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Witness: Steven M. Wills
Sponsoring Party: Union Electric Company
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Case No.: ER-2012-0166
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MISSOURI PUBLIC SERVICE COMMISSION

CASE NO. ER-2012-0166

SURREBUTTAL TESTIMONY

OF

STEVEN M. WILLS

ON

BEHALF OF

**UNION ELECTRIC COMPANY
d/b/a Ameren Missouri**

St. Louis, Missouri
September, 2012

Ameren Exhibit No. 17
Date 10-11-12 Reporter KS
File No. ER-2012-0166

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SURREBUTTAL TESTIMONY

OF

STEVEN M. WILLS

CASE NO. ER-2012-0166

I. INTRODUCTION

Q. Please state your name and business address.

A. Steven M. Wills, Ameren Services Company ("Ameren Services"), One
en Plaza, 1901 Chouteau Avenue, St. Louis, Missouri 63103.

Q. What is your position with Ameren Services?

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

Q. Are you the same Steven M. Wills who filed direct and rebuttal
only in this case?

A. Yes, I am.

II. PURPOSE OF TESTIMONY

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

A. To respond to the rebuttal testimony of Missouri Public Service Commission Staff ("Staff") witness Dr. Seoung Joun Won regarding the appropriate adjustments to be applied to the historical temperature readings taken at the weather station at St. Louis Lambert Airport ("Lambert Field").

Q. Do you have any overall observations regarding the positions put
rd by Dr. Won in his rebuttal testimony?

1 A. Yes. I have two. First, I am both surprised and troubled by Dr. Won's
2 repeated assertions that temperature adjustments relied upon by both Ameren Missouri
3 ("Company") and Staff in over a decade of rate cases are not based on adequate,
4 appropriate, and sound scientific analysis. Mr. Allen Dutcher, the State Climatologist of
5 Nebraska, is one of the climatologists that developed the original adjustment values in
6 concert with another climatologist hired by Staff. Mr. Dutcher will respond to the
7 specific methodological concerns raised by Dr. Won. However, the claims made by
8 Dr. Won are particularly troubling given the fact that Dr. Won himself utilized the very
9 same adjustments in his analysis for the Company's last rate case just over a year ago,
10 Case No. ER-2011-0028. If he has such serious reservations about the calculation of the
11 adjustments in question, surely he would not have found it appropriate to incorporate
12 them into his own analysis so recently.

13 Secondly, Dr. Won repeatedly voices his concerns with the assumptions and
14 methodologies that he specifically attributes to me in this case. I would point out that
15 assumptions I made in this case regarding the appropriate weather adjustments **are**
16 **exactly the same** as the assumptions made by each Company and Staff witness in every
17 Ameren Missouri rate case over the past decade. So to the extent that his criticisms are
18 valid (which I believe they are not, as I will point out below), they are just as applicable
19 to all of the work on this topic that has been accepted by the Commission – and
20 recommended by Staff -- for a very long time.

1 **Q. Dr. Won indicates in his testimony that:**

2 **The DMA adjustments are not appropriate because**
3 **Mr. Wills is relying on analysis performed**
4 **approximately 13 years ago, and they are not adequate**
5 **because DMA is a subjective methodology that can**
6 **easily introduce bias. (Won rebuttal, p. 2, l. 19-21).**

7
8 **How do you respond?**

9 A. Mr. Dutcher clearly explains in his rebuttal testimony the objective criteria
10 he uses in calculating the adjustments in order to refute Dr. Won's assertion of
11 subjectivity in the methodology. The concern over the age of the analysis is simply
12 absurd. The methodology outlined by Mr. Dutcher for performing Double Mass Analysis
13 is very transparent, clear and robust. It doesn't become invalid simply because a few
14 years pass by. I would point out that Staff's own weather normalization procedure is
15 based on a manual developed by Dr. Michael Proctor in 1990,¹ more than twenty years
16 ago. By Dr. Won's logic, it seems that the Commission also should question the
17 appropriateness of Staff's weather calculations due to the age of their methodology. Let
18 me be clear; I am not suggesting that the weather normalization manual written by
19 Dr. Proctor in 1990 is invalid. But it does illustrate the irrelevance of pointing out the
20 age of the analytic approach as a means to criticize it.

