF OREGON
Investigation into Forecasting Forced Outage Rates
for Electric Generating Units.**

August 13, 2010

CASE: UM 1355
WITNESS: Kelcey Brown

**PUBLIC UTILITY COMMISSION
OF
OREGON**

STAFF EXHIBIT 400

Reply Testimony

August 13, 2010

1 **Q. PLEASE STATE YOUR NAME, OCCUPATION, AND BUSINESS**
2 **ADDRESS.**

3 A. My name is Kelcey Brown. My business address is 550 Capitol Street NE
4 Suite 215, Salem, Oregon 97301-2551. I am a Senior Economist in the
5 Electric and Natural Gas Division of the Utility Program of the Public Utility
6 Commission of Oregon (OPUC).

7 **Q. ARE YOU THE SAME KELCEY BROWN THAT FILED OPENING, REPLY**
8 **AND SUPPLEMENTAL REPLY TESTIMONY IN THIS PROCEEDING?**

9 A. Yes. My Witness Qualification Statement can be found in Exhibit Staff/101,
10 Brown/1.

11 **Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?**

12 A. In Order No. 09-479, the Commission proposed a modification of Staff's
13 methodology for addressing forced outage rates (FOR) for years in which an
14 outlier, or prolonged event occurs. The Commission's proposed modification
15 was advocated by Industrial Customer's of Northwest Utilities (ICNU),¹ which
16 supported its position with exhibits and testimony citing increased accuracy
17 compared to the proposed Staff methodology. On July 16, 2010, Portland
18 General Electric (PGE) and Idaho Power Company (Idaho Power) filed opening
19 testimony to respond to the Commission's proposed modification, and ICNU's
20 testimony. The purpose of my testimony is to reply to Idaho Power and
21 Portland General Electric's opening testimony.

22 **Q. HOW IS YOUR TESTIMONY ORGANIZED?**

¹ See ICNU/300.

1 A. First, I will briefly discuss the background for the current phase of this
2 proceeding. Second, I will summarize PGE and Idaho Power's testimony on
3 ICNU's FOR proposal. Third, I will address the alternative replacement value
4 proposals provided by PGE and Idaho Power in opening testimony. Lastly, I
5 will provide Staff's conclusions and recommendations.

6 **Q. WHAT IS THE CONCLUSION OF YOUR TESTIMONY?**

7 A. After reviewing PGE and Idaho Power's testimony, Staff finds no compelling
8 reason for the Commission to alter its decision in Order No. 09-479. However,
9 as an alternative to the current Commission proposal, Staff believes that the
10 use of a ten-year rolling average, excluding outlier values, should address
11 Idaho Power and PGE's concerns with regard to ICNU and the Commission's
12 proposed method.

13 **Forced Outage Rate Investigation**

14 **Q. PLEASE PROVIDE A BRIEF BACKGROUND OF PHASE I OF THE**
15 **FORCED OUTAGE RATE INVESTIGATION.**

16 A. The Commission opened the forced outage rate investigation (UM 1355) on
17 November 2, 2007. In Phase I of UM 1355 the parties participated in three
18 workshops, filed opening and reply testimony, and participated in a technical
19 workshop with the Commissioners and the Administrative Law Judge (ALJ).
20 PGE and Idaho Power reached full settlements with intervenors and Staff, and
21 PacifiCorp reached partial settlement with intervenors and Staff. ICNU, the
22 Citizens' Utility Board of Oregon (CUB), Staff and PacifiCorp filed two
23 additional rounds of testimony, and filed opening and closing briefs.

1 On October 7th, the Commission issued notice to the parties of its
2 intention to adopt the stipulations, or terms of the settlement, subject to certain
3 modifications. In its notice, the Commission set forth its proposed modification
4 for addressing extraordinary forced outages in the calculation of rates for coal-
5 fired thermal generating facilities.

