BEFORE THE WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION

WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION, Complainant, v. PACIFICORP D/B/A PACIFIC POWER & LIGHT COMPANY, Respondent.	DOCKET UE-100749

TESTIMONY OF

Vanda Novak

**STAFF OF
WASHINGTON UTILITIES AND
TRANSPORTATION COMMISSION**

Temperature Normalization

October 5, 2010

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I. INTRODUCTION

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2

3 **Q.   Please state your name and business address.**

4 A.   My name is Vanda Novak. My business address is The Richard Hemstad Building,

5   1300 S. Evergreen Park Drive S.W., P.O. Box 47250, Olympia, WA 98504. My

6   email address is vnovak@utc.wa.gov.

7

8 **Q.   By whom are you employed and in what capacity?**

9 A.   I am employed by the Washington Utilities and Transportation Commission as a

10   Regulatory Analyst in the Energy section of the Regulatory Services Division.

11

12 **Q.   What are your current duties and responsibilities?**

13 A.   My current duties and responsibilities involve the analysis of revenue normalization

14   adjustments in energy utility rate proceedings. I also participate in Staff's review of

15   integrated resource plans filed by energy utilities.

16

17 **Q.   How long have you been employed by the Commission?**

18 A.   I have been employed by the Commission since June 2007.

19

20 **Q.   Would you please state your educational and professional background?**

21 A.   I graduated from the University of Washington in 2006 with a Bachelor of Arts

22   degree in Mathematics. In 2007, I attended the annual regulatory studies program

23   held by the National Association of Regulatory Utility Commissioners. I have also

1   attended an Aurora software training session with EPIS. I have presented testimony

2   before the commission in two rate cases: Dockets UE-090134 and UG-090135

3   (Avista Utilities); and Dockets UE-090704 and UG-090705 (Puget Sound Energy).

4

5   **II.   BACKGROUND AND SUMMARY OF TESTIMONY**

6

7   **Q.   What is the purpose of your testimony in this proceeding?**

8   A.   My testimony presents Staff's review of PacifiCorp's temperature normalization

9   adjustments for its electric results of operations for ratemaking purposes. The

10   impacts of temperature normalization are included in Company and Staff Adjustment

11   3.1.

12

13   **Q.   Please summarize your testimony.**

14   A.   The overall temperature normalization methodology used by PacifiCorp in this case

15   is consistent with the Commission-approved Stipulation in Docket UE-050684.

16   Pursuant to that Stipulation, the parties worked together to establish an agreed

17   temperature normalization methodology, which is contained in a document filed in

18   that docket entitled "PacifiCorp's Plan for a Long-Term Temperature Normalization

19   Solution in Washington" (The Plan).

20   However, Staff has concerns about the Company's implementation of that

21   methodology as it applies to the commercial class, namely, the accuracy of the

22   temperature sensitivity coefficients, which are less than adequate. Consequently, I

23   recommend the Commission remove the effect of the Company's temperature

1 normalization adjustment as it relates to the commercial class. Staff Adjustment 3.7,

2 Remove Commercial Sales Normalization, accomplishes this.

3

4 **Q. Please describe The Plan filed in Docket UE-050684.**

5 A. The Plan called for the Company to conduct a load research study for customers in

6 PacifiCorp's Washington jurisdiction, in order to better measure the relationship

7 between weather and electricity consumption. The Plan called for PacifiCorp to

8 collect hourly load data from meters the Company had in place for residential

9 Schedule 16, small commercial Schedule 24 and large commercial Schedule 36, in

10 order to accurately determine "base points", that is, the specific temperatures at

11 which customers respond to temperature changes. These base points are then

12 weighted to create composite heating degree day and cooling degree day "splines"[1],

13 which are thought to be an improvement over using the standard base point for

14 determining customer comfort level, of 65 degrees Fahrenheit.

