MISSOURI PUBLIC SERVICE COMMISSION

UTILITY OPERATIONS DIVISION

DIRECT TESTIMONY

OF

ALAN J. BAX

FILED[2]

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Missouri Public
Service Commission

AQUILA, INC.
D/B/A AQUILA NETWORKS--MPS

CASE NO. ER-2004-0034

Jefferson City, Missouri
December 2003

BEFORE THE PUBLIC SERVICE COMMISSION

OF THE STATE OF MISSOURI

In The Matter Of Aquila, Inc. D/B/A Aquila)
Networks L&P And Aquila Networks MPS) Case No. ER-2004-0034
To Implement A General Rate Increase In)
Electricity)

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 Direct Testimony, as modified, in question and answer form, consisting of ___ pages of Direct Testimony to be presented in the above case, that the answers in the attached written Direct 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 ___ day of February, 2004.

_____
Notary Public

DAWN L. HAKE
Notary Public – State of Missouri
County of Cole
My Commission Expires Jan 9, 2005

My commission expires_____

TABLE OF CONTENTS

DIRECT TESTIMONY

OF

ALAN J. BAX

AQUILA, INC.

D/B/A AQUILA NETWORKS-MPS

CASE NO. ER-2004-0034

Q.   Please state your name and business address?

A.   Alan J. Bax, P.O. Box 360, Jefferson City, Missouri, 65102.

Q.   By whom are you employed and in what capacity?

A.   I am employed by the Missouri Public Service Commission (Commission) as a Utility Engineering Specialist III in the Energy Department of the Utility Operations Division.

Q.   Please describe your educational and work background.

A.   I graduated from the University of Missouri - Columbia with a Bachelor of Science degree in Electrical Engineering in December 1995. Concurrent with my studies, I was employed as an Engineering Assistant in the Energy Management Department of the University of Missouri – Columbia from the Fall of 1992 through the Fall of 1995. Prior to this, I completed a tour of duty in the United States Navy, completing a course of study at the Navy Nuclear Power School and a Navy Nuclear Propulsion Plant. Following my graduation from the University of Missouri - Columbia, I was employed

1 by The Empire District Electric Company (Empire) as a Staff Engineer until

2 August 1999, at which time, I began my employment with the Staff of the Missouri

3 Public Service Commission (Staff).

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

5   A.   Yes, I am a member of the Institute of Electrical and Electronic Engineers

6 (IEEE).

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

8   A.   Yes, I have filed testimony on jurisdictional allocations and system energy

9 losses in electric rate cases involving Missouri Public Service, at the time a division of

10 Utilicorp United, Inc. (Case No. ER-2001-672), and Empire, (Case No. ER-2002-424).

11 In addition, I filed testimony on losses and jurisdictional allocations in a complaint case

12 involving Union Electric Company d/b/a AmerenUE (Case No. EC-2002-1) and filed

13 true-up testimony concerning jurisdictional allocations in an electric rate case involving

14 Empire (Case No. ER-2001-299).

15   Q.   To which of the operations of Aquila, Inc. are you directing your

16 testimony?

17   A.   My testimony concerns the electric operations of Aquila, Inc. in Missouri.

18   Q.   What is the purpose of your testimony?

19   A.   The purpose of this testimony is to recommend that the Commission adopt

20 the system energy loss factors that I calculated for Aquila Networks – MPS (MPS)

21   (Schedules 1 and 2 respectively, attached to this Direct

22 Testimony), and the jurisdictional allocation factors for demand and energy that I

1 calculated for MPS as shown on Schedules 3 and 4 respectively, attached to this Direct

2 Testimony. My testimony also describes how I determined these factors.

3 **SYSTEM ENERGY LOSSES**

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

5   A.   As shown on Schedule 1 attached to this Direct Testimony, I have

6 calculated the system energy loss factor for MPS to be 0.0691, or 6.91% of MPS's Net

7 System Input (NSI).

8

9   Q.   What are system energy losses?

10   A.   System energy losses are the energy losses that occur in the electrical

11 equipment (e.g., transmission and distribution lines, transformers, etc.) of   MPS's

12   system between the generating sources and the customers' meters.