6 **Q. PLEASE PROVIDE A BRIEF BACKGROUND OF PHASE II OF THE**
7 **FORCED OUTAGE RATE INVESTIGATION.**

8 A. As stated above, the Commission set forth a proposed modification to the
9 original Staff methodology for addressing extraordinary forced outages in the
10 calculation of rates for coal-fired thermal generating facilities. The

11 Commission's proposed modification was further clarified in Order No. 09-479:

12 "The methodology for calculating the forced outage rate shall be as set
13 forth in Staff/200, Brown/8-15, except that, instead of adjusting the
14 FOR to the 10th and 90th percentile values for the calendar year, the
15 mean annual FOR from the unit's entire historical data shall be
16 substituted."

17
18 Further, in Order No. 10-157, the Commission granted PGE and Idaho Power
19 permission to file additional testimony to address issues with its modification
20 and ICNU's FOR proposal.

21 **Q. PLEASE SUMMARIZE ICNU'S FORECASTING METHOD COMPARED TO**
22 **STAFF'S PROPOSED FORECASTING METHOD.**

23 A. ICNU witness Randall Falkenberg proposed a forecast methodology to replace
24 the outlier value with the average FOR of the plant over the last twenty years.

25 The 90th and 10th percentile value, used to determine the presence of an

1 outlier, was calculated based on the plants historical FOR.² Staff's proposed
2 forecast method uses the North American Electric Reliability Corporation
3 (NERC) unit data for a similar sized coal-fired generating unit in order to
4 calculate the 90th and 10th percentile FOR value. If one of PGE, PacifiCorp, or
5 Idaho Power's coal-fired units were to fall outside of the 90th or 10th percentile
6 NERC value in any given year, that FOR value would be replaced by the 90th
7 or 10th percentile value for purposes of the four-year rolling average for
8 ratemaking.

9 **Q. WHAT WAS ICNU'S REASON FOR PROPOSING ITS OWN**
10 **METHODOLOGY IN ICNU/300?**

11 A. ICNU claimed that "the Staff method is reasonable and it does not pose an
12 unreasonably difficult standard. It is, however, not the best possible solution,
13 and I will offer an improved collar."³ ICNU claimed that its proposed
14 forecasting methodology increased forecast accuracy by "almost twice as
15 much as using the Staff collar design and replacement strategy."⁴

16 **Q. PLEASE SUMMARIZE PGE'S OPENING TESTIMONY.**

17 A. In testimony, PGE questioned ICNU's assertions that its proposed method is
18 more accurate than the original Staff proposal. PGE contended that ICNU's
19 assertions of increased accuracy are flawed due to methodological errors.
20 PGE corrected these errors in its testimony and found that the forecast
21 performance of ICNU's mean replacement strategy is nearly identical to that of

² See ICNU/300.

³ See ICNU/300, Falkenberg/2, Lines 7-9.

⁴ See Id, Falkenberg/13, Lines10-11.

1 the original Staff proposal. Also, PGE refuted ICNU's theory that there is
2 "mean reversion" over the life of a coal plant in its forced outage rates and
3 therefore, using the twenty year mean of the plant as the replacement value is
4 ultimately flawed.

5 **Q. WHAT IS MEAN REVERSION?**

6 A. Mean reversion is an idea that a coal unit's high and low FOR values are
7 temporary, and that the coal unit will tend to have an average FOR value over
8 time. PGE also claims that in order to be "mean reverting" the data set must
9 be a stationary time series.

10 **Q. WHAT IS A STATIONARY TIME SERIES?**

11 A. A stationary time series simply means that the average does not change over
12 time. For example, if you were to plot the annual average height of a man from
13 1900-1950, and then from 1950-2000, if the series were "stationary" the
14 average height of man would not change over that time. If however, there was
15 a trend of increasing or decreasing average height over time this would be
16 considered a "non-stationary" time series.

