

Exhibit No.:

Issues: Jurisdictional  
Allocations/  
System Energy  
Losses

Witness: Alan J. Bax

Sponsoring Party: MoPSC Staff

Type of Exhibit: Direct Testimony

Case No.: ER-2002-424

Date Testimony Prepared: August 22, 2002

**MISSOURI PUBLIC SERVICE COMMISSION**

**UTILITY OPERATIONS DIVISION**

**DIRECT TESTIMONY**

**OF**

**ALAN J. BAX**

**THE EMPIRE DISTRICT ELECTRIC  
COMPANY**

**CASE NO. ER-2002-424**

Jefferson City, Missouri  
August, 2002

**\*\*Denotes Proprietary Information\*\***

**NP**

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

IN THE MATTER OF THE EMPIRE )  
DISTRICT ELECTRIC COMPANY OF )  
JOPLIN, MISSOURI FOR AUTHORITY )  
TO FILE TARIFFS INCREASING )  
RATES FOR ELECTRIC SERVICE )  
PROVIDED TO CUSTOMERS IN THE )  
MISSOURI SERVICE AREA OF THE )  
COMPANY )

Case No. ER-2002-424

**AFFIDAVIT OF ALAN J. BAX**

STATE OF MISSOURI )  
 ) ss  
COUNTY OF COLE )

Alan J. Bax, of lawful age, on his oath states: that he has participated in the preparation of the following written testimony in question and answer form, consisting of 12 pages of testimony to be presented in the above case, that the answers in the attached written testimony were given by him; that he has knowledge of the matters set forth in such answers; and that such matters are true to the best of his knowledge and belief.

  
\_\_\_\_\_  
Alan J. Bax

Subscribed and sworn to before me this 21<sup>st</sup> day of August, 2002.

My commission expires \_\_\_\_\_  
DAWN L. HAKE  
Notary Public - State of Missouri  
County of Cole  
My Commission Expires Jan 9, 2005

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

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1 Q. Are you a member of any professional organizations?

2 A. Yes, I am a member of the Institute of Electrical and Electronic Engineers  
3 (IEEE).

4 Q. Have you previously filed testimony before the Commission?

5 A. Yes. I filed testimony on jurisdictional allocations and system energy  
6 losses in the most recent electric rate case involving the Aquila Networks-MPS division  
7 of Aquila, Inc., formerly known as Missouri Public Service, a division of Utilicorp  
8 United, Inc. (Case No. ER-2001-672) and the complaint case involving Union Electric  
9 Company d/b/a AmerenUE (Case No. EC-2002-1). In addition, I filed true-up testimony  
10 concerning jurisdictional allocations in the most recent electric rate case involving  
11 Empire (Case No. ER-2001-299).

12 Q. What is the purpose of your testimony?

13 A. The purpose of this testimony is to recommend that the Commission adopt  
14 the system energy loss factor and the jurisdictional allocation factors for demand and  
15 energy that I calculated for Empire as shown on Schedules 1, 6, and 7 respectively,  
16 attached to this direct testimony. My testimony also describes how I determined these  
17 factors.

18 **SYSTEM ENERGY LOSSES**

19 Q. What is the result of your system energy loss factor calculation?

20 A. As shown on Schedule 1 attached to this direct testimony, I have  
21 calculated the system energy loss factor to be \*\* P-----\*\* of Net System Input (NSI).

22 Q. What are system energy losses?

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1           A.     System energy losses are the energy losses that occur in the electrical  
2 equipment (e.g., transmission and distribution lines, transformers, etc.) in Empire's  
3 system between the generating sources and the customers' meters.

4           Q.     How are system energy losses determined?

5           A.     The basis for this calculation is that NSI equals the sum of "Total Sales,"  
6 "Company Use," and "System Energy Losses." This can be expressed mathematically  
7 as:

$$\text{NSI} = \text{Total Sales} + \text{Company Use} + \text{System Energy Losses}$$

9 NSI, Company Use and Total Sales are known; therefore, system energy losses may be  
10 calculated as follows:

$$\text{System Energy Losses} = \text{NSI} - \text{Total Sales} - \text{Company Use}$$

12 The system energy loss factor is the ratio of system energy losses to NSI:

$$\text{System Energy Loss Factor} = (\text{System Energy Losses}/\text{NSI})$$

14           Q.     How is NSI determined?

15           A.     In addition to the equation above, NSI is also equal to the sum of Empire's  
16 net generation and net interchange (the latter being the net of off-system purchases and  
17 sales). Net generation is the total energy output of each generating station minus the  
18 energy consumed internally to enable its production. The net output of each generating  
19 station is monitored continuously, as is the net of off-system purchases and sales. I  
20 obtained this information from data supplied by Empire in response to Staff Data Request  
21 Nos. 2903, 2908, 2912, 2913 and 2923.