15

16 **Q. Did the Company follow the methodology called for in the Plan?**

17 A. Yes, although the Company used sample sizes larger than what were identified in

18 The Plan. However, the larger sample sizes improve the accuracy of the results.

19

20 **III. DISCUSSION**

21

22 **Q. Why is a temperature normalization adjustment necessary?**

---

[1] A "spline" is a function that is defined piece-wise over its range. In other words, a spline is a sequence of functions where each function covers only a piece of the argument range. All functions together cover the entire range.

1   A.   Many PacifiCorp customers use electricity for space heating. Consequently, changes

2   in temperature may greatly affect the usage by such customers, and this ultimately is

3   reflected in the Company's total revenues.

4   A temperature normalization adjustment presents to the Commission

5   estimated electric loads, and resulting revenue, as if weather had been "normal"

6   during the test year. This ensures that rates are not set too high, if the test year was

7   warmer than normal, or too low, if the test year was colder than normal. The

8   primary purpose and intent of the adjustment is to measure what the revenues would

9   be absent any variations in weather from normal.

10

11   Q.   **What parameters are required to compute temperature normalized electricity**

12   **consumption for the test year?**

13   A.   Four parameters are needed to compute temperature normalized electricity

14   consumption for the test year. They are: (1) normal temperature; (2) variations or

15   differences between normal and test year temperature; (3) temperature sensitivity

16   coefficients; and (4) test year number of customers.

17

18   Q.   **Starting with the first parameter, how is normal temperature determined?**

19   A.   PacifiCorp determines normal temperature with a 20-year moving average of

20   temperature data from the Portland Airport weather station. Heating degree days

21   (HDD) and cooling degree days (CDD) are quantitative indices that reflect heating or

22   cooling demand, respectively.

1   These HDD and CDD are calculated using a "balance" or "base point"

2   outside temperature that is assumed to trigger demand for heating or cooling energy.

3   When the outside temperature is below the base point, the indoor temperature needs

4   to be increased by space heating. Conversely, when the outside temperature is

5   greater than the base point, the indoor temperature needs to be reduced by air

6   conditioning. 65 degrees Fahrenheit is the most commonly used balance point

7   temperature in determining both HDD and CDD. However, PacifiCorp uses the

8   composite HDD and CDD splines, developed in accordance with the Plan document.

9

10   Q.   How are variations from normal calculated?

11   A.   Variations from normal are calculated using HDD and CDD. In normalizing test

12   year electricity consumption, the temperature for each day of the test year is

13   compared to the normal temperature for that day. PacifiCorp uses the average of 24

14   hourly temperature measurements as the "actual" temperature for a given day. The

15   difference, or variation between normal and actual test year temperature, is called

16   "heating degree days" or "cooling degree days".

17

18   Q.   What do temperature sensitivity coefficients measure, and how are they

19   calculated and used in developing the adjustment?

20   A.   Customer response to fluctuations in temperature is measured and a regression

21   analysis computed with temperature (HDD and CDD) and energy consumption is

22   done to derive the temperature sensitivity coefficients. These coefficients are

23   multiplied by the variation of test year temperature from normal temperature and the

1		number of customers. The result is temperature-normalized electricity use for the
2		test year.
3		
4	Q.	How did PacifiCorp develop these temperature sensitivity coefficients?
5	A.	PacifiCorp developed "splines" at the weighted base points of 40°, 50°, 55°, 60°,
6		65°, 70° and 75° to explain customer behavior as temperatures vary. Within each
7		spline customers' behavior is similar, between splines behavior is different. For
8		instance, as temperature moves from 65° to 70° some customers may leave the
9		furnace on while others turn it off. But when the outside temperature moves from
10		50° to 45° to 40° most people will be turning up the heat in the house. PacifiCorp
11		determined these splines based on PacifiCorp's load research data on an hourly basis
12		by class.
13		
14	Q.	How are the components of a weather normalization adjustment used in order
15		to make an adjustment to the revenue requirement amount?
16	A.	The adjusted kilowatt hours derived from the four parameters I just described are
17		applied to each weather sensitive rate schedule to determine the weather
18		normalization adjustment.
19		
20	Q.	Is the Company's calculation of the weather normalization adjustment
21		appropriate?
22	A.	Not entirely. The effects of the Company's weather normalization adjustment are
23		included in Exhibit No. ___ (RBD-3) page 3.1. While Staff does not dispute the