17 **Q. DO YOU BELIEVE MR. FALKENBERG CONSIDERED WHETHER THE**
18 **MEAN WAS CHANGING THROUGH TIME?**

19 A. It is unclear if Mr. Falkenberg's method was contingent on an unchanging
20 mean, or if he simply meant that the coal plant will return to a value nearer to
21 the current mean. As explained in testimony, Mr. Falkenberg's statement was

1 simply that after an extended outage it was more likely that the plant would
2 experience an outage rate that was closer to “normal.”⁵

3 **Q. HAVE YOU OBSERVED ANY CHANGES IN THE AVERAGE OF THE**
4 **FORCED OUTAGE RATE DATA OF THE INDIVIDUAL COAL-FIRED**
5 **UNITS?**

6 A. The data set, provided by PacifiCorp in Phase I of this proceeding, is only up to
7 twenty years of data. This data set is relatively small when trying to determine
8 whether there has been a change in the average FOR of the plant over time.
9 In some cases, such as with Colstrip 3 and 4, there is only ten years of data.

10 **Q. HAS STAFF ATTEMPTED TO PERFORM LONG-TERM ROLLING**
11 **AVERAGES TO SEE IF THERE ARE CHANGES IN THE AVERAGE OVER**
12 **A PERIOD OF TIME?**

13 A. Yes. I calculated a simple ten-year rolling average for each of PacifiCorp's
14 units that had twenty years of information. This calculation revealed trends in
15 the mean that went both up and down. In some cases the trend is significant
16 and changed as much as 48 percent over a ten-year period. Again, since I am
17 unable to review the annual FOR data since the inception of the plant, I cannot
18 determine whether the mean of the plant has changed over that time.

19 **Q. IS A DECREASING OR INCREASING AVERAGE IMPORTANT?**

20 A. Yes. If the FOR average of the lifetime of the plant is increasing or decreasing
21 over time due to outside factors, such as changes in policy or operating

⁵ See ICNU/300, Falkenberg/6.

1 procedures, then that historical information may be irrelevant to what will
2 happen in the future and may be unduly biasing the forecast.

3 **Q. IS THIS THE ARGUMENT THAT IDAHO POWER MAKES IN ITS**
4 **TESTIMONY?**

5 A. Yes.

6 **Q. WHAT IS STAFF'S PRIMARY CONCERN WITH REGARD TO A LONG-**
7 **TERM AVERAGE BEING USED AS A REPLACEMENT VALUE?**

8 A. Due to the fact that many of these plants do not have "long-term" averages, or
9 histories that are greater than 10-15 years, it seems problematic to do a long-
10 term average of the information that also includes any outlier values.

11 **Q. DO YOU HAVE AN EXAMPLE OF THE EFFECT THIS CAN HAVE ON THE**
12 **AVERAGE OF THE PLANT OVER A RELATIVELY SHORT TIME**
13 **PERIOD?**

14 A. Yes. Colstrip 3, with only ten years of historical FOR data, has an average
15 FOR of 12.54 percent. Colstrip 4, also with only ten years of historical FOR
16 data, has an average FOR of 9.38 percent. The primary difference between
17 the FOR of the plants is the presence of an extended outage in 2002 that
18 resulted in a FOR of 38.26 percent at Colstrip 3. The inclusion of 2002 has a
19 profound effect on the ten-year average. By excluding the outlier value in
20 2002, the FOR average of the plant is 9.32 percent. It is the presence of
21 outliers in small data sets that is the primary reason for this docket. As
22 originally stated, it is unreasonable to include outliers in a four-year rolling

1 average because it unduly influenced the forecast; this is also true for a ten-
2 year historical average.

3 **Q. DO YOU PROPOSE AN ALTERNATIVE SOLUTION TO THE CURRENTLY**
4 **PROPOSED METHOD?**

5 A. Yes. As an alternative approach, using a ten-year average which excludes
6 outliers as the replacement value for future periods would reasonably address
7 the issues raised by PGE and Idaho Power.

8 **Q. PLEASE DESCRIBE THE METHODOLOGICAL ERRORS PGE CLAIMS**
9 **ARE FOUND IN MR. FALKENBERG'S TESTIMONY?**

10 A. In addition to the mean reversion issue, PGE points out that ICNU used the full
11 twenty-year average for replacement of all outlier years that occurred
12 throughout the twenty-year data set. For example, if an outlier occurred in
13 1997, Mr. Falkenberg replaced that outage with the twenty-year average of
14 1989-2007. This is what PGE is referring to when it states that Mr. Falkenberg
15 was "omniscient."⁶

16 **Q. IS IT POSSIBLE TO USE FUTURE INFORMATION IN FORECASTING?**

17 A. No. If it were possible to know the future we would have no reason to come up
18 with such complex methods for trying to predict it.

