MISSOURI PUBLIC SERVICE COMMISSION

CASE NO. ER-2010-0036

DIRECT TESTIMONY

OF

STEVEN M. WILLS

ON

BEHALF OF

UNION ELECTRIC COMPANY
d/b/a AmerenUE

St. Louis, Missouri
July, 2009

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2   **OF**

3   **STEVEN M. WILLS**

4   **CASE NO. ER-2010-____**

5   **I.   INTRODUCTION**

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

7   A.   Steven M. Wills, Ameren Services Company ("Ameren Services"), One

8   Ameren Plaza, 1901 Chouteau Avenue, St. Louis, Missouri.

9   **Q.   What is your position with Ameren Services?**

10   A.   I am the Managing Supervisor of Quantitative Analytics in the Corporate

11   Planning Department.

12   **Q.   What is Ameren Services?**

13   A.   Ameren Services provides various corporate, administrative and technical

14   support services for Ameren Corporation ("Ameren") and its affiliates, including Union

15   Electric Company d/b/a AmerenUE ("Company" or "AmerenUE"). Part of that work is

16   performing important analyses, including weather normalization of test year sales for rate

17   proceedings, which is the subject of my direct testimony in this case.

18   **Q.   Please describe your educational background and employment**

19   **experience.**

20   A.   I received a Bachelor's of Music degree from the University of Missouri-

21   Columbia in 1996. I subsequently earned a Master's of Music degree from Rice

22   University in 1998, then a Master's of Business Administration ("M.B.A.") degree with

23   an emphasis in Economics from St. Louis University in 2002. While pursuing my

1

1   M.B.A., I interned at Ameren Energy in the Pricing and Analysis Group. Following

2   completion of my M.B.A. in May 2002, I was hired by Laclede Gas Company as a Senior

3   Analyst in its Financial Services Department. In this role I assisted the Manager of

4   Financial Services in coordinating all financial aspects of rate cases, regulatory filings,

5   rating agency studies, and numerous other projects.

6   In June 2004, I joined Ameren Services as a Forecasting Specialist. In this

7   role, I developed forecasting models and systems that supported the Ameren operating

8   companies' involvement in the Midwest Independent Transmission System Operator,

9   Inc.'s ("MISO") Day 2 Energy Markets. The forecasts that I developed were the basis

10   for all of the companies' demand bids into the MISO markets. In November 2005, I

11   moved into the Corporate Analysis Department of Ameren Services, where I was

12   responsible for performing load research activities, electric and gas sales forecasts, and

13   assisting with weather normalization for rate cases. In January 2007, I accepted a role I

14   briefly held with Ameren Energy Marketing Company as an Asset and Trading

15   Optimization Specialist before returning to Ameren Services as a Senior Commercial

16   Transactions Analyst in July 2007. I was subsequently promoted to my present position

17   as the Managing Supervisor of the Quantitative Analytics group.

18   Q.   What are your responsibilities in your current position?

19   A.   In my current position, I supervise a group of employees with

20   responsibility for short-term electric load forecasting, long-term electric and gas sales

21   forecasting, load research, weather normalization, and various other analytical tasks. My

22   group's day-ahead load forecasts serve as the basis for the Company's demand bids into

23   the MISO energy markets. We also perform forecasts of the Company's electric and gas

1 sales for budgeting and resource planning purposes. Our load research work supports

2 cost of service studies, settlements, and weather normalization, among other things.

II.   PURPOSE AND SUMMARY OF TESTIMONY

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

5 A.   The purpose of my testimony is to describe the process AmerenUE used to

6 weather normalize test year sales and net system output, and to present the results of the

7 weather normalization analysis. Additionally, I calculated a days' adjustment for the test

8 year to apply to sales and annualization adjustments for wholesale and Large

9 Transmission Service class sales. Finally, I developed a customer count forecast that was

10 used to project customer growth through the proposed true-up date in the case.

III.   WEATHER NORMALIZATION OF TEST YEAR SALES

12 **Q.   Are the Company's sales dependent on weather conditions**

13 **experienced in its service territory?**

14 A.   Yes. Weather is one of the most significant factors that can introduce

15 short-term fluctuations in the sales made by the Company. This is primarily due to the

16 large number of customers that heat and cool their premises with electric air conditioning,

17 electric space heating, and gas space heaters that have associated electric blowers. When

18 summer weather is unusually hot, air conditioning equipment must work harder to keep

19 buildings cool. This results in an increase in the Company's sales. Similarly if the

20 summer is particularly mild, air conditioning loads, and therefore electric sales, will

21 decline from expected levels. The converse is true in the winter. Colder temperatures

22 cause increases in space heating-related electric sales, while warm weather reduces them.

23 **Q.   What is weather normalization and why is it necessary?**

1   A.   Weather normalization is the process of determining the level of sales that

2   the Company should be expected to make on an ongoing basis under normal weather

3   conditions. When changing rates in a rate case, it is important to normalize sales for the

4   impact of unusual weather. This is because the level of test year sales will become the

5   denominator in the development of new electric rates (cents/kilowatt-hour ("kWh")). If

6   the test year included weather-related decreases in sales that are not expected to persist

7   from year to year, the denominator of the rate will be too small and the resulting rate will

8   be too high. In this case the Company would be expected to recover more than its

9   revenue requirement. Conversely, if the weather-related sales are higher than normal, the

10   resultant rate will be too low for the Company to have a reasonable opportunity to

11   recover its revenue requirement. Adjusting sales to a normal level will help develop a

12   final rate that is most likely to permit the Company to collect its revenue requirement

13   accurately.

14   Q.   **Please outline the process of weather normalizing electric sales.**

15   A.   There are three broad steps involved in the process, each with significant

16   detail involved in them. The first step is to define "normal" weather. The Company has

17   used weather observations from the period of 1971-2000 to develop its normal weather

18   conditions. This is consistent with the National Oceanic and Atmospheric Administration

19   ("NOAA") definition, which states that normal for a climatic element is equal to the

20   arithmetic average of that element computed over three consecutive decades (currently

21   1971-2000). However, because of the unique nature of the problem of normalizing

22   energy usage, a specific technique that is often referred to as the "rank and average"

23   approach is applied to temperatures from these decades. Application of this procedure is

1   necessary in order to produce realistic levels of normal energy later in the process. This

2   method has been utilized routinely in electric rate cases by the Missouri Public Service

3   Commission Staff ("Staff"), and was used by both the Company and the Staff in the

4   Company's most recent rate case (Case No. ER-2008-0318). I will elaborate further on

5   this methodology later in my testimony.

