

Exhibit No.
Issue: Weather Normalization
Witness: Mr. Mark Quan
Type of Exhibit: Surrebuttal Testimony
Sponsoring Party: Empire District Electric Co.
Case No. ER-2010-0130
Date Testimony Prepared: April 2010

**Before the Public Service Commission
Of the State of Missouri**

Surrebuttal Testimony

of

Mr. Mark Quan

April 2010

SURREBUTTAL TESTIMONY
OF
MR. MARK QUAN
ON BEHALF OF
THE EMPIRE DISTRICT ELECTRIC COMPANY
BEFORE THE
MISSOURI PUBLIC SERVICE COMMISSION
CASE NO. ER-2010-0130

1 **Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.**

2 A. My name is Mark Quan. I am a Principal Consultant for Itron's Forecasting
3 Solutions group. My business address is 11236 El Camino Real, San Diego,
4 California 92130.

5 **Q. ARE YOU THE SAME MARK QUAN THAT PREVIOUSLY FILED DIRECT**
6 **TESTIMONY IN THIS CASE ON BEHALF OF THE EMPIRE DISTRICT**
7 **ELECTRIC COMPANY ("EMPIRE")?**

8 A. Yes I am.

9 **Q. WHAT IS THE PURPOSE OF YOUR SURREBUTTAL TESTIMONY?**

10 A. The purpose of my testimony is to address the weather issues raised by
11 Missouri Public Service Commission Staff ("Staff") witness Ms. Manisha
12 Lakhanpal in her rebuttal testimony dated April 2, 2010.

13 **Q. WHAT IS THE PRIMARY ISSUE RAISED BY STAFF?**

14 A. Staff's rebuttal testimony centers on the calculation of normal weather. In her
15 rebuttal testimony, Staff witness Lakhanpal argues that the normal weather
16 should be based on average temperatures defined as the average of the
17 maximum and minimum temperature for the period from 1971 to 2000. I will

1 address Staff's testimony in two parts. First, I'll address the definition of
2 average, and second, I'll address the normal period.

3 **Q. HOW IS AVERAGE DEFINED?**

4 A. In my direct testimony, I calculated the average temperature based on the
5 sum of the twenty-four hours of temperatures divided by twenty-four. I will
6 call this method Empire's definition. Staff calculated average temperature
7 based on the maximum plus minimum temperature divided by two. I will call
8 this method Staff's definition.

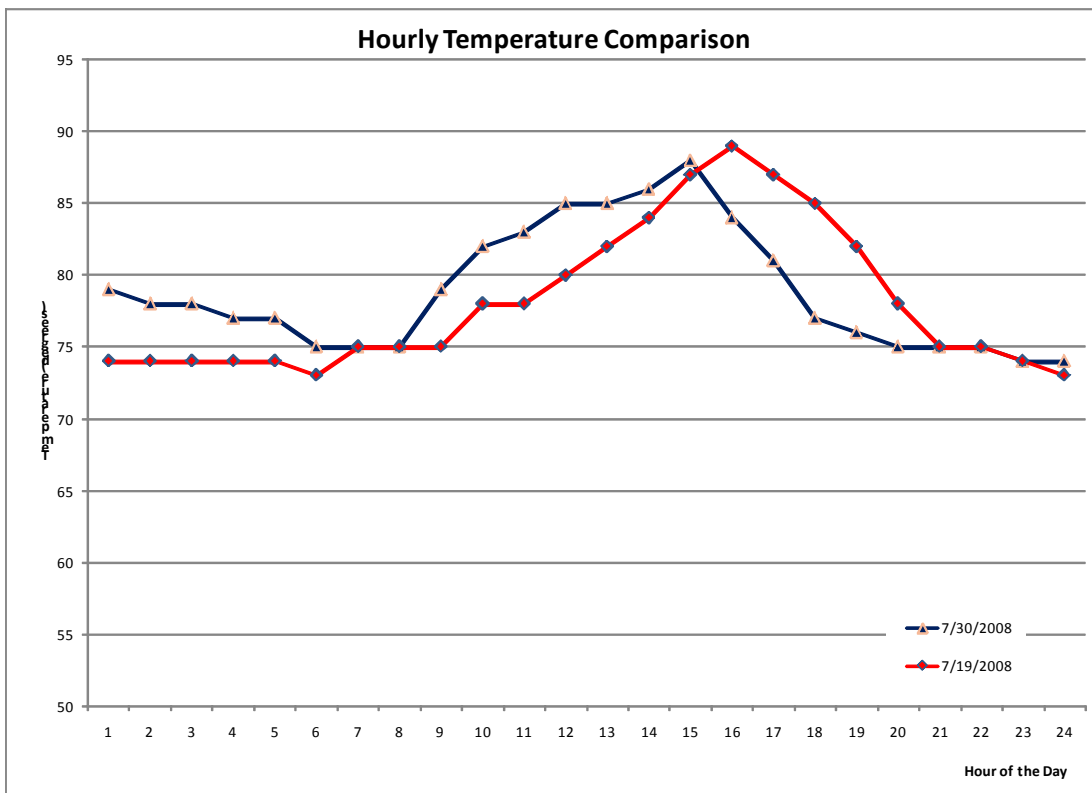
9 **Q. WHAT IS THE DIFFERENCE BETWEEN THE AVERAGE DEFINITIONS?**

