| | |
|---|---|
| Exhibit No.: | |
| Issues: | Weather Normalization |
| Witness: | Richard A. Voytas |
| Sponsoring Party: | Union Electric Company |
| Type of Exhibit: | Rebuttal Testimony |
| Case No.: | ER-2007-0002 |
| Date Testimony Prepared: | January 31, 2007 |

**MISSOURI PUBLIC SERVICE COMMISSION**

**CASE NO. ER-2007-0002**

# REBUTTAL TESTIMONY

**OF**

**RICHARD A. VOYTAS**

**ON**

**BEHALF OF**

**UNION ELECTRIC COMPANY**
**d/b/a AmerenUE**

**St. Louis, Missouri**
**January 31, 2007**

**REBUTTAL TESTIMONY**

**OF**

**RICHARD A. VOYTAS**

**CASE NO. ER-2007-0002**

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

A. My name is Richard A. Voytas. My business address is One Ameren Plaza, 1901 Chouteau Avenue, St. Louis, Missouri 63166-6149.

**Q. Are you the same Richard A. Voytas that filed Direct Testimony in this proceeding?**

A. Yes, I am.

**Q. What is the purpose of your Rebuttal Testimony in this proceeding?**

A. My Rebuttal Testimony will address the direct testimony of Staff witness Curt Wells in which he develops the normal weather that is used by Staff witnesses Shawn E. Lange and James A. Busch to weather normalize AmerenUE's test year sales and revenue.

**Q. What is your primary concern with the Direct Testimony of Staff witness Curt Wells?**

A. Mr. Wells revised the weather history Staff and the Company have used in two prior cases to calculate normal weather. The revised weather history Mr. Wells developed is different than the weather history used by both Staff and the Company in Case No. EC-2002-1. The ultimate impact of Mr. Wells' attempt to revise weather history results in inappropriately minimizing the impact of weather on sales which, in turn, has the impact of reducing the Company's annual revenue requirement.

**Q. Did the Company meet with Mr. Wells to discuss weather normalization issues, including the historical weather data base, prior to the development of Mr. Wells' testimony?**

A. Yes. The Company met with Mr. Wells and Staff witness Lange on November 12, 2006.

**Q. Did Mr. Wells mention the fact that he intended to revise weather history at that time?**

A. No.

**Q. Did the Company meet with Mr. Wells and Staff subsequent to the submittal of direct testimony but prior to the preparation of rebuttal testimony in an attempt to settle the historical weather database issue?**

A. Yes. The Company met with Staff regarding weather related technical issues and potential settlement including the historical weather database issue on January 17, 2007. The Company provided Staff with all the workpapers, analyses and supporting documentation that Staff needed to assess weather history.

**Q. Did Staff have any further inquiries regarding the weather information provided by the Company?**

A. No.

**Q. Does Mr. Wells appropriately define normal weather?**

A. Yes. Mr. Wells uses the National Oceanic and Atmospheric Administration (NOAA) standard of defining normal weather.

**Q. What is the NOAA standard for defining normal weather?**

A. NOAA defines normal for a weather element as the arithmetic average of that weather element over three consecutive decades. Staff, the Company and NOAA all currently define the normal period to be 1971-2000.

**Q. If Staff and the Company agree on the time frame over which to compute normal weather, why are there any issues in dispute?**

A. While the time period to be used in the calculation is agreed upon, the historical temperature data that feed the calculation is not. As I mentioned in my Direct Testimony, historical temperature data must be consistent. The St. Louis Lambert Airport weather station changed both its location and equipment during the period from 1971-2000. These changes affect the temperature readings that are taken at the station. For historical data to be useful in developing normals that will be used along with current actual temperature readings, the historical data must be adjusted so that the readings are consistent with the readings being currently produced. This adjustment is known as homogenization. I cannot emphasize enough that it is critical for the historical readings to be adjusted appropriately to match current readings for the weather normalization process to be meaningful.

**Q. Does the Staff recognize the need to make homogenization adjustments?**

A. Yes. Staff witness Wells states that "NOAA also provides adjusted maximum and minimum monthly temperatures for this time period in a file known as the NOAA Sequentials – in which NOAA made adjustments to the monthly averages to account for missing data, significant discontinuities with surrounding stations, time of observation, etc." Wells Direct, p. 4 l. 3-7. The significant discontinuities with surrounding stations mentioned

by Mr. Wells are primarily as a result of the station location and equipment changes that I mentioned above.