1　　residential class part of the Company's adjustment, PacifiCorp has not adequately

2　　supported the commercial class part of the adjustment. PacifiCorp should improve

3　　this part of the adjustment in future cases.

4

5　Q.　**Why is the commercial class part of the Company's weather adjustment**

6　　**inappropriate?**

7　A.　Staff's primary concern is the statistical "fit" of the sensitivity function developed

8　　for the commercial class data, which the Company used to derive the temperature

9　　sensitivity coefficients for that class.

10

11　Q.　**What do you mean by statistical "fit"?**

12　A.　As I described earlier, the Company runs regressions. A regression is a statistical

13　　method that approximates the relationship that exists between variables by finding a

14　　best-fitting curve to a set of data points. A common method is to fit a curve to a set

15　　of data points by minimizing the sum of the squares of the points which do not lie on

16　　the curve, also known as the residuals.

17　　A statistic which measures the fit of that regression function is called the "R-

18　　squared" statistic. The R-squared statistic measures the success of the regression in

19　　predicting the values of the dependent variable (in this case, electricity consumption)

20　　within the sample, or simply the ratio of the residuals to dispersion (where dispersion

21　　is the scatter of data points).

22　　R-squared may be interpreted as the fraction of the variance of the dependant

23　　variable explained by the independent variables (in this case, HDD, CDD, etcetera).

1   The R-squared statistic will equal 1.0 if the regression fits perfectly, and zero if the

2   fit function is constant, that is if there is no relation between independent and

3   dependent variables.

4

5   **Q.**   **What was the R-squared statistic for the commercial class, based on**

6   **PacifiCorp's weather normalization analysis?**

7   **A.**   PacifiCorp came up with an R-squared of ▮▮▮▮ for the commercial class of

8   customers.

9

10 **Q.**   **Does an R-squared of ▮▮▮▮ demonstrate a good statistical fit?**

11 **A.**   No. An R-squared of ▮▮▮▮ does not show a sufficiently approximated relationship

12   between temperature and electricity consumption. An R-squared of ▮▮▮▮ can

13   essentially be interpreted as meaning only about ▮▮▮▮ of the total variation of

14   electricity consumption is explained by the customers' response to temperature

15   fluctuations from the base points. In other words, PacifiCorp's study shows the

16   commercial class produces a marginally fitting function.

17

18 **Q.**   **In PacifiCorp's study, how does the ▮▮▮▮ R-squared for the commercial class**

19   **compare to the R-squared value for the residential class?**

20 **A.**   The residential class has an R-Squared value of ▮▮▮▮. This demonstrates a good

21   approximation of the relationship which exists between temperature fluctuations

22   from customer comfort base points and electricity consumption.

23

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CONFIDENTIAL PER PROTECTIVE ORDER – REDACTED VERSION

1   **Q.**   **You testified earlier that you have analyzed temperature normalization**

2   **adjustments in rates cases for Avista Utilities and Puget Sound Energy. How do**

3   **the R-squared values for the commercial classes in those cases compare to**

4   **PacifiCorp's ████ R-squared value?**

5   A.   The R-squared value for the commercial class from the study conducted by Avista

6   was over 0.8. The PSE R-squared value is confidential in that docket.

7

8   **Q.**   **Has PacifiCorp justified normalizing the commercial class for temperature**

9   **despite this marginal fit?**

10   A.   No.

11

12   **Q.**   **Is PacifiCorp's commercial class temperature sensitive?**

13   A.   PacifiCorp claims the commercial class is a temperature-sensitive customer class,

14   and Staff can agree based on the load research study. The issue is PacifiCorp's

15   measurement of that temperature sensitivity.

