

1 **Q. Please state your name, business address and present position with**
2 **PacifiCorp (the Company).**

3 A. My name is Reed C. Davis, my business address is 825 N.E. Multnomah, Suite
4 1700, Portland, Oregon 97232, and my present position is Director of Planning.

5 **Q. Briefly describe your education and business experience.**

6 A. I received an undergraduate degree in Business Administration from Brigham
7 Young University. I have worked for PacifiCorp since 1979 and have held
8 various positions dealing with forecasting, budgeting and planning. I am currently
9 the Director of Planning in Revenue Accounting, a position I have held since
10 2003. I am responsible for the development of forecasts for kWh sales, number of
11 customers, system loads, and system peaks for the Company's six retail
12 jurisdictions. I am also responsible for revenue and sales accounting at the state
13 level.

14 **Purpose of Testimony**

15 **Q. What is the purpose of your rebuttal testimony?**

16 A. The purpose of my testimony is to provide rebuttal to the weather normalization
17 methodology and proposed adjustment submitted by Staff witness Yohannes
18 Mariam. In particular, I address the following areas:

- 19 1. The effect of Dr. Mariam's upward adjustment of projected electricity
20 consumption in Washington upon certain allocation factors and variable
21 costs, especially net power costs;
- 22 2. NOAA Normalized Temperatures;
- 23 3. Why PacifiCorp's four-part model, which incorporates non-linear energy

1 usage patterns, is superior to Dr. Mariam's 65 degree base model;

2 4. Why Dr. Mariam's proposed modifications to the Company's weather
3 normalization model would be expensive and would take many years to
4 collect the required data; and

5 5. Why Dr. Mariam's other proposed modifications to the Company's
6 weather normalization model would not be appropriate.

7 **Additional Consumption Means Higher Variable Costs**

8 **Q. Staff witness Mariam proposes a pro forma revenue adjustment of**
9 **\$2,737,455 greater than that proposed by the Company, based on his**
10 **temperature normalization analysis that assumes an additional consumption**
11 **of 50,001,371 KWh of energy in Washington. Do you agree with this**
12 **adjustment?**

13 A. No. As explained below, we disagree with several aspects of Dr. Mariam's
14 analysis. However, even if one assumes that Dr. Mariam's temperature
15 normalization methodology is correct, this adjustment cannot be made in
16 isolation. Increased consumption of electricity necessarily increases other
17 variable costs such as net power costs and increases inter-jurisdictional allocation
18 factors resulting from the increased load, as well. Staff, however, did not adjust
19 net power costs or other variable costs or allocation factors, as indicated in the
20 Staff Responses to Data Request Nos. 3.3 and 3.8. Exhibit No.____(RCD-2). Our
21 estimate of the additional costs attributable to Washington resulting from the
22 increased net power costs alone is in excess of \$2 million. Mr. Weston addresses
23 these costs in more detail in his rebuttal testimony.

1 **NOAA Normalized Temperatures**

2 **Q. Dr. Mariam points out that the Company used the NOAA normalized**
3 **temperatures for the period 1961-1990 even though the most recent data**
4 **available was for the period 1971-2000. Why is that?**

5 A. The NOAA normalized weather values for 1971-2000 were not released until
6 halfway through the test period in this proceeding. As a consequence, the
7 Company lacked adequate time to incorporate this new information in order to
8 update a wide variety of applications using the normalized weather values.
9 Therefore, as a practical matter, it was not feasible to use the 1971-2000 data for
10 the Company's test year in this case.

11 **PacifiCorp's Four-Part Temperature Normalization Methodology**

12 **Q. Do you agree with Dr. Mariam's use of the 65 degree base in the temperature**
13 **normalization calculation?**

14 A. No. Instead of using one base, as recommended by Dr. Mariam, the Company
15 uses a more sophisticated non-linear model that was based on research conducted
16 by a consulting company called Research Triangle Institute (RTI). In its study,
17 RTI concluded that energy usage was not linear, *i.e.*, was affected by factors other
18 than temperature, such as seasonality. For example, we have found that customers
19 respond to an 80 degree day in April differently than an 80 degree day in June. In
20 June, customers would typically turn on the air conditioning, but in April
21 customers typically open windows and wait for the heat to pass. As a result, we
22 see a band of temperatures where there is little or no space conditioning, neither
23 heating or cooling occurring. Unlike Dr. Mariam's 65 degree base method, our

1 modeling captures these non-linear effects.