6   The second step in the weather normalization process is to develop load-

7   temperature relationships. Accurate statistical models of the response of load to

8   temperature are critical to developing a reasonable level of sales and net system output

9   upon which to develop rates. Using a software package called MetrixND, daily loads at

10 the rate and revenue class level are modeled statistically as a function of calendar and

11 weather variables. These statistical relationships are the basis for the weather

12 adjustments that are made to test year sales and will be discussed in more detail later in

13 my testimony.

14   The final step in the weather normalization process is to bring together the

15 actual and normal weather data with the statistical relationships of load and weather to

16 calculate the adjustments necessary to bring test year sales to the level expected under

17 normal conditions. This is the point at which we develop the level of sales that will

18 ultimately produce rates that afford the best opportunity to generate revenues in line with

19 the revenue requirement in the case. These calculations will also be described further

20 below.

21   **IV.   ACTUAL AND NORMAL WEATHER DATA**

22   **Q.   What weather data is required for the weather normalization**

23 **process?**

1   A.   It is necessary to obtain actual and normal two-day weighted mean

2   temperatures for each day in the test year that apply to the Company's service territory.

3   **Q.   What is a two-day weighted mean temperature ("TDMT")?**

4   A.   The TDMT is a temperature measure that is calculated by first taking an

5   average of the high and low temperature reported for each day. This value is referred to

6   as the daily average or mean temperature. Then for each day, the daily mean temperature

7   is averaged with the prior day's daily mean temperature with 2/3 weight on the current

8   day and 1/3 weight on the prior day. This calculation is done because the TDMT is a

9   better predictor of electric loads than the simple daily mean temperature. As an example

10   of why this is the case, electric loads tend to be higher on each successive very hot day.

11   This phenomenon is observable in load data and is largely attributed to heat build-up.

12   When coming off of a very hot day, buildings' internal temperatures are higher than they

13   otherwise would be. Therefore air conditioning units must work harder to cool

14   structures. The TDMT captures this effect by bringing forward the effect of the prior

15   day's temperature into the value being used to explain the current day's electric usage.

16   **Q.   What weather station is used to describe the weather in the**

17   **Company's service territory?**

18   A.   Weather readings taken at the NOAA station at the St. Louis International

19   Airport ("Lambert Field") are used in the weather normalization process as representing

20   the Company's service territory. As the St. Louis Metropolitan Area is home to a large

21   majority of the Company's customer base and the entire load served by the Company is

22   located in relatively nearby Missouri counties, this is appropriate. The Company acquires

1   this weather data from the Midwestern Regional Climate Center's ("MRCC")

2   Midwestern Climate and Information System database.

3   **Q.   Are there any adjustments made to the temperatures reported by the**

4   **MRCC before they are used in the weather normalization process?**

5   A.   Actual temperatures for the test year are used as reported by the MRCC in

6   the Company's calculations.   However, in the calculation of normal weather, it is

7   necessary to make adjustments to the historical readings to account for certain

8   discontinuities in the data that have resulted from known changes made over time in the

9   equipment used at Lambert Field and its location.

10   **Q.   Please describe the need to make adjustments to the weather data as**

11   **mentioned above.**

12   A.   Over the time period from 1971-2000, there have been changes made to

13   the weather station at Lambert Field where the temperature measurements are taken. The

14   most significant of these changes occurred in May 1996, when Lambert Field was

15   changed to an Automated Surface Observing System station. At this time, both the

16   equipment used to record temperatures and the location of that equipment changed in

17   order to introduce a system that records weather data continuously and automatically.

18   The new equipment and location resulted in readings that were lower than they would

19   have been with the previous equipment and location.

20   The most important characteristic of the calculated normal temperature is

21   that it be accurate relative to the test year temperatures.   The difference between the

22   normal temperature and the actual temperature should represent climate variability, not

23   artificial differences that can be introduced by changing observation practices.   If the

7

1   temperature readings from 1971-2000 have a known bias when compared with current

2   readings from Lambert Field, the calculated normal temperatures that are based on those

3   readings will not be applicable to the test year.

4   To illustrate this point, imagine two consecutive days that happen to have

5   identical high and low temperature conditions. At midnight, assume that the weather

6   station is disassembled and reconstructed with new equipment some distance away from

7   where it was. The new equipment happens to read cooler than the equipment it replaced,

8   since it is now in a grassy field instead of near blacktop pavement that absorbs heat. The

9   temperature on the second day now reads more than 1 degree cooler than the first day. It

10   would be inappropriate to use the temperature from the first day without any adjustment

11   in a calculation that will be used on the second day. The adjustment process corrects this

12   problem and allows us to fulfill the objective of having normal temperatures that are

13   accurate relative to the test year temperatures.

14   **Q.   How are the magnitudes, direction, and timing of these adjustments**

15   **determined?**

16   A.   The adjustments that the Company makes to the historical temperature

17   data from Lambert Field are based on a collaborative analysis undertaken by Staff and the

18   Company during Case No. EM-96-149. Climatologists engaged by the Company and

19   Staff used a statistical technique called "double-mass analysis" to determine the timing,

20   direction, and magnitude of the necessary adjustments. In the course of this analysis, the

21   climatologists used multiple reference weather stations in close geographic proximity to

22   Lambert Field to identify and characterize the discontinuities in the data. These

1   adjustments were agreed to in Case No. EM-96-149 and were used again by both parties

2   most recently in Case No. ER-2008-0318.

3   **Q.   Please describe the specific adjustments you applied to the historical**

4   **temperatures.**

5   A.   There are three adjustments made to the historical temperatures. First, on

6   January 11, 1978, a change occurred at Lambert Field that resulted in readings that were

7   0.3 degrees warmer than before. Next, on February 1, 1988, a change occurred that

8   resulted in readings that were 0.45 degrees warmer than those prior. Finally, on May 1,

9   1996, a change occurred that resulted in temperature readings that were 1.69 degrees

10   cooler than before. All adjustments are applied to the temperature readings before the

11   date of the change. This practice brings historical temperatures in line with current

12   readings at Lambert Field so that the normal and actual temperatures are appropriate for

13   comparison.

