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Exhibit No. 120  
Issue: Weather Normalization  
Witness: Mark Quan  
Type of Exhibit: Surrebuttal Testimony  
Sponsoring Party: Empire District Electric  
Case No. ER-2014-0351  
Date Testimony Prepared: March 2015

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

**Surrebuttal Testimony**

of

**Mark Quan**

**March 2015**

Empire Exhibit No. 120  
Date 4-14-15 Reporter KF  
File No. ER-2014-0351

**SURREBUTTAL TESTIMONY  
OF  
MARK QUAN  
ON BEHALF OF  
THE EMPIRE DISTRICT ELECTRIC COMPANY  
BEFORE THE  
MISSOURI PUBLIC SERVICE COMMISSION  
ER-2014-0351**

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

2 A. My name is Mark Quan. My business address is 12348 High Bluff Drive,  
3 Suite 210, San Diego, California, 92130.

4 **Q. ARE YOU THE SAME MARK QUAN THAT PROVIDED REBUTTAL**  
5 **TESTIMONY IN THIS CASE BEFORE THE MISSOURI PUBLIC SERVICE**  
6 **COMMISSION (“COMMISSION”)?**

7 A. Yes, I am.

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

9 A. The purpose of my surrebuttal testimony is to address two issues raised in  
10 the Rebuttal Testimony of Commission Staff (“Staff”) witness Dr. Won.

11 **Q. WHAT ISSUES ARE YOU ADDRESSING?**

12 A. The first issue is the normal temperature assignment discussed on page 5,  
13 beginning at line 13, of Dr. Won’s Rebuttal Testimony. On this issue, Dr. Won  
14 asserts that Empire witness Stephen C. Williams orders the normal daily  
15 temperatures for each month in the test year from lowest to highest and then  
16 assigns the normal temperatures to days of the month in calendar order.

17 The second issue is bias size and is discussed on page 7, beginning on line  
18 15, of Dr. Won’s Rebuttal Testimony. On this issue, Dr. Won claims that

1 Empire's methodological errors likely result in a significant bias and states  
2 that Empire's October 2013 residential weather normalization result is 17%  
3 higher than Staff's result.

4 **Q. WITH REGARD TO THE FIRST ISSUE, NORMAL TEMPERATURE**  
5 **ASSIGNMENT, IS DR. WON CORRECT THAT EMPIRE'S METHOD**  
6 **ASSIGNS NORMAL TEMPERATURES FROM LOWEST TO HIGHEST?**

7 A. No. In Mr. Williams' Direct Testimony, he describes Empire's weather  
8 normalization process. On page 7, beginning on line 7, of Mr. Williams' Direct  
9 Testimony, he states:

10

11 *"The final step in this method is to map the ranked averages to the test year*  
12 *actual weather. This allows for the assignment of the largest CDD for each*  
13 *particular month in the 30 year historical database to be mapped to the*  
14 *hottest day in the actual month of the test year."*

15

16 This statement explains that Empire's method does not assign normal  
17 temperatures from lowest to highest in the test year calendar as Dr. Won  
18 asserts. Instead, Dr. Won has identified an error in execution of Empire's  
19 weather normalization procedure. I have corrected this error.

20 **Q. WHAT IS THE IMPACT OF CORRECTING THIS ERROR?**

21 A. In Figure 1, I have corrected the normal weather assignment error and  
22 updated the weather normalization period to September 2013 through August  
23 2014. Figure 1 shows the revenue cycle normalized energy.