16

17   **Q.**   **Is PacifiCorp's temperature adjustment appropriate?**

18   A.   No. While the Company's commercial class may be temperature sensitive as a

19   whole, and a specific adjustment might be justified, PacifiCorp must defend the

20   magnitude of such an adjustment. In this case, PacifiCorp has not adequately

21   defended its commercial class temperature normalization adjustment.

22

TESTIMONY OF VANDA NOVAK   Exhibit No. ___CT (VN-1CT)
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CONFIDENTIAL PER PROTECTIVE ORDER – REDACTED VERSION

1   Q.   **Has PacifiCorp attempted to explain why the regression for the commercial**

2   **class produces an R-squared of only ▮▮▮?**

3   A.   Yes. In PacifiCorp's response to Staff Data Request 135, shown in my Exhibit No.

4   ___ (VN-2), the Company explains that the ▮▮▮ R-squared is caused by

5   heterogeneous data. In essence, PacifiCorp's explanation is that the commercial

6   class presents a heterogeneous data set, which makes it difficult to adequately

7   approximate the response of the commercial class customers to fluctuations in

8   temperature. In other words, the commercial class reflects customers with a variety

9   of characteristics.

10

11   Q.   **Does PacifiCorp's explanation justify the Company's weather normalization**

12   **adjustment for the commercial class?**

13   A.   No. A weather normalization adjustment should be based on an accurate depiction

14   of the relationship between temperature and electricity consumption. As I have

15   explained, PacifiCorp's study shows only ▮▮▮ accuracy, and consequently, the

16   Company has not substantiated its commercial class temperature normalization

17   adjustment.

18

19   Q.   **What adjustment does Staff recommend based on your analysis?**

20   A.   The Commission should reject the Company's commercial class temperature

21   normalization adjustment. Staff Adjustment 3.7, Remove Commercial Sales

22   Normalization accomplishes this result.

23

TESTIMONY OF VANDA NOVAK   Exhibit No. ___CT (VN-1CT)
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CONFIDENTIAL PER PROTECTIVE ORDER – REDACTED VERSION

1   **Q.   Please explain Staff Adjustment 3.7, Remove Commercial Sales Normalization.**

2   A.   The Company's Adjustment 3.1 reduces commercial sales revenues by over one

3   million dollars due to higher than normal kWh sales in the test year. Reversing that

4   adjustment increases the kWh sales, which increases power costs, and impacts the

5   allocation factors and production factor. PacifiCorp shows the following revenue

6   requirement impacts in its Response to Staff Data Request 151:

7   General business revenues increase $1,253,006;

8   Net power costs increase $881,999;

9   Allocation factor impacts increase revenue requirements by $179,443; and

10   Production factor impacts decrease revenue requirements by $773,752.

11   Overall, the removal of the commercial class part of the Company's temperature

12   normalization adjustment produces a net decrease in revenue requirements of

13         $965,317, which is the impact of Staff Adjustment 3.7, Remove Commercial Sales

14   Normalization.

15

16   **Q.   Are there ways for PacifiCorp to address the problems you have identified**

17   **regarding the Company's commercial class temperature normalization**

18   **adjustment?**

19   A.   There may be ways for PacifiCorp to address the problems I have identified. First,

20   PacifiCorp could find similar characteristics within its heterogeneous dataset and

21   filter according to these similar characteristics and produce individual regressions for

22   these subgroups. Moreover, the Company could select other methods to evaluate

23   the data. However, in the end, PacifiCorp must be able to defend its adjustment.

1   The Company has not done so in this case, as far as the adjustment for the

2   commercial class is concerned.

3

4 **Q.   Does this conclude your testimony?**

5 A.   Yes.

6