14   **Q.   Now that you have described the source of and adjustments to**

15   **historical temperature data, please describe the process you use to develop daily**

16   **normal temperatures for the test year.**

17   A.   First, daily TDMTs are calculated for the period from 1971-2000. Next, a

18   technique called "rank and average" is applied to the historical TDMTs in order to

19   develop normal values to use in the test year. The rank and average technique is used so

20   that the resultant normal temperatures produce appropriate levels of electric usage when

21   applied to the statistical models that capture the relationship between load and

22   temperature. The rank and average technique starts by ranking all of the days within a

23   season or year for each year from the highest TDMT to the lowest. Then for that season

9

1   or year, the warmest day of each of the 30 years is averaged, the second warmest day of

2   each of the 30 years is averaged, and so on until the coolest day of each of the 30 years is

3   averaged. Through this process we get a series of daily temperatures that represent the

4   normal hottest day for the season or year through the normal coldest day for the season or

5   year. This result is desirable because it gives normal temperatures that also exhibit

6   normal levels of extreme temperatures.

7   **Q.   Why is it important to have normal levels of extreme temperatures?**

8   A.   The response of load to temperature is non-linear. That means that a

9   change in temperature of 1 degree from 40 to 41 degrees has a different impact than a

10   change in temperature from 60 to 61 degrees, which in turn has a different impact than a

11   change from 80 to 81 degrees. Because load behaves differently across the spectrum of

12   possible temperatures, it is important to have a representative number of days in each part

13   of the temperature range in order to reproduce the level of load that would be experienced

14   across a year with normal temperature variability. The rank and average technique

15   achieves this objective.

16   **Q.   Are there any other considerations that you make when using this**

17   **technique?**

18   A.   Yes, there are many details to this calculation. In particular, there are

19   various ways to handle certain issues around seasons and days of the week. The

20   Company has performed the calculations consistent with its understanding of the Staff's

21   preferred approach and similar to how the Company and Staff ultimately agreed to

22   perform these calculations in Case No. ER-2008-0318.

| 1 | | V. | LOAD – TEMPERATURE RELATIONSHIP |

2   Q.   How is the relationship between load and TDMT established?

3   A.   The Company uses a software package called MetrixND to develop

4   statistical models that represent the relationship of load and temperature.

5   Q.   Is this a change from prior cases?

6   A.   The software has changed, but the underlying statistical models are very

7   similar. In past cases, the Company used the Hourly Electric Load Model ("HELM").

8   MetrixND has functionality that is very similar to HELM and the models employ the

9   same fundamental principles as HELM models.

10   Q.   What are the inputs to the MetrixND models?

11   A.   Hourly loads for each customer rate/revenue class combination to be

12   weather normalized are input into MetrixND. In addition, calendar variables that

13   describe the day of the week and season of the year are utilized. Finally, the model

14   requires actual TDMT for the period being used to develop the model. In the case of a

15   few classes, trend variables were also included.

16   Q.   What is a trend variable and why might it be needed?

17   A.   A trend variable is a variable that grows with time. Every day, the value

18   of this variable is one higher than the prior day's value. This is utilized to capture a load

19   pattern that is growing or declining significantly over time. By controlling for load

20   growth, the underlying weather response is modeled more accurately. This variable was

21   required for a few customer classes because the loads were deteriorating rapidly as

22   economic conditions worsened in the Company's service territory.

1   **Q.   Since the Company bills its customers monthly, and therefore reads**

2   **most of its customers' meters only monthly, how does the Company obtain hourly**

3   **load data by customer rate and revenue class to input into the model?**

4   A.   The Company uses hourly load data developed through its Load Research

5   Program in the model. AmerenUE maintains stratified random samples of customers

6   from each rate class, for which it collects hourly load data. Using the hourly loads from

7   the samples along with calendar month class sales, the Company uses a statistical

8   technique called ratio analysis to generate hourly class level loads. In addition to the rate

9   class level analysis, the Company uses another statistical technique called "domains

10   analysis" to extract revenue class level data.   Revenue classes include Residential,

11   Commercial, and Industrial. By subdividing the rate classes into revenue classes, more

12   homogeneous customer groups are available to model.

13   The class level loads are aggregated, adjusted for transmission and

14   distribution line losses and compared to the system load by hour. The system load is an

15   actual hourly metered value, whereas the class loads are still statistical estimates. The

16   class level loads are calibrated so that they aggregate up to match the known system loads

17   by hour. This ensures that the class level hourly data is consistent with the energy that

18   was consumed on the system. The resultant calibrated loads by rate and revenue class are

19   used in the MetrixND model and become a very important element in the process used to

20   normalize net system output.

21   **Q.   Please discuss the modeling process that occurs in MetrixND.**

22   A.   In MetrixND, a scatter plot is created with daily TDMTs on the horizontal

23   axis and load on the vertical axis. Using this graph, temperature ranges are identified that

1   have similar load responses to temperature. The ranges become temperature groupings

2   for the model. Additionally, seasons are analyzed graphically to see if the load-

3   temperature response differs seasonally. Variables are then developed to reflect these

4   temperature ranges and seasonal combinations that have similar load-temperature

5   responses. These variables, along with day of week variables and the trend variables

6   mentioned earlier are combined in regression models to explain the variation in daily

7   energy by class.

8   **Q.   Please describe how these statistical models represent the load-**

9   **temperature response.**

10   A.   Consider a model that is being fit for which no seasonal variations in the

11   load-temperature response have been identified. Over the course of the year, both

12   heating and cooling equipment may be used by the Company's customers. The model

13   may determine that when the temperature is between 40 and 50 degrees, a particular

14   customer class' usage may increase by 100 megawatt hours ("MWhs") for each degree it

15   gets colder. That means that when the TDMT falls from 42 to 41 degrees, space heating

16   equipment works harder, resulting in 100 MWhs of increased usage. In this case, the

17   MetrixND model would have a coefficient of -100 for the variable or variables that

18   represent that temperature range. This is similar to graphically drawing a line with a

19   slope of -100 over the area between 40 and 50 degrees on the scatter plot that we started

20   with. However, this same model may indicate that from 70 to 80 degrees, the same class'

21   usage increases by 150 MWhs for each degree warmer that it gets. This is because as

22   temperature increased, heating equipment was switched off and air conditioning

23   equipment was switched on. The coefficient of the model for the variable(s) that

1   represent this temperature range will be 150, which is similar to including a line with a

2   slope of 150 on the scatter plot over the load-temperature pairs between 70 and 80

3   degrees. The model establishes across all relevant temperature ranges what is expected to

4   happen to customer loads as the temperature changes. An example graph displaying a

5   load-temperature scatter plot with the weather response function is attached to my

6   testimony as Schedule SMW-E1.