22           Q.     What are Total Sales and Company Use and how are these values  
23 determined?

1           A.     Total Sales includes all of Empire's retail and wholesale sales within its  
2 system. Company Use is the electricity consumed at Empire's non-generation facilities,  
3 such as its corporate office building at 620 Joplin Street. Total Sales data was provided  
4 by Empire in response to Staff Data Request Nos. 2910 and 2923. Company Use data  
5 was provided by Empire in response to Staff Data Request Nos. 2911 and 2923.

6           Q.     Which Staff witness used your calculated system energy loss factor?

7           A.     I provided my calculated system energy loss factor to Staff witness  
8 Richard J. Campbell.

9           **JURISDICTIONAL ALLOCATIONS**

10  
11          Q.     Please define the phrase "jurisdictional allocation".

12          A.     For purposes of my testimony, jurisdictional allocation refers to the  
13 process by which demand-related and energy-related costs are allocated to the applicable  
14 jurisdictions. In the case of Empire, demand-related and energy-related costs are divided  
15 among six jurisdictions: retail operations in the states of Missouri, Kansas, Arkansas, and  
16 Oklahoma and wholesale operations in the states of Missouri and Kansas. The  
17 application of a particular allocation factor is dependent upon the types of costs being  
18 allocated.

19          **DEMAND ALLOCATION FACTOR**

20          Q.     What is the definition of demand?

21          A.     Demand refers to the rate at which electric energy is delivered to or by a  
22 system, generally expressed in kilowatts or megawatts, either at an instant in time or  
23 averaged over any designated interval of time. In my analyses, I used hourly demands.

1 Q. What types of costs are allocated on the basis of demand?

2 A. Capital costs associated with generation and transmission plant and certain  
3 operational and maintenance expenses are allocated on this basis. This is appropriate  
4 because generation and transmission are planned, designed and constructed to meet the  
5 anticipated demand.

6 Q. What methodology did you use to determine the demand allocators?

7 A. I used what is known as the Twelve Coincident Peak (12 CP)  
8 methodology.

9 Q. What is meant by “coincident peak”?

10 A. The term coincident peak refers to the load in megawatts (MWs) in each  
11 of the six jurisdictions that coincides with the hour of Empire’s overall system peak. In  
12 this case, the recorded coincident peak for each month in the test period was used to  
13 determine the allocation factor.

14 Q. Why use peak demand as the basis for allocations?

15 A. Peak demand is the largest electric load requirement occurring within a  
16 specified period of time on a utility’s system (e.g., day, month, season, year). In addition,  
17 for planning purposes, an amount must be included for meeting required contingency  
18 reserves. Since generation units and transmission lines are planned, designed, and  
19 constructed, in part, to meet a utility’s anticipated system peak demands plus required  
20 reserves, the contribution of each individual jurisdiction to these peak demands is an  
21 appropriate basis on which to allocate the costs of these facilities.

22 Q. Please describe the procedure for calculating the jurisdictional demand  
23 allocation factors using the 12 CP methodology.



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1           A.     The allocation factor for each jurisdiction was determined using the  
2 following process:

- 3           1.     Identify Empire's peak hourly load in each month for the twelve month  
4                 period July 2001 through June 2002 and sum the hourly peak loads.
- 5           2.     Sum the particular jurisdiction's corresponding loads for the hours  
6                 identified in #1 above.
- 7           3.     Divide #2 above by #1 above.

8  
9  
10  
11           The result is the allocation factor for the particular jurisdiction. The sum of the  
12 demand allocation factors across all jurisdictions equals one.