19 **Q. IS IT REASONABLE TO USE FUTURE INFORMATION IN THE**
20 **REPLACEMENT VALUE AS A MEANS OF CHECKING THE ACCURACY**
21 **OF A FORECAST?**

⁶ See PGE/300, Tinker-Weitzel/7, Lines 20-22.

1 A. No. The method employed by ICNU to test the accuracy of its forecast seems
2 counter-intuitive.

3 **Q. DID PGE CORRECT THIS METHODOLOGICAL ERROR AND RE-CHECK**
4 **THE ACCURACY OF THE FORECAST METHOD?**

5 A. Yes. Using the same data set as used by ICNU in its testimony, PGE used the
6 “mean to date” as the replacement value, versus the mean of the full twenty-
7 year period. For example, if an outlier event occurred in 1997 the mean
8 replacement value would have been the mean of 1989-1996.

9 **Q. DID PGE FIND THE ACCURACY OF THE FORECAST TO BE BETTER**
10 **THAN THE ORIGINAL STAFF METHOD?**

11 A. According to PGE, the improvement in accuracy was not distinguishable from
12 the improvement in accuracy of the Staff method. Essentially, PGE makes the
13 case that it is a statistical tie.⁷

14 **Q. PLEASE SUMMARIZE IDAHO POWER’S OPENING TESTIMONY.**

15 A. Idaho Power filed opening testimony on July 16, 2010. In its testimony, the
16 Company described its current method for calculating FOR’s for its coal-fired
17 generating units and responded to ICNU’s proposed forecasting methodology.
18 Idaho Power raised concerns associated with using historical plant information
19 that may be irrelevant with regard to current operating practices.

20 **Q. PLEASE DISCUSS IDAHO POWER’S CRITIQUE OF ICNU’S PROPOSED**
21 **FORECASTING METHOD.**

⁷ See PGE/300, Tinker-Weitzel/2, Lines 1-6.

1 A. Idaho Power believes that ICNU's proposal is designed specifically for the
2 PacifiCorp generating fleet. The Company points out that it only co-owns three
3 plants, or seven coal-fired generating units. PacifiCorp owns, or co-owns, 26
4 units and its service area extends to six different states. Idaho Power also
5 claims that "using long-term historical data presents significant problems that
6 can be avoided through the use of more recent operating data."⁸

7 **Q. DO YOU AGREE WITH IDAHO POWER, THAT ICNU'S PROPOSAL WAS**
8 **DESIGNED ONLY FOR PACIFICORP'S COAL-FIRED GENERATING**
9 **FLEET?**

10 A. No. ICNU's proposal simply used PacifiCorp's coal-fired generating fleet data
11 for purposes of statistical testing. In addition, included in the PacifiCorp data
12 set are four of the seven units co-owned by Idaho Power. Use of the
13 PacifiCorp data set by both Staff and ICNU is mainly due to the fact that
14 PacifiCorp provided a number of units, over various sizes, with up to 20 years
15 of history. At that time Idaho Power was unable to provide any historical FOR
16 data. Only recently has Idaho Power provided historical data for the
17 Boardman, Valmy and Jim Bridger coal-fired power plants. The historical data
18 provided by Idaho Power ranged from thirteen years of history for Boardman,
19 fourteen years for Valmy, and thirty-six years for Jim Bridger.

20 **Q. PLEASE DESCRIBE IDAHO POWER'S CONCERN OVER THE USE OF A**
21 **LONG-TERM HISTORICAL AVERAGE AS A REPLACEMENT VALUE.**

⁸ See Idaho Power/100, Carsensen/3, Lines 15-17.

1 A. According to its opening testimony, Idaho Power is concerned about the use of
2 long-term historical averages as a replacement value because it believes that
3 over time the physical and operational characteristics of the unit changes. For
4 example, the Company cites implementation of new maintenance practices,
5 significantly greater large-scale equipment replacement, and overall prudent
6 utility practices.