7   **Q.   How are these models used to normalize customer loads?**

8   A.   For each day, actual and normal TDMTs have been paired based on the

9   normal weather calculations described above. For a given day, assume that the actual

10   TDMT was 74 degrees and normal is determined to be 78 degrees. We will look to the

11   statistical relationships developed in MetrixND, which may indicate that in this

12   temperature range, each additional degree causes usage to increase by 100 MWhs. So in

13   order to normalize load we will take the number of degrees that the actual temperature

14   deviated from normal (78 degree normal – 74 degree actual = 4 degree adjustment from

15   actual to normal) and multiply it by the usage per degree described by the model

16   (4 degrees x 100 MWhs/degree = 400 MWhs). On that day, normal usage is 400 MWhs

17   higher than the actual usage was.

18   **Q.   Are there any other models developed in this fashion?**

19   A.   Yes, an identical process is followed to generate statistical models and

20   normal values to represent each customer class' daily peak load. This will be

21   instrumental in developing the normalized net system output.

14

1   VI.   **NORMALIZING BILLED AND CALENDAR SALES**

2   Q.   **Once you have normalized the energy from the daily loads that you**

3   **developed in your load research process, how does this translate into normal sales**

4   **for billing months?**

5   A.   The Company's billings for a given month do not necessarily represent all

6   of the energy used within the calendar days of that month. This is because the

7   Company's customers have their meters read in 21 groups (or cycles) each month

8   according to a published schedule. So an August bill for one customer may be based on

9   the period July 14 through August 13, while for another customer the August bill may

10   include usage from July 26 through August 26. Groups of customers that have their

11   meters read on the same date are referred to as sharing a billing cycle. In the weather

12   normalization process, the Company is normalizing each billing cycle independently.

13   We start with billed sales for each billing cycle (group of customers whose meters are

14   read together) for each month. Since we know the dates the meters were read for each

15   billing cycle, it is possible to estimate how much usage occurred on each day. Take for

16   example a hypothetical billing cycle that began on July 14 and ended on August 13. A

17   particular class of customers (e.g., Residential, Commercial Small General Service, etc.)

18   may have been billed for 150,000 MWhs of usage in that period for the customers on that

19   billing cycle. We then look at the total estimated class daily usage from load research for

20   those dates. We may find that the total class used 3,000,000 MWhs over the dates

21   between July 14 and August 13. Perhaps the total class usage on July 14th was 100,000

22   MWhs. Therefore, 3.33% of the class' usage occurred that day (100,000 MWhs of class

23   daily usage / 3,000,000 MWhs of class usage over the billing period). That 3.33% is

1 applied to the sales of the actual billing cycle that is being normalized (150,000 MWhs x

2 3.33% = 5,000 MWhs on July 14th). Using this methodology the actual billed sales are

3 estimated by day for each billing cycle. Then for each day, the actual billed sales are

4 adjusted based on the daily normalized loads produced by MetrixND. We know that the

5 total class used 100,000 MWhs on July 14th, and through the MetrixND process the

6 normal load for July 14th was determined to be 110,000 MWhs. So for that day, normal

7 usage was 110% of actual (110,000 MWhs normal load / 100,000 MWhs actual load =

8 110%). So the billing cycle that used 5,000 MWhs on July 14th has a normal load for that

9 day of 5,500 MWhs (5,000 MWhs actual usage x 110% normal/actual ratio = 5,500

10 MWhs normal usage). For every customer class, month and billing cycle combination,

11 this calculation is done for each day that falls between the applicable meter reading dates.

12 The sum of the daily billed actual sales across all months and billing cycles tie to the

13 Company's billings for the year for the customer class being normalized. The sum of the

14 daily billed normal sales across all months and billing cycles is the normalized level of

15 the Company's billings for the year.

16   **Q.   How are calendar month actual and normal sales estimated in this**

17 **process?**

18   A.   When going through the calculations of actual and normal billed sales,

19 daily actual and normal sales by billing cycle are developed. These sales are then just

20 aggregated according to the days within a calendar month rather than according to meter

21 read schedules to develop calendar month sales.

1   Q.   **Please summarize the results of your analysis.**

2   A.   The test year was warmer than normal both in the summer and winter.

3 Cooling Degree Days ("CDD"), a quantification of the weather that typically results in air

4 conditioning load, were 2.6% greater than normal. This results in summer sales being

5 normalized downward. Heating Degree Days ("HDD"), a quantification of the weather

6 that typically results in heating load, were 6.3% less than normal. This results in winter

7 sales being normalized upward. Total retail sales for the weather sensitive classes were

8 adjusted up by 0.2% in aggregate. Class-by-class monthly results are reported in

9 Schedule SMW-E2. The schedule also includes the annualized sales for the LTS class as

10 discussed below.

11   **VII.   ANNUALIZATION OF WHOLESALE SALES AND REVENUES**

12   Q.   **Why was an annualization adjustment necessary for AmerenUE's test**

13 **year wholesale sales?**

14   A.   AmerenUE has had a static group of six wholesale customers for several

15 years. These customers are Missouri municipal utilities that were under long-term full

16 requirements power purchase contracts. All of the existing wholesale contracts were

17 originally set to expire December 31, 2008. Four of the six municipal customers signed

18 new contracts to continue on with full requirements service with AmerenUE beyond the

19 test year and true-up date in this case. The two customers that did not sign new contracts

20 are no longer served by AmerenUE. These customers had nine months of sales included

21 in the test year. As this is clearly a known and measurable change that will be reflected

22 in the Company's sales mix going forward, it is appropriate to remove these sales from

23 the test year totals. Additionally, the 4 returning customers are buying power at new

1 contract rates. The revenues associated with these customers were adjusted to reflect the

2 level of revenues that would have been achieved with the new contract rates in effect.