**Q. If Staff also recognizes the need to adjust the temperature history to be consistent with current readings, what is the problem?**

A. Staff's inclusion of temperature adjustments based on the NOAA Sequentials mentioned by Mr. Wells is completely redundant, unnecessary, and inappropriate. Mr. Wells states in his testimony,

> Q. Were any unique additional adjustments made to the daily average temperatures over the normals period for the St. Louis station?
> A. Yes. As a result of analyses performed by Missouri State Climatologist Dr. Steve Qi Hu in previous AmerenUE cases (Case No. EO-96-14 and EM-96-149), he recommended additional adjustments to daily average temperature for the St. Louis station over the 1971-2000 period that had not been incorporated into the NOAA normals. AmerenUE incorporated these adjustments in its weather normals. Staff reviewed these adjustments, has determined that they reflect Dr. Hu's analysis, and has also incorporated the same adjustments into its normals calculations.

The problem is that Dr. Hu's adjustments address the very same discontinuities as the adjustments made in the NOAA Sequentials. Utilizing both sets of adjustments is clearly inappropriate. This distorts the temperature history so that it is not truly meaningful in the weather normalization process.

**Q. But Mr. Wells said that Dr. Hu's adjustments "had not been incorporated into the NOAA normals." How can these be the same adjustments addressed by the NOAA Sequentials?**

A. At the time that Dr. Hu performed this analysis for the 1996 rate case, NOAA had not yet published the 1971-2000 normals. The prevailing normals were based on the

period from 1961-1990. There were no homogenization adjustments made by NOAA for the previous set of St. Louis normals. When the 1971-2000 normals were produced, NOAA made homogenization adjustments to account for the same changes that Dr. Hu had already addressed.

**Q. Does NOAA indicate in the Sequentials that Mr. Wells referenced what changes the adjustments were intended to address?**

A. Not explicitly. They do however keep a history of station changes that occurred at the St. Louis Lambert Airport station that can be reviewed. More importantly, though, it is clearly evident from the data itself that the adjustments are the same.

**Q. How so?**

A. If you compute the average monthly temperature from the raw daily temperature data and compare the results to the Sequentials, you can "back into" the adjustments that NOAA made. When the NOAA adjustments are compared to the adjustments that Dr. Hu suggests, it is evident that they address the same events. Each adjustment identified by Dr. Hu has a corresponding adjustment in the NOAA Sequential data. The timing and direction of each pair of corresponding adjustments is the same. It is virtually impossible to conceive of a situation where the two methods would have identified three different necessary adjustments, all occurring simultaneously and in the same direction if they were not addressing the same issues. Please see Schedule RAV-3 for a chart comparing the adjustments made by NOAA and Dr. Hu.

**Q. Was Mr. Wells aware that the NOAA adjustments were addressing the same issues as Dr. Hu's adjustments?**

A. Apparently not. There is no possible rationale for making the adjustments twice. The Company and Staff have addressed this issue thoroughly in the past, reaching agreement on the adjustments to be used for weather normalization purposes. It is curious at best why now the abrupt departure from the previous agreed method to the one Mr. Wells now advocates.

**Q. It is clear from Schedule RAV-3 that the adjustments address the same issue which raises another question. Which adjustment should be used to account for the past weather station changes?**

A. The adjustments made by Dr. Hu should be considered superior to the adjustments found in the NOAA Sequentials.

**Q. Why?**

A. The analysis done by Dr. Hu was actually in collaboration with Allen Dutcher, who was the State Climatologist of Nebraska at the time. That analysis was an exhaustive, focused analysis of the daily St. Louis Lambert Airport temperatures performed by two highly trained climatologists. The NOAA adjustments are made by a procedure that has been developed for mass application. Over a thousand weather stations are reviewed and adjusted by an automated process that assesses only annual and monthly temperature data. While this is an acceptable approach for an agency with a huge volume of data that still merits some minimum level of scrutiny, we have the benefit of the much more thorough and detailed analysis that had the full attention of two qualified climatologists.

**Q. Are there any reasons other than the careful attention that was given to Dr. Hu's and Mr. Dutcher's analysis that warrant it being accepted over the NOAA analysis?**

A. Yes. I am very familiar with the homogenization work done by Dr. Hu and Mr. Dutcher and I have subsequently researched the processes used by NOAA to do their work. There are compelling methodological reasons to defer to the adjustments developed by Dr. Hu.