10 A. Staff's definition accounts for higher maximum temperatures and lower
11 minimum temperatures. This is because the maximum and minimum
12 temperature of the day can occur at any time during the day. Empire's
13 definition obtains temperature values once an hour, and these thermostat
14 readings may not occur at the exact time of the daily maximum or minimum
15 temperature. However, Empire's definition captures the temperature shape
16 throughout the day, whereas Staff's definition ignores how temperatures
17 move throughout a day.

18 For example, in the figure below I compare two days (7/19/2008 and
19 7/30/2008) of weather for Springfield, Missouri. Using Staff's definition and
20 dataset, the average temperature for both days is 81.0 degrees. Using
21 Empire's definition, the average temperature on 7/19/2008 is 78.1 degrees
22 and on 7/30/2008 is 78.9 degrees. Upon inspection of the data, 7/19/2008
23 has a lower minimum temperature and higher maximum temperature than

1 7/30/2008. Empire's definition captures the difference in the temperature
2 shape identifying that these shapes are different and would result in a
3 different load response. Staff's definition would see these days as identical
4 and would result in the same load response.

5 While the example highlights the difference produced by the
6 definitions, most daily differences are not as dramatic. However, weather
7 normalization is about modeling energy consumption and should recognize
8 that customers may respond differently to the same temperature when it
9 occurs at a different time of the day.



10

11 **Q. WHAT IS THE NORMAL CALCULATION PERIOD DIFFERENCE?**

12 A. Staff uses historic weather data from 1971 to 2000 as the basis for
13 developing "normal weather". This is reaffirmed in Staff witness Lakhnupal's

1 rebuttal testimony, page 5. Empire uses historic weather data from 1978 to
2 2008 as the basis for developing “normal weather”.

3 **Q. WHAT IS THE REASON FOR USING THE 1978 TO 2008 TIME FRAME**
4 **FOR WEATHER DATA?**

5 A. Staff’s discussion of normal weather calculation includes a description of
6 historical adjustments to the weather data (Staff witness Lakhanpal’s rebuttal
7 testimony, page 3). This description recognizes the Automated Surface
8 Observing System (“ASOS”) installed after 1996.

9 There are three reasons why Empire recommends using the most
10 recent 30 years of data. First, the effect of the technology change is reduced;
11 the most recent 30 years includes 12 years of unadjusted ASOS data versus
12 4 in Staff’s recommendation. Second, NOAA updates its normals each
13 decade and typically uses the most recent 30 years of data. Using the most
14 recent 30 years of data is consistent with this approach. Finally, if any
15 changes to temperature patterns have occurred since 2000, the most recent
16 30 years will capture these changes.

17 **Q. DOES THIS CONCLUDE YOUR SURREBUTTAL TESTIMONY?**

18 A. Yes, it does.

AFFIDAVIT OF MARK QUAN

STATE OF CALIFORNIA)
) ss
COUNTY OF SAN DIEGO)

On the 19 day of April, 2010, before me appeared Mark Quan, to me personally known, who, being by me first duly sworn, states that he is a Principal Consultant for Itron's Forecasting Solution Group and acknowledges that he has read the above and foregoing document and believes that the statements therein are true and correct to the best of his information, knowledge and belief.

Mark Quan
Mark Quan

Subscribed and sworn to before me this 19 day of April, 2010.

[Signature]
Notary Public

My commission expires: JULY 9, 2012

State of California County of
SAN DIEGO
Subscribed and sworn to (or affirmed)
before me on this 19 day of APRIL, 2010, by
MARK QUAN
proved to me on the basis of satisfactory evidence
to be the person(s) who appeared before me.
Signature [Signature]
(Seal)