21 **Q. In an attempt to criticize the calculation of the original temperature**
22 **adjustments from Case No. EM-96-149, Dr. Won states regarding the reference**
23 **temperature stations² used in the analysis:**

¹ See n.72 on p. 97 of the Staff Cost of Service Report.

² A reference station is a weather station whose data is used to make comparisons with the data from the weather station that is the target of the double mass analysis study.

1 ...even though there were no documented changes, the relationship
2 between the two temperature data series was still inconsistent because
3 of undocumented changes to the land use or land cover surrounding
4 of the reference station. (Won rebuttal, p. 3, l. 5-7).

5
6 **Does Dr. Won provide any evidence to support his claim?**

7 A. He cites a source in a footnote. However, the source he cites does not
8 have any information that is in any way pertinent to the temperature series used in
9 Mr. Dutcher's analysis. The paper referenced only raises this issue generally as a
10 *potential* concern with *some* methodologies for detecting and correcting biases with no
11 specific reference to any particular weather stations. Mr. Dutcher will explain more fully
12 how he addresses the issue of undocumented station changes so that it does not and
13 cannot negatively impact his analysis. Dr. Won seemed to simply find a paper that
14 identified a potential weakness in an analytical approach with some similarities to the
15 analysis undertaken by Mr. Dutcher, and then asserted that that weakness was in fact a
16 flaw of Mr. Dutcher's analysis with no evidence whatsoever to support the allegation.

17 **Q. Is there evidence that the concern about undocumented station**
18 **changes cited in Dr. Won's paper is not even applicable to Mr. Dutcher's**
19 **methodology?**

20 A. Yes. Mr. Dutcher will also respond to this point, but it bears repeating in
21 my testimony as it is a serious flaw in Dr. Won's criticism of the Company's adjustment.
22 The paper by Menne and Williams that Dr. Won draws his argument from states
23 specifically in the very first sentence of the abstract that it discusses a method for
24 developing an **automated algorithm** for calculating adjustments. This means that the
25 process developed by the National Oceanic and Atmospheric Association ("NOAA") is a
26 computer program that has data dumped into it, which spits out results that are considered

1 properly adjusted with no direct review of the calculations by any human. This is in stark
2 contrast to the many man hours of direct inspection by a trained climatologist that were
3 spent to come up with the calculation of the Company's (and Staff's in prior cases)
4 adjustment. It makes perfect sense that the computer program would have an easier time
5 dealing with documented station changes, where the date of the change event can be
6 input into the program, than undocumented events. Mr. Dutcher, however, can identify
7 undocumented changes due to his expertise and the time he invests in the process.
8 Dr. Won seems to believe that NOAA's process is a superior process. However, he
9 ignores the very real and significant constraint that NOAA is faced with. That is the fact
10 that, because of the huge number of stations that NOAA must run this process on, they
11 simply don't have the resources for manual inspection of the data. Given that constraint,
12 NOAA's process makes sense. However, we are fortunate to have the option of choosing
13 an adjustment that was calculated without the necessity of relying solely on a computer
14 algorithm. This fact, coupled with the other evidence Mr. Dutcher has provided on the
15 strengths of his approach and his concerns with NOAA's approach, are compelling
16 reasons to adopt the Company's proposed adjustments.

17 **Q. Dr. Won points out that the Company was unable to provide**
18 **electronic copies of the analysis from Case No. EM-96-149. Should this be a concern**
19 **when it comes to using the analysis from that case?**

20 A. No. In fact, the Company did provide the data requested by Dr. Won.
21 The only thing the Company was unable to do is provide it in the format Dr. Won would
22 have liked. The data request cited by Dr. Won, in which the Company is quoted as
23 saying the requested data is not available, was a follow-up data request asking for the