13           Q.     How was the decision made to recommend using the 12 CP method?

14           A.     The 12 CP method is appropriate for a utility, such as Empire, that  
15 experiences relatively small variations in monthly and/or seasonal (e.g., summer and  
16 winter) peaks during a particular year. Schedule 2 attached to this direct testimony  
17 presents a table of Empire's maximum hourly peak in each month for calendar years  
18 1997 through 2001, and for the twelve-month period ending June 2002. This information  
19 was taken from FERC Form 1, and from data provided by Empire in response to Staff  
20 Data Request No. 2921 in this case and Staff Data Request No. 2918 in Case No.  
21 ER-2001-299. As shown, Empire experiences its highest system peak during the summer  
22 months (July, August, and September); however, a relatively high system peak also  
23 occurs during the winter months (December and/or January).

24           The line graph on Schedule 3 attached to this direct testimony represents a load  
25 profile of each month's hourly peak as a percentage of its corresponding annual  
26 maximum hourly peak for calendar years 1997 through 2001, for the monthly averages of  
27 these five-years, and for the twelve-month period ending June 2002. It was derived from

1 the data shown in Schedule 2. This indicates relatively high peaks in both the summer  
2 and the winter.

3 Q. Is there additional support for the position that a 12 CP methodology is  
4 appropriate in this case?

5 A. Yes. In various cases, the FERC has, among other things, used a number  
6 of tests as a guide in its determination of an appropriate allocation methodology. These  
7 tests are arithmetical calculations whose results are compared to specific ranges that  
8 suggest which methodology may be more appropriate. Attached to my testimony as  
9 Schedule 4 is an excerpt (Chapter 5) from a publication entitled A Guide to FERC  
10 Regulation and Ratemaking of Electric Utilities and Other Power Suppliers, Third  
11 Edition (1994), authored by Michael E. Small. As this excerpt shows, FERC has used  
12 these tests to support its adoption of a 12 CP methodology in a number of cases. On  
13 occasion, however, these tests have suggested that an alternative coincident peak  
14 methodology (such as a 4 CP) might be more appropriate.

15 Q. Please illustrate these arithmetical relationships and define these specific  
16 range of percentages for both a 12 CP and a 4 CP methodology.

17 A. Test 1 - Computes the difference between the following two ratios:

18 a) The average of the system peaks during the reported peak period as a  
19 percentage of the annual peak, and

20 b) The average of the system peaks during the remainder of the test period  
21 as a percentage of the annual peak

22 The resultant percentage is compared to the following ranges:

1                   18% - 19% - Reflected in cases in which FERC adopted a 12 CP  
2                   methodology

3                   26% - 31% - Reflected in cases in which FERC adopted a 4 CP  
4                   methodology

5                   Test 2 - A ratio of the average of the twelve monthly peaks in the  
6                   reporting period to the annual peak

7                   The resultant percentage is compared to the following ranges:

8                   81% - 88% - Reflected in cases in which FERC adopted a 12 CP  
9                   methodology

10                  78% - 81% - Reflected in cases in which FERC adopted a 4 CP  
11                  methodology

12                  Test 3 - A ratio of the lowest monthly peak to the annual peak.

13                  The resultant percentage is compared to the following ranges:

14                  66% - 81% - Reflected in cases in which FERC adopted a 12 CP  
15                  methodology.

16                  55% - 60% - Reflected in cases in which FERC adopted a 4 CP  
17                  methodology.

18                  Q.     Did you apply these FERC tests to Empire's data?

19                  A.     Yes. As illustrated on Schedule 5, I calculated the following percentages  
20                  using the demands recorded for the twelve-month period ending June 30, 2002:

21                         Test 1 -17.15%

22                         Test 2 -82.85%

23                         Test 3 -61.74%

1 Q. Please discuss the significance of these results.

2 A. The result of the first test falls below the above-indicated 18-19% range  
3 noted in the FERC decisions adopting a 12 CP methodology. Since a higher percentage  
4 suggests the use of a smaller number of coincident peaks, my calculated lower percentage  
5 only adds further support to my recommendation that a 12 CP methodology be adopted in  
6 the current case. The result of the second test falls within the 81-88% range noted in  
7 FERC decisions adopting a 12 CP methodology. The result of the third test leans toward  
8 the 55-60% range suggesting a 4 CP. Overall, however, the test results support a 12 CP  
9 methodology.