7 **Q. DID IDAHO POWER SHOW A CHANGE IN FORCED OUTAGE RATES**
8 **OVER TIME THAT REFLECTS THIS CONCERN?**

9 A. No.

10 **Q. HAS STAFF REVIEWED ANY FORCED OUTAGE RATE PLANT DATA**
11 **THAT WOULD LEAD YOU TO CONCLUDE THERE MAY BE SOME**
12 **VALIDITY TO THESE CLAIMS?**

13 A. No. None of the utilities have been able to statistically show that the forced
14 outage rate is dependent on changes in maintenance practices or replacement
15 of large scale equipment. Additionally, it is difficult to conclude that the
16 average annual forced outage rate is changing through time due to the
17 relatively short time frame of data that has been provided to Staff. It is difficult
18 for Staff, or anyone, to conclude that there are changes in forced outage rate
19 data that are dependent on the variables cited in Idaho Power's testimony
20 without the lifetime of the plant annual FOR data.

21 **Q. WHAT METHODOLOGY DID IDAHO POWER PROPOSE IN ITS**
22 **TESTIMONY TO ADDRESS ITS CONCERN WITH USING HISTORICAL**
23 **FORCED OUTAGE RATE INFORMATION?**

1 A. Idaho Power proposed that it use its current method in dealing with prolonged
2 forced outage events.

3 **Q. WHAT IS IDAHO POWER'S CURRENT METHOD?**

4 A. When a prolonged outage event occurs the Company replaces that time period
5 with the previous three-year FOR average. This replacement value is used for
6 ratemaking purposes over the next three years.

7 **Q. HAS IDAHO POWER PROVIDED AN EXAMPLE OF THIS METHOD?**

8 A. Yes. In Staff Data Request No. 7, Idaho Power provided an example of this
9 method using the Boardman coal-fired unit. In August of 2005, Idaho Power
10 calculated the FOR for the Boardman plant at 4.33 percent using the last three
11 years of data provided by the plant (August 2002-July 2005). In 2006, the
12 Boardman three-year average FOR was calculated at 28.3 percent due to an
13 extended outage at the end of 2005 through mid-year 2006. The Company
14 replaced the months of the extended outage (October 2005-June 2006) with
15 the three-year FOR calculated in August, 2005 (4.33 percent) to more
16 accurately forecast the availability of the unit.

17 **Q. HOW WAS THE FORCED OUTAGE RATE FOR THE 2007 TEST PERIOD**
18 **CALCULATED?**

19 A. With the replacement of the extended outage months using the 4.33 percent
20 three-year average, the forecasted test period for 2007 resulted in a forecasted
21 forced outage rate of 4.97 percent.⁹

⁹ See Exhibit Staff/401, Brown/1.

1 **Q. DO YOU BELIEVE THIS IS A REASONABLE METHOD AS COMPARED**
2 **TO THE RECOMMENDATION TO USE THE MEAN OF THE PLANTS**
3 **FORCED OUTAGE RATE HISTORY?**

4 A. Idaho Power has utilized this method effectively in the past. At the same time,
5 Idaho Power has subjectively judged the presence of an outlier versus an
6 objective determination that has been proposed by Staff in this proceeding.
7 For example, PGE only excluded the months of October 2005 through April
8 2006 for the same Boardman outage.

9 **Q. DO YOU BELIEVE YOUR ALTERNATIVE PROPOSAL, USING A**
10 **ROLLING TEN-YEAR AVERAGE, WHICH EXCLUDES OUTLIERS, IS A**
11 **REASONABLE COMPROMISE OF IDAHO POWER'S PROPOSAL?**

12 A. Yes. Due to the fact that PGE cites a relative tie in the improvement of the
13 forecasting method for the ICNU and Staff approach, and given the disparity in
14 historical data sets for each of the coal-fired units, from 10-20 years, this is a
15 reasonable alternative for the Commission to consider.