13   Q.   How are system energy losses determined?

14   A.   The basis for this calculation is that NSI equals the sum of "Retail Sales",

15 "Wholesale Sales" (as applicable), "Company Use," and "System Energy Losses." This

16 can be expressed mathematically as:

17   NSI = Retail Sales + Wholesale Sales + Company Use + System Energy Losses.

18 NSI, Company Use, Retail Sales and Wholesale Sales are known; therefore, system

19 energy losses may be calculated as follows:

20   System Energy Losses = NSI – Retail Sales - Wholesale Sales – Company Use.

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

22   System Energy Loss Factor = (System Energy Losses ÷ NSI)

23   Q.   How is NSI determined?

1   A.   In addition to the relationship expressed in the equation above, NSI is also

2   equal to the sum of net generation, the net interchange and applicable resultant

3   inadvertent flows. Net generation is the total energy output of each generating station

4   minus the energy consumed internally to enable its production. Net interchange is the

5   resultant of summing the following calculations:

6   1. The net of off-system purchases and sales and

7   2. The net of purchases and sales between divisions of Aquila Networks,

8   Inc. (Aquila).

9   Inadvertent flows is the term often utilized in the electric utility industry to

10   describe the portion of the actual physical flows on one's electrical grid structures that are

11   not accounted for in existing contractual and/or scheduled agreements. The output of

12   each generating station is monitored continuously, as is the net of affiliate and off-system

13   purchases and sales and any resultant inadvertent flows. I obtained this information from

14   data supplied by Aquila in response to Staff Data Request Nos. 35, 53, 62, 63, 110, 353

15   and 539.

16   Q.   What are Retail Sales, Wholesale Sales and Company Use and how are

17   these values determined?

18   A.   Retail Sales and Wholesale Sales represent the jurisdictional energy

19   metered within a particular system.   In this case, MPS has both a wholesale and a retail

20   jurisdiction,   Company Use is the electricity

21   consumed at each of the non-generation facilities, such as the corporate office building.

22   Retail Sales and Wholesale Sales data was provided in response to Staff Data Request

1   Nos. 54 and 353. Company Use data was provided in response to Staff Data Request

2   Nos. 57 and 353.

3   Q.   Why are inadvertent flows only included in the calculation of MPS?

4   A.   In the response to Staff Data Request 63, Aquila reported the inadvertent

5   flows reflected in Schedule 1 as pertaining to MPS

6   Upon further questioning, MPS   were apparently treated as one control area, not

7   separate divisions, in the monitoring and reporting of inadvertent flows. I was informed

8   it would be next to impossible to allocate the data received between MPS   .

9   Therefore, without a means of allocating the reported information between the two

10   operating divisions, I applied the total of the inadvertent flows to MPS.

11   Q.   Which Staff witness used your calculated system energy loss factors?

12   A.   I provided my calculated system energy loss factors, for both MPS

13   to Staff witness Richard J. Campbell.

14   **JURISDICTIONAL ALLOCATIONS**

15   Q.   Please define the phrase "jurisdictional allocation".

16   A.   For purposes of my testimony, jurisdictional allocation refers to the

17   process by which demand-related and energy-related costs are allocated to the applicable

18   jurisdictions.   Demand-related and energy-related costs are divided between two

19   jurisdictions: retail and wholesale operations. The application of a particular allocation

20   factor is dependent upon the types of costs being allocated. These calculations were

21   performed for MPS only.

22

1 **DEMAND ALLOCATION FACTOR**

2 Q. What is the definition of demand?

3 A. Demand refers to the rate of electric energy that is delivered to a system to

4 meet the energy requirements of its customers, generally expressed in kilowatts or

5 megawatts, either at an instant in time or averaged over any designated interval of time.