Q. **Please explain.**

A. The NOAA website gives fairly extensive detail on the procedures they use to make homogenization adjustments to temperature data. In their discussion, they point out that "…if a change occurs very near the end of the normals period (e.g. after 1995), the discontinuity may not be detectable using this methodology." The most significant adjustment to the St. Louis data is the result of the switch to an Automated Surface Observing System (ASOS) in May of 1996. The ASOS installation falls into the period after 1995. NOAA's website suggests that their methodology may not accurately capture the impact of this change that occurred relatively late in the 30 year normal period. In fact, because the lowest frequency of data used by NOAA is at the monthly level, there would be fewer than 50 data points available to estimate the impact of the change. In stark contrast, Dr. Hu's daily analysis had hundreds of data points available to assess the appropriate magnitude of the adjustment. These numerous data points serve to ensure the greater accuracy and reliability of Dr. Hu's work and provide another sound rationale for using his analysis to determine the adjustments that are necessary to create a weather history that is representative of current recording conditions.

**Q. Did Dr. Hu address the data frequency issue in Case No. EM-96-149?**

A. He did. Dr. Hu states:

"Karl, et al.'s method is used at NCDC for estimating corrections to monthly maximum, minimum and mean temperatures, not for daily data. However, daily data are what I used in my analysis, not the monthly data. The reason is simple: daily data provide more information, as well as more accurate information than monthly data do for the problem of identifying possible biases due to changes at a weather station." (Steve Qi Hu, Surrebuttal Testimony, Case No. EM-96-149, page 6, lines 19-22.) Dr. Hu's argument that more detailed data yields a more robust analysis is simple and compelling.

**Q. Is there yet another advantage of Dr. Hu's methodology that you have identified?**

A. Yes. Both Dr. Hu and NOAA use other weather stations known as reference stations to help identify and quantify inhomogeneities at a subject weather station. The stations that Dr. Hu used were carefully screened to be certain that they were the most appropriate stations to use for analysis of the St. Louis Lambert Airport weather station. In fact, no station was included that was more than 25 miles from Lambert Airport and several stations were dismissed from consideration due to poor data quality. Only closely neighboring stations with complete and consistent data were used for Dr. Hu's adjustments. This means the data accumulating from these stations is more comparable, and thus more reliable, than data that may have been acquired from stations whose weather sensitivities differ from the St. Louis Lambert Airport station, as I later discuss.

**Q. Have you been able to ascertain what weather stations NOAA used as reference stations to perform its adjustment to the St. Louis Lambert Airport weather station?**

A. My staff has had communications with NOAA personnel and received a list of "potential" reference stations that were input into their automated application for use in the St. Louis homogenization work.

**Q. You refer to "potential" reference stations. Why do you qualify the reference stations with the word "potential?**

A. As it turns out, NOAA officials do not even know which stations were actually selected to adjust the St. Louis temperature series. The selection is internal to their algorithm and is not even included in the program's output. From this fact alone, we should be able to establish the clear advantages of having a station specific analysis that was performed and reviewed by multiple climatologists in addition to Company and Staff personnel. The NOAA procedures are adequate for their purposes given the huge volume of data that they must screen. However it is simply not possible for them to use as rigorous a methodology on all of their stations as the methodology employed by Dr. Hu.

**Q. Do you have any additional concerns with the list of "potential" reference stations you received from NOAA?**

A. Yes. The list of stations that were used to prepare the adjustments to the St. Louis Lambert Airport weather station did not even include one station that is within 40 miles. The nearest candidate station that went into the NOAA algorithm was in Warrenton, MO, which is 41.7 miles from Lambert Airport. The other 19 stations that were fed into the NOAA application were each over 50 miles away from Lambert and as far away as Urbana,

IL (184.4 miles from St. Louis). We know which stations were used by Dr. Hu and Mr. Dutcher and not one of the reference stations they selected was even as far away from St. Louis as the *closest* "potential" reference station used by NOAA.

**Q. Does the proximity of the reference stations impact the quality of the analysis used to make the temperature adjustments?**

A. Absolutely. In Case No. EM-96-149, Dr. Hu testified:

"Choosing the reference station is critical in this comparison process for identifying biases. The stations selected as the reference stations should be 1) as close to the St. Louis Lambert International Airport station as possible, and, equally importantly, 2) Have as similar as possible environment to that surrounding the St. Louis Lambert International Airport station." (Steve Qi Hu, Surrebuttal Testimony, EM-96-149, page 2, lines 18-22)

This statement by Dr. Hu is an excellent example of the rigor that was used in his process that clearly was not matched by the NOAA methodology.