3   **Q.   Are there any other changes to the mix of wholesale customers that**

4 **impact the test year?**

5   A.   Yes. The Company entered two long-term partial requirements contracts

6 with new customers in the spring of 2009. These contracts are effective well in advance

7 of the true-up date in the case and an annualized level of expected sales under these

8 contracts should be included in the test year to appropriately reflect the mix of customers

9 the Company will be serving as of the true-up date in the case.

10   **Q.   How were the annualization adjustments computed?**

11   A.   For the customers whose contracts terminated on December 31, 2008, all

12 usage that was recorded on the books during the nine months of the test year that

13 proceeded that date was removed from the wholesale sales totals. For the new customers,

14 the contracts guided the calculation of the sales to impute into the test year. One contract

15 calls for 100 MW of power (energy and capacity) every hour of the contract term. The

16 other contract calls for 150 MW of energy and capacity, subject to the customer's day-

17 ahead schedule. This contract requires the customer to achieve a minimum of a 76% load

18 factor over the term of the agreement. The appropriate monthly volumes were calculated

19 consistent with the provisions listed above and imputed in the test year to reflect an

20 appropriate annualized wholesale sales level.

21   **Q.   What are these adjustments used for?**

22   A.   There are two places these adjustments show up in the case. First, I

23 provided the sales adjustments to Company witness Gary S. Weiss to use in the

1   development of allocation factors to assign costs to retail and wholesale load. Second, I

2   used the adjusted sales in the development of normalized net system output that I

3   provided to Company witness Timothy D. Finnell for production cost modeling. I will

4   describe the net system output calculations later in my testimony. The adjustments to the

5   wholesale class sales and revenues are detailed in Schedule SMW-E3.

6   **VIII. ANNUALIZATION OF LTS SALES**

7   **Q.   Why is an annualization adjustment necessary to the Large**

8   **Transmission Service ("LTS") class sales?**

9   **A.**   The Large Transmission Service Class is made up of only one customer.

10   This customer is the Company's largest customer by sales volume by a wide margin. The

11   customer in this class experienced an outage of their production capacity related to a

12   winter storm that occurred in January 2009. The last three months of the test year

13   included usage for this customer that was significantly below normal usage by historical

14   standards.

15   **Q.   How was the normal annual level of sales to the LTS class**

16   **determined?**

17   **A.**   The customer that makes up this class has an extremely consistent load

18   when operating under normal conditions. The annual load factor of this class is

19   approximately 98% and the annual sales to this class have not varied by more than 1% in

20   a full year over the last three years. Because the load pattern of this customer is so

21   consistent under normal operations, it is adequate to use sales from the first three months

22   of 2008 to replace January through March sales of 2009. The annualized sales for the

1   LTS class sales simply replaced the last three months of the test year with the same three

2   months from the prior year.

3   **Q.   Were any adjustments made to the prior year's sales at all?**

4   A.   Yes. February of 2008 included a leap day. The February 2008 sales

5   volume was reduced by 1/29th to reflect the level of sales that would be expected to occur

6   in a 28 day month, as February 2009 was.

7   **Q.   What was the LTS class adjustment used for?**

8   A.   I provided this adjustment to Mr. Weiss, again for the development of the

9   variable allocation factor in his cost of service analysis. Also, I provided the annualized

10   sales to Company witness James R. Pozzo for him to use in the development of billing

11   units for the case. Finally, I incorporated the adjusted sales level in the development of

12   the normalized net system output that I provided to Mr. Finnell.

13   **IX.   CUSTOMER GROWTH FORECAST**

14   **Q.   What is the purpose of the customer growth forecast you provided for**

15   **this case?**

16   A.   The Company has proposed to true-up certain items of revenue and

17   expense through February 28, 2010. The basis of the revenue true-up is the forecast of

18   customer counts at that time. To the extent that the customer base continues to grow and

19   use per customer remains unchanged, revenues will grow. The customer forecast was

20   used to true-up revenues to the level expected to be achieved based on growth through

21   that time.

1   **Q.**   **How was the customer forecast created?**

2   **A.**   Using MetrixND, the same statistical software that was used to create the

3 load-temperature response models, econometric forecasts were created for seven

4 customer classes.

5   **Q.**   **Which classes were included and why were they selected?**

6   **A.**   Customer growth was forecast for the Residential, and Commercial and

7 Industrial ("C&I") classifications of the Small General Service, Large General Service,

8 and Small Primary Service classes. The only tariff classes not chosen for a customer

9 growth adjustment were the C&I Large Primary Service ("LPS") classes and the LTS

10 class. The LPS class is a class with a fairly small number of very large customers. This

11 class was reviewed by the Company's rate engineering group for known changes to the

12 existing customer base. The LTS class, as mentioned earlier, only has one customer and

13 has no prospects for change at this time.

14   **Q.**   **Please describe the models used to forecast customer growth.**

15   **A.**   For most customer classes, an appropriate economic driver was selected to

16 explain changes in customer counts over time. The Company receives both historical

17 data and forecasted data on numerous economic data series that are relevant specifically

18 to its service territory from Moody's Economy.com. The drivers selected were all

19 forecasted by this nationally respected service.

20   For the Residential class, the households variable was selected as the

21 driver variable for its obvious intuitive fit. For the various C&I classes a relevant

22 employment or output (for example, Gross Domestic Product for the Manufacturing

23 sector) was selected as the driver variable. The variable for each particular class was

1   selected based on its having an intuitive relationship with the class being forecast as well

2   as the statistical fit of the variable. In most cases, the model simply consisted of a lagged

3   dependent variable and the driver variable.

4   **Q.   What is the purpose of the lagged dependent variable?**

5   A.   The lagged dependent variable simply means that the last period's actual

6   customer count is used to predict the customer count for the following period. As

7   customer counts are fairly stable over time, this lends stability to the model and provides

8   for a very good statistical fit. The economic variables then can provide a basis for

9   changes in the growth rate over time.

10   **Q.   Were any classes modeled in a different fashion?**

11   A.   Yes, the Commercial Small Primary Service class was done with just a

12   time series model. This essentially means that the level and trend across time is just

13   extrapolated into the future.

14   **Q.   Why was that done for this class?**

15   A.   All of the relevant drivers projected a significant near-term decline in

16   customers due to the poor economic conditions included in Economy.com's forecast. A

17   decline was not evident in the actual customer data yet, so these forecasts were rejected in

18   favor of a time series forecast.