6 In my analyses, I used hourly demands.

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

8 A. Capital costs associated with generation and transmission plant and certain

9 operational and maintenance expenses are allocated on this basis. This is appropriate

10 because generation and transmission are planned, designed and constructed to meet the

11 anticipated demand.

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

13 A. I used what is known as the Four Coincident Peak (4 CP) methodology.

14 Q. What is meant by "coincident peak"?

15 A. The term coincident peak refers to the load in megawatts (MWs) in each

16 of the jurisdictions that coincides with the hour of MPS's overall system peak recorded

17 for each month in the test period.

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

19 A. Peak demand is the largest electric requirement occurring within a

20 specified period of time (e.g., day, month, season, year) on a utility's system. In addition,

21 for planning purposes, an amount must be included for meeting required contingency

22 reserves. Since generation units and transmission lines are planned, designed, and

23 constructed to meet a utility's anticipated system peak demands plus required reserves,

6

1   the contribution of each individual jurisdiction to these peak demands is the appropriate

2   basis on which to allocate the costs of these facilities.

3   Q.   Please describe the procedure for calculating the jurisdictional demand

4   allocation factors using the 4 CP methodology.

5   A.   The allocation factor for each jurisdiction was determined using the

6   following process:

7   a.   Identify MPS's peak hourly load in each month for the four -
8   month period June 2002 through September 2002 and sum the
9   hourly peak loads.
10

11   b.   Sum the particular jurisdiction's corresponding loads for the hours
12   identified in #1 above.
13

14   c.   Divide #2 above by #1 above.
15

16   The result is the allocation factor for the particular jurisdiction. The sum of the

17   demand allocation factors across all jurisdictions equals one. The system peak and

18   associated jurisdictional peaks where determined from information provided in the

19   response to Staff Data Requests 52, 330 and 353.

20   Q.   What are the results of your calculations?

21   A.   As shown on Schedule 3 attached to this direct testimony, the calculated

22   demand jurisdictional allocation factors for the updated test year are as follows:

23   Retail   0.9869
24
25   Wholesale   0.0131
26

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

28   A.   I provided these jurisdictional demand allocation factors to Staff witness

29   Phillip K. Williams.

1   **ENERGY ALLOCATION FACTOR**

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

3   A.   Variable expenses, such as fuel and certain operational and maintenance

4   (O&M) costs, are allocated to the jurisdictions based on energy consumption.

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

6   A.   The energy allocation factor for an individual jurisdiction is the ratio of

7   the annual kilowatt-hour (kWh) usage in the particular jurisdiction to the total MPS

8   system kWh usage. The sum of the energy allocation factors across jurisdictions equals

9   one. Applicable jurisdictional kWh usage totals were provided in the response to Staff