1 same data that had already been provided in hard copy graphical format in a response to a
2 previous data request. It is not surprising that a particular electronic file might be
3 difficult to locate after many years. The hard copies of the analysis provided in response
4 to the original data request should be sufficient to demonstrate the basis of the
5 calculation. Also, it is clear that Staff fully participated in and vetted the adjustments at
6 the time of the original analysis, especially given the fact that the climatologist hired by
7 Staff participated in and concurred with the analysis. This fact alone suggests that Staff
8 should have had its own access to whatever electronic files existed. As stated earlier,
9 Staff has consistently used this adjustment in over a decade of rate cases. Presumably
10 this would not have been the case if Staff had not been sufficiently comfortable that the
11 original calculation was valid. Producing an electronic version of a 13-year-old
12 spreadsheet versus a hard copy of the same analysis should not be a pre-condition for
13 continued reliance on the collaborative work that resulted in the adjustments that have
14 been deemed to be just and reasonable for more than a decade.

15 **Q. Dr. Won attempted to replicate the analysis that resulted in the**
16 **original adjustments. Should this effort be a basis for now re-writing weather**
17 **history at Lambert Field from what has been used in the last several rate cases?**

18 **A.** No. Mr. Dutcher will outline specific concerns with Dr. Won's analysis in
19 his surrebuttal testimony. Mr. Dutcher also provided his own re-analysis of the 1996
20 event in rebuttal testimony using the Staff's data. However, it should be pointed out that
21 there was nothing precluding Staff from re-doing the Double Mass analysis at any time in
22 the past decade. The change in the Lambert Field readings in question occurred in 1996,
23 and the raw temperature data has been unaltered for all of these years. In addition,

1 NOAA has had its own analysis available for nearly a decade. Nothing has changed in
2 this case that would cause a need for a re-analysis of the 1996 weather adjustment.
3 Again, it is troubling that Dr. Won raises all of these concerns in this case when Staff,
4 including Dr. Won himself for part of the time, used the Case No. EM-96-149 adjustment
5 for over a decade without questioning it.

6 **Q. Are there any other observations that you would make regarding**
7 **Dr. Won's attempt to recreate the Double Mass analysis?**

8 A. Yes. It is clear that despite the shortcomings in Dr. Won's analysis
9 pointed out by Mr. Dutcher, the concept of Double Mass analysis is transparent enough
10 that he was able to put together a reasonable attempt at replicating the analysis from Case
11 No. EM-96-149 on his own. The same cannot be said of NOAA's calculations. In a data
12 request response in which the Company requested copies of correspondence between
13 NOAA and Staff, there was an exchange in which Dr. Won expressed to NOAA his need
14 to replicate their analysis for purposes of this case. In an email sent to NCDC on
15 January 5, 2012, Dr. Won states:

16 To justify using your serially-complete monthly temperature, we
17 respectfully ask the detail information of the comprehensive procedure of
18 your homogenization with a full data set including temperature data of
19 reference weather stations of St. Louis Lambert International Airport
20 (Station Number: 72434). The information will be used for replicating
21 your serially-complete monthly temperature and for producing the MPSC
22 staff testimony.

23
24 Dr. Won renewed his request on January 12, 2012, in an email to the same NCDC
25 personnel:

26 For our analysis of normal utility usage in the area, we need to be able to
27 replicate the 30-year-normals from the observations. We have found
28 papers with verbal descriptions of the process used by NOAA in
29 computing the new 30-year-normals but not the exact mathematical

1 formulas for making the calculations. Previously, NOAA always
2 published its methodologies for calculating and making adjustments to the
3 30-year normals time series.
4

5 Despite the urgency of his requests, Dr. Won was not able to determine the exact
6 mathematical formulas used by NCDC. In fact, during his deposition, Dr. Won
7 acknowledged that he was unable to replicate NOAA's analysis, and in fact stated that it
8 was impossible for him to do so.

9 Q. Okay. Did you attempt to duplicate NOAA's analysis where
10 they took the 40 stations and did the correlation?
11

12 A. The first time, I attempt. And after communication with
13 NCDC climatologists, we understand it is impossible.³
14

15 Clearly there is a lack of transparency into NOAA's methodology when it was
16 literally impossible for Dr. Won, someone with a doctoral degree in mathematics, to
17 replicate. Double Mass analysis is a far more transparent and understandable process.