1 **Figure 1: Updated Empire Revenue Cycle Weather Normalized Energy**

| Revenue Cycle Normalized Energy |     | Res (kWh)     | CB (kWh)    | GP (kWh)    | SH (kWh)   | TEB (kWh)   | Total (kWh)   |
|---------------------------------|-----|---------------|-------------|-------------|------------|-------------|---------------|
| 2013                            | Sep | 147,702,693   | 29,054,491  | 79,912,329  | 7,388,687  | 33,418,838  | 297,477,037   |
| 2013                            | Oct | 102,257,637   | 23,046,259  | 69,882,221  | 5,723,283  | 26,926,053  | 227,834,453   |
| 2013                            | Nov | 100,652,512   | 20,779,954  | 63,399,825  | 5,666,769  | 26,328,801  | 216,827,860   |
| 2013                            | Dec | 161,619,580   | 25,599,048  | 68,778,995  | 8,071,234  | 32,417,268  | 296,486,124   |
| 2014                            | Jan | 207,438,602   | 29,816,510  | 71,999,694  | 10,785,260 | 37,298,889  | 357,338,955   |
| 2014                            | Feb | 191,055,160   | 28,687,850  | 66,646,268  | 10,514,983 | 33,793,325  | 330,697,587   |
| 2014                            | Mar | 155,477,525   | 26,151,857  | 65,157,689  | 8,520,683  | 30,049,337  | 285,357,091   |
| 2014                            | Apr | 114,821,418   | 22,470,609  | 62,091,760  | 6,576,818  | 27,251,221  | 233,211,826   |
| 2014                            | May | 94,206,732    | 21,273,166  | 65,510,373  | 5,630,562  | 25,160,240  | 211,781,072   |
| 2014                            | Jun | 106,975,391   | 24,359,759  | 70,637,618  | 6,123,679  | 28,231,597  | 236,328,044   |
| 2014                            | Jul | 151,690,396   | 30,181,705  | 78,884,637  | 7,505,217  | 33,130,916  | 301,392,871   |
| 2014                            | Aug | 148,722,871   | 29,890,607  | 78,648,125  | 7,559,764  | 33,775,280  | 298,596,646   |
| Total                           |     | 1,682,620,517 | 311,310,815 | 841,549,533 | 90,066,938 | 367,781,764 | 3,293,329,567 |

2

3 **Q. HOW DOES THE WEATHER NORMALIZED ENERGY COMPARE WITH**  
 4 **THE ANALYSIS OF STAFF'S WEATHER NORMALIZED ENERGY**  
 5 **CONTAINED IN YOUR REBUTTAL TESTIMONY?**

6 A. Figure 2 compares Empire's updated normalized energy with recalculated  
 7 Staff normalized energy. The "Staff Corrected" and "Staff Revision" weather  
 8 normalized energy values are from my Rebuttal Testimony, page 8, Figure 4.  
 9 The difference between the annual weather normalization results are 0.33%.  
 10 In spite of the differences in method, Staff's and Empire's weather  
 11 normalization processes produce similar results.

1 **Figure 2: Revenue Cycle Weather Normalized Energy Comparison**

| Class        | Empire Update<br>9/13-8/14 | Staff Corrected<br>9/13-8/14 | Staff Revision<br>9/13-8/14 |
|--------------|----------------------------|------------------------------|-----------------------------|
| Res          | 1,682,620,517              | 1,675,077,118                | 1,675,093,208               |
| CB           | 311,310,815                | 313,674,092                  | 313,675,937                 |
| GP           | 841,549,533                |                              |                             |
| GP Primary   |                            | 112,557,474                  | 112,556,486                 |
| GP Secondary |                            | 721,919,069                  | 721,919,441                 |
| SH           | 90,066,938                 | 90,925,107                   | 90,925,451                  |
| TEB          | 367,781,764                | 368,294,870                  | 368,296,268                 |
| Total        | 3,293,329,567              | 3,282,447,730                | 3,282,466,791               |

2

3 **Q. WITH REGARD TO THE SECOND ISSUE, BIAS SIZE, IS 17% A PROPER**  
4 **CHARACTERIZATION OF THE METHODOLOGICAL DIFFERENCES?**

5 A. No. Dr. Won asserts that Empire's October 2013 revenue cycle weather  
6 normalization energy is 17% higher than Staff's energy. Based on Staff's  
7 response to Empire Data Request 231, this comparison is based on Dr.  
8 Won's originally filed revenue month normalized sales. This comparison is  
9 incorrect because Dr. Won revised his weather normalization values to  
10 correct for the calculation error I describe in my Rebuttal Testimony. Using  
11 Dr. Won's Rebuttal Testimony workpapers, the correct October 2013  
12 difference for the residential class is 1.6%. Dr. Won has mischaracterized the  
13 methodological differences by including Staff's known calculation error into  
14 the 17% difference. The real difference between methods is 0.33% on an  
15 annual basis.

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

17 A. Yes, at this time.

AFFIDAVIT OF MARK QUAN

STATE OF CALIFORNIA    )  
  ) ss  
COUNTY OF SAN DIEGO    )

On the 20<sup>th</sup> day of March, 2015, 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

Subscribed and sworn to before me this 20<sup>th</sup> day of March, 2015.

  
\_\_\_\_\_  
Notary Public

My commission expires: 4/25/2017