19   **Q.   What was done with the results of the customer forecast?**

20   A.   I provided forecasted customers for each of the seven classes mentioned

21   above to Mr. Pozzo. He used these customer counts to adjust the test year billing units to

22   the level that is expected to exist as of the requested true-up date.

1   X.   **NORMALIZED NET SYSTEM OUTPUT**

2   **Q.   What is net system output?**

3   A.   Net system output is the term the Company uses to describe the total

4   amount of energy generated or purchased to serve its retail and long-term wholesale load,

5   along with the associated distribution system line losses. The Staff frequently refers to

6   this as net system input. The terms may be used interchangeably. The only difference is

7   the perspective on the system. It is system output from the point of view of the

8   generation fleet. It is system input from the point of view of the transmission system.

9   **Q.   Why is it necessary to normalize net system output?**

10   A.   Earlier I described the need for normalizing test year sales. Because we

11   have normalized sales, it is also essential to normalize net system output. The net system

12   output is the load that will drive the production cost model that determines the fuel and

13   purchased power costs of the Company during the test year. The matching principle

14   dictates that revenues should be matched up with the expenses that were incurred to

15   generate those revenues. Essentially, we are simply treating revenues and expenses

16   equivalently so that the true cost of service of our normalized level of load is reflected in

17   the case.

18   **Q.   How is net system output normalized?**

19   A.   Much of the work is already done from the process of normalizing sales.

20   We used calibrated load research data for each customer class to build statistical models

21   of daily class energy. As I mentioned when describing the sales normalization, I

22   simultaneously built models to weather normalize the daily peak load for each class.

23   From these models, it is possible to generate hourly weather normalized class loads.

1   **Q.   How does normalization of the daily energy and peak produce normal**

2   **hourly class loads?**

3   A.   I used a technique called the "unitized hourly load calculation" that keeps

4   the existing hourly pattern of loads that was experienced in the test year, but adjusts it to

5   the targeted energy and peak levels from the daily weather response functions. This

6   technique is detailed in the Staff's 1990 Draft Report titled "Weather Normalization of

7   Electric Loads."

8   **Q.   Once you have computed normalized hourly class loads, how do you**

9   **create the total system output on a normal basis?**

10   A.   This is the reason it was important to point out the calibration process of

11   our load research work. The load research was developed at the customer meter level,

12   then adjusted for transmission and distribution line losses and compared to the actual net

13   system output. Any variation between the sum of our class level estimates and the total

14   system load was allocated to the various customer classes at that time. So the sum of

15   hourly class loads adjusted for losses is equal to the observed system load. Now that we

16   have normalized these loads individually, we can once again sum up the loss adjusted

17   normal hourly loads. The sum of these becomes the normal system load, or net system

18   output.

19   **Q.   What is the advantage of the class-by-class, or "bottom-up" method of**

20   **normalizing net system output that you are proposing in this case?**

21   A.   There are at least three advantages of this method. First, the models that

22   are normalizing the energy level of the net system output are the exact same models that

23   are normalizing sales for revenue calculations. That helps to build consistency between

1   these adjustments. Second, the energy models at the rate class level can pick up

2   differences in response to temperature by class and therefore incorporate more useful

3   information about load into the calculation. The higher level of detail should provide a

4   truer representation of the load-temperature relationship. Finally, it helps build

5   consistency across filings to use the bottom-up approach, as a class-by-class hourly

6   weather normalization will be included in Integrated Resource Plan ("IRP") filings made

7   by the Company. Using a similar approach to weather normalization of class and system

8   loads in the rate case and IRP only makes sense. Again, it is worth reiterating that the

9   calibration of the original class level load research ensures consistency between the class

10   level calculations and the system load calculations.

11   **Q.** **Were any other adjustments made to the class level loads besides the**

12   **weather normalization calculations?**

13   A. Yes, the annualization adjustments to the LTS and wholesale classes were

14   also reflected in the net system output. Additionally, the sales included in the billing

15   units to reflect expected customer growth through the true-up date were also built into the

16   net system output. Finally, an estimate of transmission losses that will be calculated

17   through the settlement process with MISO was deducted from the net system output.

18   **Q.** **Why does the estimate of transmission losses need to be based on**

19   **MISO settlements and why is it deducted from net system output?**

20   A. When the Company interacts with MISO, transmission losses are settled

21   financially. This means that when the Company buys the energy needed to serve its load

22   from the MISO, it does not explicitly buy the associated energy to cover transmission

23   losses. The Company will be paid for all energy it generates by MISO and will pay for

1   all energy it consumes from MISO. The difference between the generation and load will

2   be off-system sales net of power purchases. Since transmission losses are not included in

3   the load purchased from MISO, the load used for the net system output should not

4   include those losses. That way the generation that went to serve transmission losses will

5   appear as off-system sales in the production cost model, which is a reflection of how the

6   Company truly transacts with MISO. Transmission losses are paid for through the

7   Marginal Loss Component of the Locational Marginal Price paid for all load. In order to

8   match this reality, the loss rate that matches MISO's loss estimates is used in the

9   calculation.

10   **Q.   How was that loss rate developed?**

11   A.   I reviewed the last two years of data from the MISO. For 2007 and 2008,

12   MISO's calculated transmission losses were 2.2% of the metered volume of energy that

13   the Company settled with the MISO.

14   **Q.   Once all of the appropriate adjustments are made, what is done with**

15   **the net system output numbers?**

16   A.   I provided them to Mr. Finnell. He uses them in his production cost model

17   to determine the net base fuel cost incurred to serve this load given our generation mix,

18   cost of fuel, and market prices.

19   **XI.   DAYS' ADJUSTMENT**

20   **Q.   What is a days' adjustment?**

21   A.   The billed sales in the test year are based on the Company's meter read

22   schedule. This schedule varies from year to year and from billing group to billing group.

23   The effect of this is that customers may be billed for slightly more or less than 365 days

26

1   over the course of a test year. Since a normal year has 365 days, customer usage is

2   adjusted accordingly.