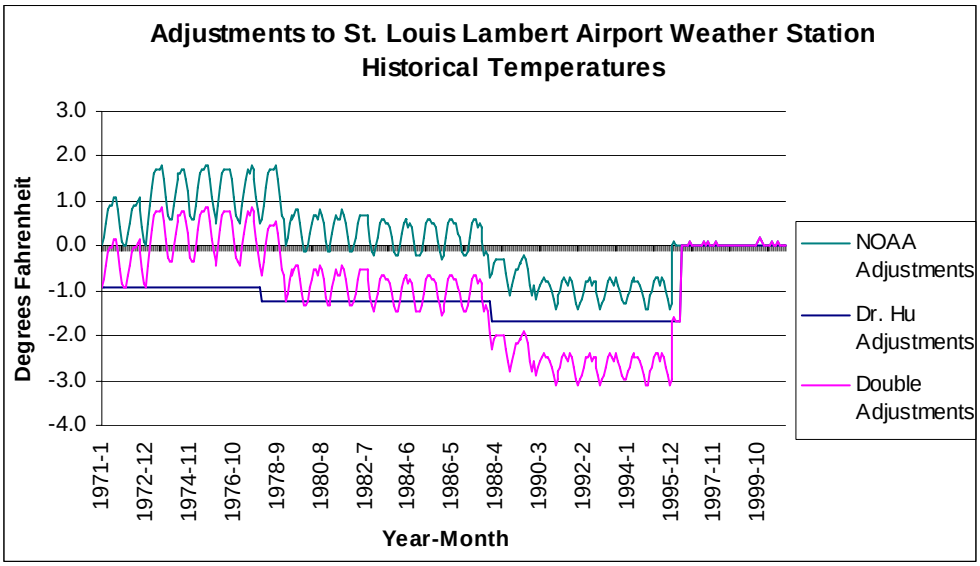
**Q. Please summarize your Rebuttal Testimony.**

A. The normal temperatures developed by Staff witness Wells for use in the weather normalization of sales and revenue are fatally flawed. Mr. Wells has used the appropriate 30 year period to compute normals, but did not start the task with appropriate temperature data. Mr. Wells used two sets of adjustments to account for past changes in the location of and equipment at the St. Louis Lambert Airport weather station. This "double-adjustment" serves to render the resulting normal temperatures meaningless as a standard to perform weather normalization against. Mr. Wells should discontinue application of the NOAA Sequentials adjustment he made and retain the adjustments developed by Dr. Hu. The Dr. Hu adjustments are superior to the adjustments from NOAA's "automated"

procedure because they were calculated through a detailed daily temperature analysis performed with the full attention of two highly trained climatologists.

**Q. Does this conclude your Rebuttal Testimony?**

A. Yes, it does.


Adjustments to St. Louis Lambert Airport Weather Station
Historical Temperatures
Degrees Fahrenheit
3.0
2.0
1.0
0.0
-1.0
-2.0
-3.0
-4.0
1971-1
1972-12
1974-11
1976-10
1978-9
1980-8
1982-7
1984-6
1986-5
1988-4
1990-3
1992-2
1994-1
1995-12
1997-11
1999-10
Year-Month
NOAA Adjustments
Dr. Hu Adjustments
Double Adjustments

**BEFORE THE PUBLIC SERVICE COMMISSION**
**OF THE STATE OF MISSOURI**

| | | |
|---|---|---|
| In the Matter of Union Electric Company d/b/a AmerenUE for Authority to File Tariffs Increasing Rates for Electric Service Provided to Customers in the Company's Missouri Service Area. | ) ) ) ) ) | Case No. ER-2007-0002 |

## AFFIDAVIT OF RICHARD A. VOYTAS

**STATE OF MISSOURI** )
) **ss**
**CITY OF ST. LOUIS** )

Richard A. Voytas, being first duly sworn on his oath, states:

1. My name is Richard A. Voytas. I work in St. Louis, Missouri and I am employed by Ameren Services Company as Manager of Corporate Analysis

2. Attached hereto and made a part hereof for all purposes is my rebuttal Testimony on behalf of Union Electric Company d/b/a AmerenUE consisting of 11 pages, which has been prepared in written form for introduction into evidence in the above-referenced docket.

3. I hereby swear and affirm that my answers contained in the attached testimony to the questions therein propounded are true and correct.

Richard A. Voytas

Subscribed and sworn to before me this 30th day of January, 2007.

Danielle R. Moskop
Notary Public

My commission expires: July 21, 2009

Danielle R. Moskop
Notary Public - Notary Seal
STATE OF MISSOURI
St. Louis County
My Commission Expires: July 21, 2009
Commission # 05745027