10   Data Request Nos. 46 and 54.

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

12   A.   The factors are shown in Schedule 4 and repeated here.
13
14   Retail   .9843
15
16   Wholesale   .0157
17

18   Q.   Which Staff witness used your jurisdictional energy allocation factors?

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

20   Phillip K. Williams.

21   Q.   Does this conclude your prepared Direct Testimony?

22   A.   Yes, it does.

AQUILA NETWORKS - MPS SYSTEM ENERGY LOSS CALCULATION*

	NET GENERATION (MWhs)	NET INTERCHANGE NET of PURCHASES AND SALES (Off system & Divisional) (MWhs)	INADVERTANT FLOWS (MWhs)	NET SYSTEM INPUT (MWhs)	RETAIL SALES (MWhs)	WHOLESALE SALES (MWhs)	COMPANY USE (MWhs)	SYSTEM ENERGY LOSSES (MWhs)
Jan-02	418,958	33,495	(533)	451,920	439,343	13,855	871	(2,149)
Feb-02	326,160	75,591	1,482	403,233	353,226	12,567	581	36,859
Mar-02	276,961	152,886	2,588	432,435	380,241	12,888	895	38,411
Apr-02	361,411	19,222	(247)	380,386	386,225	12,353	596	(18,788)
May-02	355,228	53,812	(794)	408,246	342,600	12,191	468	52,987
Jun-02	391,077	164,985	(946)	555,116	408,786	16,755	426	129,149
Jul-02	378,887	278,671	(1,689)	655,869	539,483	20,183	479	95,724
Aug-02	415,804	211,169	(499)	626,474	594,946	20,386	511	10,631
Sep-02	295,569	210,776	432	506,777	523,206	17,529	433	(34,391)
Oct-02	388,747	25,340	161	414,248	415,048	12,742	1,355	(14,896)
Nov-02	346,861	62,540	(414)	408,987	358,414	12,772	652	37,149
Dec-02	398,407	61,950	(34)	460,323	381,874	13,878	1,020	63,551
YR 2002	4,354,070	1,350,437	(493)	5,704,014	5,123,392	178,099	8,287	394,235

* Net Generation + Net Interchange + Inadvertant Flows = Net System Input (NSI)   = Retail Sales + Wholesale Sales + Company Use + System Energy Losses

System Energy Loss Factor = .0691

Schedule 1

	NET GENERATION (MWhs)	NET INTERCHANGE Net of Purchases and Sales (Off system & Divisional) (MWhs)	NET SYSTEM INPUT (MWhs)		RETAIL SALES (MWhs)	COMPANY USE (MWhs)	SYSTEM ENERGY LOSSES (MWhs)
Jan-02							
Feb-02							
Mar-02							
Apr-02							
May-02							
Jun-02							
Jul-02							
Aug-02							
Sep-02							
Oct-02							
Nov-02							
Dec-02							
YR 2002							

* Net Generation + Net Interchange = Net System Input (NSI)   =   Retail Sales + Company Use + System Energy Losses

System Energy Loss Factor =

Schedule 2

Demand Allocation Factor

Month	Hour	System Peak (MWs)	Load at System Peak Retail (MWs)	Wholesale (MWs)
Jan-02	7:00 PM	835.676	823.190	12.486
Feb-02	7:00 PM	833.099	820.903	12.197
Mar-02	8:00 AM	795.568	784.252	11.316
Apr-02	5:00 PM	784.312	773.363	10.949
May-02	5:00 PM	1,056.387	1,041.449	14.938
Jun-02	**5:00 PM**	**1,197.233**	**1,179.991**	**17.242**
Jul-02	**4:00 PM**	**1,297.292**	**1,281.739**	**15.553**
Aug-02	**4:00 PM**	**1,309.225**	**1,294.070**	**15.155**
Sep-02	**5:00 PM**	**1,238.653**	**1,220.503**	**18.150**
Oct-02	5:00 PM	1,031.384	1,016.465	14.919
Nov-02	7:00 PM	763.125	752.177	10.948
Dec-02	6:00 PM	837.076	825.286	11.790
4CP		5,042.403	4,976.303	66.100
Allocation Factor		**1.0000**	**0.9869**	**0.0131**

Schedule 3

Energy Allocation Factor

Month	Retail (MWhs)	Wholesale (MWhs)	Total
Jan-02	439,343.129	5,488.356	444,831.485
Feb-02	353,225.840	5,575.442	358,801.282
Mar-02	380,240.873	5,930.837	386,171.710
Apr-02	386,225.255	5,816.194	392,041.449
May-02	342,600.208	4,250.933	346,851.141
Jun-02	408,785.589	7,462.689	416,248.278
Jul-02	539,483.268	8,404.009	547,887.277
Aug-02	594,945.716	9,848.081	604,793.797
Sep-02	523,206.014	9,933.605	533,139.619
Oct-02	415,047.896	6,223.277	421,271.173
Nov-02	358,414.146	6,416.698	364,830.844
Dec-02	381,874.144	6,528.394	388,402.538
Total	5,123,392.078	81,878.515	5,205,270.593
Allocation Factor	**0.9843**	**0.0157**	**1.0000**

Schedule 4