18 **Q. Dr. Won points out in his rebuttal testimony that, in response to his**
19 **data request, you provided methodology documentation that included analysis of six**
20 **weather stations, but you only used two stations. He criticizes the choice of two**
21 **stations you used and indicates there is no justification for using them. How do you**
22 **respond?**

23 A. Hopefully at this point it is crystal clear that I did not do my own analysis
24 of the weather stations, but used the *exact same adjustment values that have been used by*
25 *both the Company and Staff for over a decade*. The reason that there were six stations in
26 the methodology document is that the Company's original analysis in Case No.
27 EM-96-149 was based on the use of six stations. The final adjustment agreed to in that

³ Won deposition, August 6, 2012, p. 55, l. 5-10.

1 case (and every case since) by both Staff and the Company relied on the two stations
2 Dr. Won mentions. That is the analysis that I used for this case as well. Dr. Won's
3 search for justification of the stations used in my analysis needs to go no further than to
4 look at the large amount of evidence compiled over time by both parties in numerous
5 Company rate cases. It is his adjustments that in fact remain unjustified and unexplained.

6 **Q. Dr. Won criticizes your work because it did not include consideration**
7 **of a 2002 elevation change at Lambert Field. Please respond.**

8 A. The 2002 change occurred after the Case No. EM-96-149 agreement and
9 therefore had not been considered by either party until this case. Upon hearing of this
10 change, the Company asked Mr. Dutcher to perform an analysis of Lambert Field
11 temperature readings from that time period. My rebuttal testimony recommends adoption
12 of Mr. Dutcher's analysis of the 2002 change and, therefore, Dr. Won's concern regarding
13 the 2002 change should be alleviated. It should be noted that in his rebuttal testimony
14 Mr. Dutcher reported preliminary results for the 2002 change due to time constraints in
15 developing the full analysis. In his surrebuttal testimony he gives his final recommended
16 adjustment for 2002, and I similarly recommend adoption of this final calculation.
17 Weather normalized sales based upon the calculation are attached as Schedule
18 SMW-ES9.

19 **Q. Dr. Won suggests that use of NOAA's normals will help ensure**
20 **consistency across utilities that the Missouri Public Service Commission regulates.**
21 **What is your response to this contention?**

22 A. The desire for *consistency* should not trump the desire for *accuracy*. The
23 Commission should first seek to "get it right." Using the adjustments from the Case No.

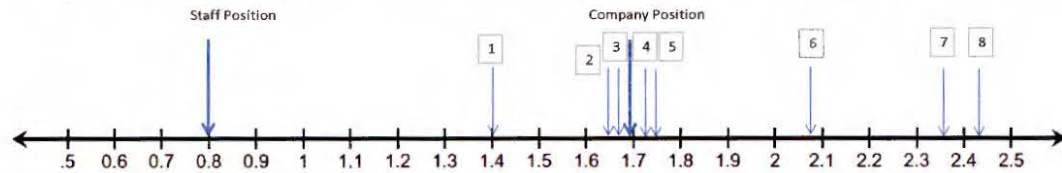
1 EM-96-149 agreement would in fact promote both accuracy and consistency across time
2 in Ameren Missouri's rate cases, as they have been used for over a decade of rate cases.
3 An appropriate Commission standard would be to consistently use the best available
4 weather data. In some cases, where a robust analysis of the specific station in question is
5 not available, using NOAA's numbers may be a reasonable approach. In a case such as
6 this where a demonstrably superior analysis is available, the Commission should use that
7 analysis.