16 **Q. WAS THE LACK OF DATA FOR CERTAIN COAL UNITS AN ISSUE IN**
17 **PHASE I OF THE PROCEEDING?**

18 A. Yes. Staff cited this issue in supplemental reply testimony as an argument
19 against PacifiCorp's proposed method due to the same issue; that erroneous
20 results will occur in small time series such as Colstrip 3.

21 **Q. HAS STAFF PROPOSED USING ANY OTHER ALTERNATIVE**
22 **METHODOLOGIES IN PREVIOUS TESTIMONY?**

1 A. Yes. Staff/200, Brown/15, Lines 3-11, discussed an alternative
2 recommendation to the Commission which used the mean of the NERC data
3 as an objective replacement value.

4 **Q. PLEASE SUMMARIZE YOUR TESTIMONY.**

5 A. PGE and Idaho Power filed testimony calling into question ICNU's claims of
6 increased accuracy and the use of long-term historical information that may be
7 irrelevant for purposes of the test period. PGE's testimony was technical in
8 nature, but simply put, it concluded that the ICNU methodology resulted in a
9 statistical tie with the previous Staff proposal. This ultimately shows, and is
10 intuitively obvious, that the removal of an outlier value in a forecast will always
11 improve the accuracy of the forecast. The question of the replacement value in
12 that forecast is a more complicated question.

13 The Commission has adopted Staff's objective approach at identifying
14 the presence of outliers (the 90th and 10th percentile values), and has shown an
15 affinity towards using the mean of the plant as the replacement value. Given
16 PGE and Idaho Power's testimony on the issue of historical data, Staff
17 proposes a compromise solution of using a ten-year rolling average of the
18 annual FOR of the unit, excluding outliers, as an alternative approach to the
19 Commission's proposal of using the "lifetime" mean of the historical data.

20 **Q. DOES THIS CONCLUDE YOUR TESTIMONY?**

21 A. Yes.

CASE: UM 1355
WITNESS: Kelcey Brown

**PUBLIC UTILITY COMMISSION
OF
OREGON**

STAFF EXHIBIT 401

**Exhibits in Support of
Reply Testimony**

August 13, 2010



Staff/401
Brown/1

July 22, 2010

Subject: Docket No. UM 1355
Idaho Power Company's Responses to Staff's Data Requests 7-12

STAFF'S DATA REQUEST NO. 7:

At Idaho Power/100, Carstensen/3, Lines 1-6, Mr. Carstensen states that "the Company replaces those values with the EFOR for that particular plant from the last planning period." Please provide more detail as to the EFOR replacement information and provide a numeric example of its implementation from a previous filing. Please provide the numeric example in an Excel format.

IDAHO POWER COMPANY'S RESPONSE TO STAFF'S DATA REQUEST NO. 7:

In August of 2005, Idaho Power Company ("Idaho Power" or "Company") calculated the EFOR for the Boardman plant at 4.33% using the last 36 months of data provided by the plant (August 2002 – July 2005). The Boardman EFOR was calculated again in September 2006 using the latest 36 months of data provided by the plant (July 2003 – June 2006). Before adjusting the months of the extended outage, the EFOR was 26.18%. The Company replaced the months of the extended outage (October 2005 – June 2006) with the 36 month EFOR calculated in August of 2005 (4.33%) to more accurately forecast the availability of the unit. This was accomplished by calculating the number of forced outage hours for each of the months during the extended outage to equal 4.33% and substituting these hours for the actual forced outage hours that occurred, which calculated to an adjusted EFOR of 4.97%. Please see the attached spreadsheet containing the above information.

**UM 1355
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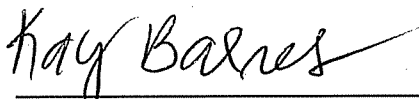
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CERTIFICATE OF SERVICE

UM 1355

I certify that I have this day served the foregoing document upon all parties of record in this proceeding by delivering a copy in person or by mailing a copy properly addressed with first class postage prepaid, or by electronic mail pursuant to OAR 860-13-0070, to the following parties or attorneys of parties.

Dated at Salem, Oregon, this 13th day of August, 2010.



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