3   **Q.   How did you calculate the days' adjustment?**

4   A.   I followed the method that was proposed by the Staff and ultimately

5   agreed to by the Company in Case No. ER-2008-0318. Essentially we look at the

6   difference between the calendar month sales and billing month sales estimated in the

7   weather normalization process above. The difference is provided to Mr. Pozzo so that he

8   can adjust the billing units to match the 365 day usage. Since the calendar month sales

9   are based on exactly 365 days, it reflects the appropriate amount of usage for a test year.

10 A table of the days' adjustment by class is attached to my testimony as Schedule

11 SMW-E4

12 **Q.   Are there any other benefits of using this method?**

13 A.   Yes. This helps ensure that the matching of revenues and expenses will be

14 accurate. Because the net system output was calculated from hourly data over the

15 calendar months of the test year, using the calendar sales level from the test year to

16 generate the revenue will ensure that the appropriate matching of these components

17 occurs.

18 **Q.   Does this conclude your direct testimony?**

19 A.   Yes, it does.

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) Case No. ER-2010-
Service Provided to Customers in the)
Company's Missouri Service Area.)

AFFIDAVIT OF STEVEN M. WILLS

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

Steven M. Wills, being first duly sworn on his oath, states:

1.   My name is Steven M. Wills. I work in the City of St. Louis, Missouri,

and I am employed by Ameren Services Company as Managing Supervisor of

Quantitative Analytics.

2.   Attached hereto and made a part hereof for all purposes is my Direct

Testimony on behalf of Union Electric Company d/b/a AmerenUE consisting of _27_

pages, Schedules SMW-E1 through SMW-E4, all of which have 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

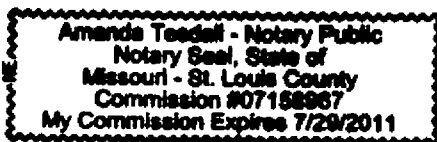testimony to the questions therein propounded are true and correct.
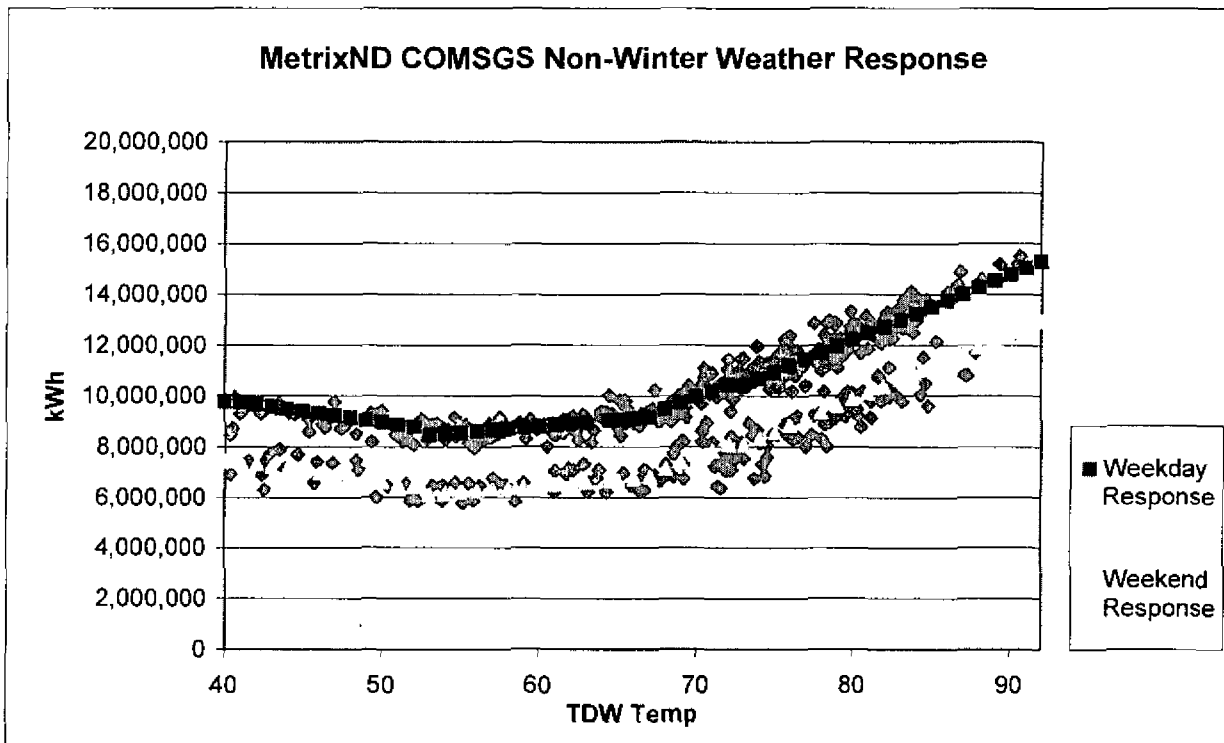
_____
Steven M. Wills

Subscribed and sworn to before me this 24th day of July, 2009.

_____
Notary Public

My commission expires:

MetrixND COMSGS Non-Winter Weather Response

Ameren UE - Residential Test Year Sales - Revenue Month			
Month	Actual	Normal	Ratio
4	969,799,153	961,461,162	99.1%
5	777,911,927	788,042,664	101.3%
6	1,003,329,065	990,466,097	98.7%
7	1,373,129,982	1,310,587,003	95.4%
8	1,340,633,504	1,346,240,926	100.4%
9	1,135,638,520	1,142,851,011	100.6%
10	837,152,796	840,635,556	100.4%
11	863,189,578	864,264,207	100.1%
12	1,318,120,651	1,305,445,251	99.0%
1	1,604,173,407	1,601,891,007	99.9%
2	1,359,668,941	1,418,069,890	104.3%
3	1,103,140,860	1,173,451,014	106.4%
Total	13,685,888,384	13,743,405,788	100.4%

Ameren UE - Small General Service Test Year Sales - Revenue Month			
Month	Actual	Normal	Ratio
4	273,992,580	274,493,455	100.2%
5	255,242,316	259,011,163	101.5%
6	293,464,157	292,898,999	99.8%
7	348,939,443	337,373,516	96.7%
8	325,456,030	325,966,570	100.2%
9	315,987,582	316,873,951	100.3%
10	274,046,281	271,997,470	99.3%
11	261,697,711	260,168,026	99.4%
12	312,595,290	310,248,190	99.2%
1	353,897,155	353,524,588	99.9%
2	319,918,678	328,535,800	102.7%
3	283,109,863	291,330,423	102.9%
Total	3,618,347,086	3,622,422,152	100.1%