10 Q. Are there any other factors to consider in determining the appropriate  
11 allocation methodology?

12 A. Yes. These FERC tests are merely part of a larger set of factors  
13 historically utilized by the FERC in its determination of which coincident peak  
14 methodology should be used in electric utility cases. In a rate case decision involving  
15 Carolina Power and Light Company<sup>1</sup>, for example, the FERC states: "...it is necessary to  
16 consider the full range of a company's operating realities including, in addition to system  
17 demand, scheduled maintenance, unscheduled outages, diversity, reserve requirements,  
18 and off-system sales commitments" (footnote omitted). In the adoption of the 12 CP  
19 methodology, FERC has cited these operating realities as important to their  
20 determination.

21 Q. How do these operational realities apply to Empire?

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<sup>1</sup> *Carolina Power & Light Co.*, Opinion No. 19, 4 FERC ¶61,107 at 61,230 (Aug. 1978).

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A. There are periods of time, typically in the spring or fall, when the usage level of the Company's native load customers is reduced. At such times, the Company is able either to perform necessary maintenance on its power plants or to pursue off-system sales, while retaining sufficient capacity to adequately meet its customers' requirements. These activities have the effect of reducing the variability in the monthly peaks. Furthermore, the Company's capacity planning process takes into account all the hours of the year, not just the peak hour or any seasonal peak. These operational realities, along with the test results and aforementioned analysis, provide ample evidence to support Staff's recommendation to adopt a 12 CP methodology in the current proceeding.

Q. Did the Company incorporate the 12 CP methodology in its filing of this rate case?

A. Yes.

Q. What are the results of your calculations?

A. As shown on Schedule 6 attached to this direct testimony, the calculated demand jurisdictional allocation factors for the updated test year are as follows:

Missouri Retail \*\* P-----\*\*

Kansas Retail \*\* P-----\*\*

Oklahoma Retail \*\* P-----\*\*

Arkansas Retail \*\* P-----\*\*

Missouri Wholesale \*\* P-----\*\*

Kansas Wholesale                                                 \*\* P-----\*\*

Q. Which Staff witness used your jurisdictional demand allocation factors?

1           A.     I provided these jurisdictional demand allocation factors to Staff witness  
2 Phil Williams.

3 **ENERGY ALLOCATION FACTOR**

4           Q.     What types of costs were allocated on the basis of energy?

5           A.     Variable expenses, such as fuel and certain operational and maintenance  
6 (O&M) costs, are allocated to the jurisdictions based on energy consumption.

7           Q.     How did you calculate the energy allocation factor?

8           A.     The energy allocation factor for an individual jurisdiction is the ratio of  
9 the normalized annual kilowatt-hour (kWh) usage in the particular jurisdiction to the total  
10 normalized Empire kWh usage. The sum of the energy allocation factors across  
11 jurisdictions equals one. The actual jurisdictional kWh usage totals were provided in the  
12 Company response to Staff Data Request No. 2910.

13          Q.     What adjustments were made to these recorded kWhs?

14          A.     The Staff made the following adjustments to be consistent with the net  
15 system hourly loads used in determining normalized fuel costs:

16           a.     Annualization Adjustment

17           b.     Normalization Adjustment

18           c.     Customer Growth Adjustment

19           d.     Wholesale Weather Adjustment

20          Q.     Did you calculate these adjustments?

21          A.     No. Staff witness Janice Pyatte supplied adjustments a. through c. for the  
22 Missouri Retail usage. Please refer to Ms. Pyatte's testimony for a description of these  
23 adjustments. Staff witness Richard J. Campbell provided me with the normal weather

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adjustment that I applied to the Missouri Wholesale jurisdiction. Please see Mr. Campbell's testimony for a description of how this adjustment was calculated.

Q. What are the calculated energy allocation factors in this case?

A. The factors are shown in Schedule 7 and repeated here.

Missouri Retail	** P-----**
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Kansas Retail	** P-----**
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Oklahoma Retail	** P-----**
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Arkansas Retail	** P-----**
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Missouri Wholesale	** P-----**
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Kansas Wholesale	** P-----**
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Q. Which Staff witness used your jurisdictional energy allocation factors?

A. I provided these jurisdictional energy allocation factors to Staff witness

Phil Williams.

Q. Does this conclude your prepared direct testimony?

A. Yes, it does.