2 **Q. Have you observed non-linear energy usage by your Washington customers?**

3 A. Yes. Exhibit No.____(RCD-3) contains a series of graphs to help illustrate this
4 point. Graph 1 compares Washington's hourly load with the hourly temperatures
5 at the Yakima Airport from April 2002 through May 2003. This graph confirms
6 the expected relationships between load and temperature, e.g., that load increases
7 in the winter as customers use electric heating and load increases in the summer as
8 customers use air conditioning.

9 **Q. Please explain Graphs 2 through 5.**

10 A. Because there is too much data over the time period to identify specific
11 conditions, Graphs 2-5 have isolated the information for 3:00 pm for each day
12 only. Graph 2 suggests that the minimum is close to 65 degrees, but the other
13 graphs demonstrate that energy usage is non-linear.

14 **Q. Please explain.**

15 A. Graph 3 compares the 3:00 pm load for week days (WD) with weekend days
16 (WE). Predictably, this graph shows that the weekend days have a lower load
17 than weekdays. Further, the relationship between loads and temperatures appears
18 to be the same as weekdays. Significantly, however, this graph demonstrates that
19 there are many days where temperatures will soar into the 80s, but load levels will
20 remain flat. This observation contradicts the fundamental premise of the single-
21 base methodology proposed by Dr. Mariam, *i.e.*, that loads increase linearly above
22 65 degrees.

1 **Q. In addition to the effect of weekends, why else would loads be lower on an 80**
2 **degree day?**

3 A. In a word, seasonality. Graph 4 helps to illustrate this phenomenon. Please note
4 that the Y-axis on the graph has been enlarged to more clearly demonstrate what is
5 happening. Graph 4 shows the part of the year when heating typically occurs (i.e.,
6 October through May). This graph shows many periods where the temperature
7 increases without a corresponding change in load. During these periods --
8 typically April and May -- neither heating nor cooling is occurring, although
9 temperatures may range both above and below 65 degrees. As noted above,
10 customers react differently to an 80 degree day in April than to an 80 degree day
11 in June.

12 Graph 4 also shows that the weekday (WD) load in May begins to move with
13 changes in temperature, indicating that cooling load has started. Studies in other
14 states have indicated that commercial customers, typically in offices, start their air
15 conditioning and ventilation equipment sooner in the year than residential
16 customers. The data in Graph 4 supports this conclusion.

17 **Q. What does Graph 5 show?**

18 A. Graph 5 shows Washington load plotted against the temperature for the periods
19 when cooling typically takes place. Based on this data and some of our own
20 modeling, we have identified three potential points when load responds to
21 temperature changes. These changes occur between the 60 and 80 degree point on
22 the axis and between the 80 and 90 degree points on the axis.

23

1 **Q. What do you conclude on the basis of these graphs?**

2 A. I conclude that energy usage is not strictly linearly related to temperature, thereby
3 justifying the Company's use of a non-linear model.

4 **Q. Is it correct, as Dr Mariam implies in his testimony, that you have not**
5 **adjusted your models since 1980?**

6 A. No. The Company regularly updates and adjusts its models to incorporate the
7 results of our research. With respect to coefficients, for example, in the early
8 1990s one question we looked at while updating our models was how frequently
9 the coefficients needed to be updated to keep them current with existing customer
10 mix, appliance mix, and preferences. To answer this question, we undertook a
11 study to look at how often the coefficients changed. That study concluded that the
12 coefficients changed statistically approximately every three to four years. As a
13 result of this study, we update our coefficients using the latest historical data every
14 three years.