8 **Q. Dr. Won presents Schedule SJW-R1 at the end of his testimony, which**
9 **summarizes the results of all of his Double Mass analyses, along with the analysis**
10 **from the Case No. EM-96-149 agreement. What conclusions can you draw from this**
11 **schedule?**

12 A. I would start by pointing out that, for the reasons highlighted by
13 Mr. Dutcher throughout his testimony in this case, Mr. Dutcher's analysis is the most
14 appropriate to determine the most accurate temperature adjustments. However,
15 considering all of the work that went into this analysis by both parties, there is one very
16 clear conclusion - the adjustment Staff is proposing to use for the 1996 Lambert Field
17 change is a clear outlier. See Figure 1 below to see a graphical representation of the
18 various Double Mass analyses presented in this case by Staff (including the original
19 double mass analysis from Case No. EM-96-149). It is clear from this graphic that the
20 Company's position is squarely in the middle of the various estimates of the impact of the
21 Lambert Field ASOS temperature sensor change that have been calculated by the parties.
22 Staff's position is that the adjustment should be a full 0.6 degrees less than the lowest

- 1 estimate presented in this case based on any analysis in this docket that has been fully
- 2 replicated and clearly explained (i.e. double mass analysis).

Figure 1: Staff and Company Analysis of Magnitude of 1996 Lambert Field ASOS Temperature Sensor Change



1	1.4	Staff Double Mass - Science Center 4 Year Analysis
2	1.65	EM-96-149 Double Mass - Science Center 4 Year Analysis
3	1.67	Staff Double Mass - St. Charles 4 Year Analysis
4	1.73	EM-96-149 Double Mass - St. Charles 4 Year Analysis
5	1.74	Staff Double Mass - St. Charles 6 Month Analysis
6	2.08	Staff Double Mass - St. Charles 7 SSW 6 Month Analysis
7	2.36	Staff Double Mass - Science Center 6 Month Analysis
8	2.43	Staff Double Mass - St. Charles 7 SSW 4 Year Analysis
Average		1.88
Company Position		1.69
Staff Position		0.8

- 3
- 4 Although Dr. Won has presented concerns regarding Double Mass analysis
- 5 relating to the potential for impacts on the analysis from undocumented station changes
- 6 and the time period selected for the analysis, those concerns should be fully addressed by
- 7 the range of estimates in Figure 1, which are based on comparisons with three different
- 8 reference stations and two different time periods of analysis. If any one of the stations
- 9 has an undocumented change, then the other two stations can still provide reliable
- 10 estimates of the change. And for each station, Staff ran the analysis on a six month and
- 11 four year window so that any biases due to time period selection will not impact both sets
- 12 of analyses. At the end of the day, NOAA's adjustment is fully 0.6 degrees below the
- 13 lowest adjustment suggested by the various combinations of stations and analysis periods.
- 14 While Mr. Dutcher's expert opinion should be given the greatest weight in determining

1 the appropriate analysis to rely on, the range established by the various iterations of
2 Staff's analysis supports the reasonableness of the adjustment adopted by the Company.

3 This graphic also serves to clearly illustrate just how far removed the NOAA
4 analysis is from that reasonable range. It is interesting to note that NOAA's adjustment is
5 very close to the Company's for minimum temperature and would fit squarely within the
6 range established by Double Mass analysis. However, NOAA includes no adjustment for
7 maximum temperature. The lack of adjustment to the maximum temperature (which is
8 illogical) likely causes NOAA's calculation to be a significant outlier when compared to a
9 range of estimates from double mass analysis.

10 **Q. Is there any evidence from outside the regulated utility world that you**
11 **can provide to demonstrate the accuracy of Mr. Dutcher's methodology relative to**
12 **NOAA's?**

13 A. Yes. The methodology used by Mr. Dutcher is advocated in a book used
14 in the financial industry for valuing weather derivatives. Weather derivatives, as the
15 name implies, are financial instruments that derive their value from underlying weather
16 events. Valuation of these instruments relies on analysis of historical weather data. The
17 book "Weather Derivative Valuation: The Meteorological, Statistical, Financial, and
18 Mathematical Foundations"⁴ discusses the issue of adjusting historical temperature data
19 used in this valuation for station changes. The issue is exactly the same as what we are
20 faced with in a rate case. Future outcomes with financial ramifications for multiple
21 parties are based on analysis using historical weather data. That data must be adjusted so
22 that it appropriately represents the weather conditions that will be experienced when the

⁴ Weather Derivative Valuation: The Meteorological, Statistical, Financial, and Mathematical Foundations, Jewson, Brix, and Ziehman, 2005, Cambridge University Press.