Ameren UE - Large General Service Test Year Sales - Revenue Month			
Month	Actual	Normal	Ratio
4	625,394,696	627,165,761	100.3%
5	621,653,092	626,208,916	100.7%
6	709,277,536	709,225,774	100.0%
7	792,542,141	777,845,967	98.1%
8	746,387,210	746,226,768	100.0%
9	749,830,689	749,389,345	99.9%
10	679,673,708	679,596,024	100.0%
11	634,639,969	632,540,889	99.7%
12	681,208,839	677,072,504	99.4%
1	715,092,170	713,670,762	99.8%
2	667,116,670	680,283,150	102.0%
3	626,700,303	641,645,817	102.4%
Total	8,249,517,023	8,260,871,678	100.1%

Ameren UE - Small Primary Service Test Year Sales - Revenue Month			
Month	Actual	Normal	Ratio
4	299,072,283	299,563,327	100.2%
5	316,115,908	318,145,524	100.6%
6	338,440,837	338,787,852	100.1%
7	362,451,890	357,542,878	98.6%
8	349,475,428	349,793,972	100.1%
9	346,150,294	346,502,601	100.1%
10	324,335,574	322,985,193	99.6%
11	298,899,142	297,621,981	99.6%
12	297,694,893	297,420,595	99.9%
1	299,790,997	300,111,330	100.1%
2	302,732,535	304,818,172	100.7%
3	278,843,369	279,747,873	100.3%
Total	3,814,003,150	3,813,041,299	100.0%

Schedule SMW-E2-1

Ameren UE - Large Primary Service Test Year Sales - Revenue Month			
Month	Actual	Normal	Ratio
4	316,358,391	316,852,698	100.2%
5	320,749,942	321,854,889	100.3%
6	343,485,525	344,704,786	100.4%
7	389,033,214	384,428,447	98.8%
8	384,263,889	383,993,815	99.9%
9	381,577,570	381,880,142	100.1%
10	369,542,016	368,608,632	99.7%
11	349,489,309	348,557,341	99.7%
12	320,915,363	320,665,611	99.9%
1	321,182,400	321,520,283	100.1%
2	306,660,823	307,394,103	100.2%
3	284,721,848	284,478,203	99.9%
Total	4,087,980,290	4,084,938,951	99.9%

Ameren UE - LTS Test Year Sales - Revenue Month			
Month	Actual	Annualized	Ratio
4	339,275,586	339,275,586	100.0%
5	349,956,770	349,956,770	100.0%
6	336,878,786	336,878,786	100.0%
7	348,934,924	348,934,924	100.0%
8	349,671,769	349,671,769	100.0%
9	337,795,250	337,795,250	100.0%
10	348,884,810	348,884,810	100.0%
11	337,833,403	337,833,403	100.0%
12	350,337,949	350,337,949	100.0%
1	315,773,079	351,378,240	111.3%
2	90,755,617	317,718,891	350.1%
3	125,973,025	350,351,489	278.1%
Total	3,632,070,968	4,119,017,867	113.4%

		AmerenUE Wholesale Test Year Billed Sales Normalization and Annualization				
Month	Original Sales	Contract Termination Annualization		Weather Adjustment	New Contract Annualization	Normalized/Annualized Wholesale Sales
Apr-08	49,347,192	(25,953,896)		(38,197)	156,816,000	180,171,099
May-08	45,865,734	(23,810,818)		(81,167)	156,480,000	178,453,749
Jun-08	45,806,281	(22,682,308)		664,834	156,816,000	180,604,807
Jul-08	57,037,341	(28,156,276)		(1,509,295)	159,216,000	186,587,770
Aug-08	64,207,684	(31,771,244)		(58,020)	156,480,000	188,858,420
Sep-08	60,559,176	(30,662,469)		430,662	156,816,000	187,143,369
Oct-08	48,658,343	(25,119,589)		(73,933)	156,480,000	179,944,821
Nov-08	43,676,352	(23,774,780)		(106,985)	156,816,000	176,610,587
Dec-08	44,535,846	(24,228,545)		(42,300)	159,216,000	179,481,001
Jan-09	53,238,867	(28,366,669)		(38,872)	151,008,000	175,841,326
Feb-09	25,096,027	0		100,771	152,016,000	177,212,798
Mar-09	94,616,226	0		914,657	82,080,000	177,610,883
Total	632,645,069	(264,526,594)		162,155	1,800,240,000	2,168,520,630

		AmerenUE Wholesale Test Year Billed Revenue Normalization and Annualization				
Month	Original Revenue	Contract Termination Annualization	New Contract Rate Annualization for Returning Customers	Weather Adjustment	New Contract Annualization	Normalized/Annualized Wholesale Revenues
Apr-08	1,512,519	(784,327)	1,031,802	(2,874)	5,072,602	6,829,723
May-08	1,523,915	(809,919)	948,363	(6,118)	5,060,328	6,716,568
Jun-08	1,456,509	(698,749)	995,738	50,415	5,072,602	6,876,514
Jul-08	2,043,868	(957,612)	1,115,589	(115,066)	5,149,522	7,236,300
Aug-08	2,234,587	(1,032,774)	1,271,171	(4,423)	5,060,328	7,528,889
Sep-08	2,298,773	(1,130,354)	1,106,768	32,774	5,072,602	7,380,562
Oct-08	1,879,131	(954,929)	865,481	(5,621)	5,060,328	6,844,389
Nov-08	1,344,080	(710,600)	865,553	(8,058)	5,072,602	6,563,576
Dec-08	1,464,649	(744,611)	808,956	(3,185)	5,149,522	6,675,331
Jan-09	1,626,974	(852,098)	1,092,649	(2,919)	4,881,941	6,746,546
Feb-09	1,885,113	0	0	7,570	4,918,762	6,811,444
Mar-09	3,904,423	0	(0)	68,766	2,675,808	6,648,997
Total	23,174,542	(8,675,974)	10,102,069	11,260	58,246,944	82,858,840

Class	Days Adjustment (kWh)
RES	-29,291,978
SGS	-11,953,906
LGS	-6,027,011
SPS	-11,799,291
LPS	-9,527,740