15 **Q. When was the last time you updated your coefficients?**

16 A. March 2001.

17 **Q. Dr. Mariam has criticized the Company's non-linear approach because the**
18 **underlying study was conducted in Utah. Do you agree with this criticism?**

19 A. No. The Company has observed the same load-temperature relationship in both
20 Utah and Washington.

21

1 **Dr. Mariam's Proposed Modifications to the Company's Methodology**

2 **Q. Do you agree with Dr. Mariam's recommendation that the Company develop**
3 **ten years of daily usage by rate schedule?**

4 A. No. The most direct way to do so would be to install time-of-day meters for all
5 customers. However, this would be extremely costly, it would take at least ten
6 years before the data would be available, and it is not clear that the benefits of
7 collecting such data would exceed the costs of collecting it.

8 **Q. Do you agree with Dr. Mariam's recommendation that the Company**
9 **implement an autoregressive or an autoregressive moving average estimation**
10 **method?**

11 A. No, because such an approach would (i) be expensive, and (ii) has not been
12 demonstrated to be superior to the Company's current methodology. Further, it is
13 not necessarily even applicable to the Company's needs. Implementing an
14 autoregressive method may be of use when modeling daily or hourly loads. When
15 working with monthly totals, however, such a method is less useful. As Dr.
16 Mariam indicated, the autoregressive parameter identifies changes that are
17 correlated with prior periods that are not identified with the independent variables
18 in the model or the modeling approach. This is an advantage in forecasting.
19 However, we are not using the models to forecast. Ideally, a model clearly
20 identifies all the relationships and attributes them to the correct causes. Adding an
21 autoregressive parameter does not do this. In fact, it can have the opposite effect
22 by making certain relationships less clear.

1 **Q. Are there other reasons why the autoregressive method does not work when**
2 **modeling on a monthly basis?**

3 A. Yes. On a monthly basis there are too many factors affecting the customer for a
4 modeler to assume that an event occurring in the prior thirty days will influence
5 customer behavior during the current thirty-day period. Further, an autoregressive
6 method is highly likely to mask the seasonality of the data. The seasonality may
7 be due to the month of the year or the weather. If the modeler is not careful the
8 modeling process can mask exactly what it is trying to capture, i.e. weather
9 responsiveness. Because of these problems, I would be very reluctant to replace
10 the Company's current methodology with an autoregressive method.

11 **Q. Do you agree with Dr. Mariam's proposal to modify your methodology to**
12 **incorporate additional variables?**

13 A. No. When modeling on a monthly basis, the benefit of including variables such as
14 holidays is negligible. The primary reason for this is that the occurrence of
15 holidays cannot be identified in monthly data. For example, conditions and
16 behaviors on the other days in the month can completely overshadow the effect of
17 the holiday, and the models cannot distinguish the separate effects. As for the
18 other variables mentioned by Dr. Mariam, these are already captured in our
19 existing model. The Company has separate models for the summer and winter
20 seasons.

21 **Q. Would you please summarize your recommendations?**

22 A. After due consideration of Dr. Mariam's proposal, I conclude the following:

23 (1) If the Commission orders the Company to accept Dr. Mariam's weather

1 adjustment, it must also recognize the related variable costs and
2 interjurisdictional costs associated with the increased load projections.
3 The need for these adjustments has been recognized by Staff. *See* Staff
4 Response to Data Request No. 3.3 and Staff Response to Data Request No.
5 3.8. Exhibit No.____(RCD-2).

6 (2) The NOAA data used by the Company was the most current available
7 when the Company was conducting its test year.

8 (3) The Company’s non-linear method is more sophisticated and more likely
9 to produce an accurate result than the one-base method recommended by
10 Dr. Mariam.

11 (4) Dr. Mariam’s recommendation that the Company prepare ten years’ worth
12 of daily usage data by rate schedule would be expensive, and absent
13 further study, would be of questionable customer benefit.

14 (5) Dr. Mariam’s recommendation to incorporate autoregressive methods is
15 more suited to predicting than modeling and, especially when using
16 monthly data, masks important relationships that would be identified in the
17 data absent this approach. Therefore, this recommendation would not
18 improve the accuracy of the Company’s data.

19 **Q. Does this conclude your rebuttal testimony?**

20 A. Yes.