1 contract is settled. The parties to these contracts are sophisticated financial institutions
2 that have a powerful financial incentive to make sure that these adjustments are as
3 accurate as possible. The book describes the appropriate methodology to use in making
4 such adjustments as follows:

5 The testing and estimation procedures used for estimating the size of
6 jumps are usually based on an analysis of the linear dependences between
7 the target station and surrounding stations. Data from the surrounding
8 stations can then be used to replicate the target station using regression,
9 and a difference time series produced by subtracting the replica time series
10 from the actual. Any jumps in the original time series show up clearly in
11 this difference time series, and can be identified visually or using
12 statistical tests.⁵

13
14 This description is remarkably similar to the methodology used by Mr. Dutcher.
15 Notably, the text never suggests checking with NOAA to see if they have adjusted the
16 data for discontinuities (or “jumps” as the text describes them). The reliance on this
17 methodology by sophisticated financial institutions that have significant resources
18 devoted to protecting their investments by accurately valuing them is another strong
19 indicator that this methodology is credible and robust.

20 **Q. Can you please summarize the Company's position on the appropriate**
21 **adjustment that the Commission should adopt for historical Lambert Field**
22 **temperatures in this case?**

23 A. Yes. The Commission should adopt the adjustments to the Lambert Field
24 temperatures in 1988, 1996, and 2002 sponsored by the Company in this case. There are
25 at least four key reasons for this:

26 1. The adjustments proposed by the Company are consistent with adjustments
27 recommended by the Company, Staff, and adopted by the Commission to set

⁵ Id., p.41.

1 Ameren Missouri's rates for over a decade. Nothing has changed over that
2 time that would render the temperature data relied upon for this entire time
3 as suddenly unreliable.

4 2. NOAA clearly developed its methodology constrained by the need to
5 automate this calculation for thousands of weather stations, which
6 compromised the accuracy of the adjustments for the Lambert Field station.
7 That constraint was not present for the Company's analysis, and the full
8 attention of an experienced climatologist renders this analysis superior.

9 3. NOAA's adjustment has the illogical and highly improbable result of
10 identifying a change in minimum temperature for three separate station
11 changes, but no change in maximum temperature. Given the physical
12 changes in equipment and location of the station, this just isn't realistic. The
13 Company's analysis shows reasonable adjustments for both minimum and
14 maximum temperatures for all three events.

15 4. Staff's own Double Mass analysis clearly demonstrates that their own
16 position (using NOAA's 1996 adjustment) is outside of a reasonable range
17 based on analysis against various reference stations and over various periods
18 of time.

19 Based on the large amount of evidence supporting the Company's calculations,
20 there is absolutely no compelling reason to change from the long-standing practice for
21 adjusting Lambert Field temperatures that have been used in Ameren Missouri rate cases
22 for years.

Surrebuttal Testimony of
Steven M. Wills

- 1 **Q. Does this conclude your surrebuttal testimony?**
- 2 A. Yes, it does.

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

In the Matter of Union Electric Company)
d/b/a Ameren Missouri's Tariffs to)
Increase Its Revenues for Electric Service.) Case No. ER-2012-0166

AFFIDAVIT OF STEVEN M. WILLS

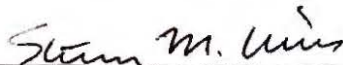
STATE OF MISSOURI)
) ss
CITY OF ST. LOUIS)

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 a Managing Supervisor of the Quantitative Analytics group.

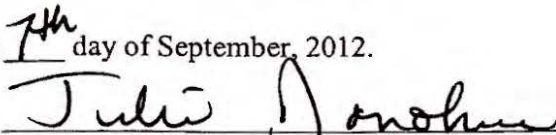
2. Attached hereto and made a part hereof for all purposes is my surrebuttal testimony on behalf of Union Electric Company d/b/a Ameren Missouri consisting of 15 pages, and Schedule(s) SMW-ES9, all of which have been prepared in written form for introduction into evidence in the above-referenced docket.

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 7th day of September, 2012.



Notary Public

My commission expires:



Ameren Missouri - Residential Test Year Sales (kWh) - Revenue Month			
Month	Actual	Normal	Ratio
2	1,433,678,742	1,404,933,014	98.0%
3	1,095,005,472	1,118,038,066	102.1%
4	908,611,572	935,026,499	102.9%
5	798,778,804	792,435,343	99.2%
6	1,121,930,188	997,145,467	88.9%
7	1,443,119,939	1,243,148,347	86.1%
8	1,650,096,035	1,417,192,620	85.9%
9	1,262,058,762	1,148,551,169	91.0%
10	746,942,356	779,363,740	104.3%
11	798,752,905	837,322,810	104.8%
12	1,132,554,290	1,260,027,270	111.3%
1	1,362,948,524	1,532,295,072	112.4%
Total	13,754,477,589	13,465,479,417	97.9%

Ameren Missouri - Small General Service Test Year Sales (kWh) - Revenue Month			
Month	Actual	Normal	Ratio
2	322,070,100	317,660,632	98.6%
3	276,605,259	279,387,061	101.0%
4	254,519,563	258,531,905	101.6%
5	248,352,183	247,965,646	99.8%
6	294,263,195	280,546,543	95.3%
7	339,720,267	315,689,801	92.9%
8	367,179,686	337,341,340	91.9%
9	321,045,214	306,661,466	95.5%
10	249,520,215	253,761,300	101.7%
11	245,614,791	248,122,592	101.0%
12	280,975,109	297,930,059	106.0%
1	314,959,856	339,603,750	107.8%
Total	3,514,825,438	3,483,202,095	99.1%

Ameren Missouri - Large General Service Test Year Sales (kWh) - Revenue Month			
Month	Actual	Normal	Ratio
2	669,510,963	662,301,512	98.9%
3	620,435,085	625,646,813	100.8%
4	608,734,172	611,197,825	100.4%
5	628,768,136	625,960,410	99.6%
6	713,769,140	691,380,552	96.9%
7	773,570,461	731,387,108	94.5%
8	829,566,664	779,622,663	94.0%
9	765,754,461	740,894,895	96.8%
10	636,212,028	643,689,791	101.2%
11	611,906,142	613,283,994	100.2%
12	643,026,618	668,464,154	104.0%
1	683,361,872	728,363,368	106.6%
Total	8,184,615,742	8,122,193,085	99.2%

Ameren Missouri - Small Primary Service Test Year Sales (kWh) - Revenue Month			
Month	Actual	Normal	Ratio
2	297,825,183	297,749,560	100.0%
3	275,780,910	275,611,403	99.9%
4	273,433,501	272,615,620	99.7%
5	304,245,771	302,653,575	99.5%
6	320,453,711	314,662,927	98.2%
7	336,386,565	324,587,492	96.5%
8	353,230,426	337,678,378	95.6%
9	355,784,727	347,915,401	97.8%
10	298,968,027	300,115,618	100.4%
11	277,237,740	275,584,717	99.4%
12	288,224,875	288,706,540	100.2%
1	304,961,923	308,684,057	101.2%
Total	3,686,533,359	3,646,565,288	98.9%

Ameren Missouri - Large Primary Service Test Year Sales (kWh) - Revenue Month			
Month	Actual	Normal	Ratio
2	275,721,397	276,466,766	100.3%
3	270,852,633	269,782,255	99.6%
4	321,365,937	319,782,899	99.5%
5	298,464,920	296,131,342	99.2%
6	339,330,297	336,189,489	99.1%
7	347,904,912	340,793,873	98.0%
8	352,165,433	341,983,665	97.1%
9	376,752,043	371,056,703	98.5%
10	327,247,832	329,143,330	100.6%
11	307,257,946	305,460,042	99.4%
12	309,530,619	307,913,792	99.5%
1	297,321,806	296,985,299	99.9%
Total	3,823,915,775	3,791,689,456	99.2%