

Exhibit No.:

Issues: Lake Road Generating
Station, Production
Modeling System,
And Natural Gas Pricing

Witness: Timothy M. Nelson

Sponsoring Party: Aquila Networks-L&P

Case No.: HR-

FILED²

FEB 24 2006

Before the Public Service Commission
of the State of Missouri

**Missouri Public
Service Commission**

Direct Testimony

of

Timothy M. Nelson

Exhibit No. 1007
Case No(s) HR-2005-0-150
Date 1-09-06 Rptr KE

TABLE OF CONTENTS

LAKE ROAD GENERATING STATION OPERATING DESCRIPTION.....	3
PRODUCTION MODELING SYSTEM.....	4
NATURAL GAS PRICING.....	7

**BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF MISSOURI
DIRECT TESTIMONY OF TIMOTHY M. NELSON
ON BEHALF OF AQUILA, INC.
D/B/A AQUILA NETWORKS-MPS AND AQUILA NETWORKS-L&P
CASE NO. HR-_____**

1 Q. Please state your name and business address.

2 A. My name is Tim M. Nelson. My business address is 10750 East 350 Highway, Kansas
3 City, Missouri, 64138.

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

5 A. I am employed by Aquila Inc. ("Aquila" or "Company") in the position of Electric
6 Systems Analyst, Resource Planning.

7 Q. What are your responsibilities as Electric Systems Analyst- Resource Planning?

8 A. I am responsible for developing and running production cost fuel and purchase power
9 models and for preparing the fuel and purchase power budgets for the three electric
10 systems and two steam systems. I also provide technical and analytical support for the
11 evaluation of short-term and long-term purchases to meet the requirements of Aquila's
12 energy and capacity needs.

13 Q. Please briefly describe your education, work experience, and participation in professional
14 associations.

15 A. In 1993 I received a Bachelor of Science degree in Mechanical Engineering from Iowa
16 State University - Ames. Since graduation from Iowa State the majority of my work has
17 been in the field of electric utility power supply and delivery. In 1994 I joined St. Joseph

1 Light & Power Company as a production engineer at the Lake Road Generating Station.

2 In that position I was responsible for engineering projects concerning electric and steam

3 production. As Results Engineer, I was responsible for all plant operating and

4 performance data for six boilers, four steam turbines, three combustion turbines, and

5 external steam customers. In 2001, St. Joseph Light & Power Company was acquired by

6 Aquila Inc. (formerly UtiliCorp United Inc). I have been in my current position of

7 Electric Systems Analyst since December 2001.

8 Q. What is the purpose of your direct testimony in this case before the Missouri Public

9 Service Commission ("Commission")?

10 A. The purpose of this testimony is to present the RealTime® production cost model used to

11 calculate the fuel expense for the production and sale of continuous process steam from

12 the Lake Road Generating Facility for Aquila Networks-SJLP ("SJLP").

13 Q. How is your direct testimony organized?

14 A. My direct testimony is organized as follows:

15 I. Lake Road Generating Station Operating Description

16 II. Production Modeling Description

17 III. Natural Gas Pricing

18 Q. Are you sponsoring any schedules?

19 A. Yes. I am sponsoring two schedules:

20 TMN 1: Lake Road Generating Station – Fuel and Steam Flow Diagram

21 TMN 2: Missouri Steam/Electric Production Model Process

1 TMN 3: 3-Month Average 2006 NYMEX Strip, Oct 1 to Dec 31, 2004

2 **I. Lake Road Generating Station Operating Description**

3 Q. Please describe the Lake Road generating facilities.

4 A. The plant is located in south St. Joseph, Missouri, on the east bank of the Missouri River.

5 The plant consists of four steam turbine-generators, three combustion turbines, and six
6 steam boilers. The plant's generating units have a net electric generating capability of
7 253.8 MW. In addition to generating electricity, the plant also supplies steam in the form
8 of continuous process steam for sale to industrial steam customers. The steam sales are
9 provided at a nominal pressure of 150-PSI. Steam sales are also provided to one
10 customers at a nominal pressure of 850-PSI. When I refer to PSI, as in 150-PSI, I mean
11 pressure measured in pounds per square inch. I will also use the term "pound" as in 900-
12 pound system, which means the 900-PSI system.

13 Q. Please explain the Lake Road 900-PSI system.

14 A. The 900 PSI system, which is used to provide steam for the 900-PSI turbine-generators and
15 L&P's industrial steam sales, operates at a nominal steam pressure of 900 PSI and is fed by
16 four 900-PSI boilers (Boilers 1, 2, 4 & 5) and one 200-PSI boiler (Boiler 3). Boilers 1, 2, 3
17 and 4 burn natural gas as their primary fuel. With the exception of Boiler 3, these boilers
18 use #2 fuel oil as a back-up fuel. Much of the 900-PSI system energy is produced by Boiler
19 5, which burns coal for its primary fuel, and natural gas for its back-up fuel. Therefore, in
20 the 900-PSI system there are multiple boilers providing steam to a common header system

1 which in turn can drive three turbine-generators (1, 2, and 3) and also supply steam for
2 industrial steam sales.

3 Q. Which fuels and production systems are dedicated to providing services to the steam
4 customers?

5 A. There is no dedicated fuel source and there are no dedicated production systems for these
6 customers. The configuration of this plant has common facilities used for both electric
7 and steam production. Schedule TMN 1 entitled "Lake Road Generating Station – Fuel
8 and Steam Flow Diagram", is attached. By inspection of this diagram it is evident that
9 the 900-PSI system is common to multiple fuel inputs and produces steam for multiple
10 turbines as well as the steam customers. The 200-PSI system also operates via multiple
11 sources and has no dedicated production equipment.

12 II. Production Modeling System

13 Q. What method is used to allocate Lake Road's operating costs between the electric and
14 steam customers.

15 A. Aquila uses production costing modeling software to simulate the electric system and
16 steam customer loads. Schedule TMN 2 entitled "Steam Production Model for Lake
17 Road" is a diagram that describes the process flow for the calculation method.

18 Q. What is a production costing model?

19 A. Aquila uses the production costing model, RealTime®, to perform an hour-by-hour
20 chronological simulation of the Company's electric system, where the generators are

1 “dispatched” to meet the hourly system electric load, to determine the energy costs and
2 fuel consumption.

3 Q. What is meant by “hour-by-hour chronological simulation”?

4 A. RealTime® solves each hour’s demand chronologically before moving onto the next
5 hour. Using this methodology, RealTime® can more accurately simulate real world
6 operating conditions and constraints.

7 Q. How are the fuel expenses associated with the operation of the 900-PSI and 200-PSI
8 systems allocated between the L&P division’s electric and industrial steam operations?

9 A. Aquila allocates fuel expense between its L&P division’s electric operations and
10 industrial steam operations using the allocation methodology approved by the
11 Commission in its Case No. EO-94-36.

12 Q. Please describe the steam/electric fuel and purchase power expense model used by
13 Aquila.

14 A. Aquila created two models in RealTime®, one for electric and one for steam, and two
15 Microsoft Excel® spreadsheets to determine the annualized fuel and purchase power
16 expense costs for the electric system. The RealTime® “electric” model is used first to
17 dispatch the electric system to meet the system load

18 After the electric model has been run the 900-PSI electric turbines hourly MW
19 load is exported to a text file. This text file is then imported into the “Unit 123 to Steam”
20 spreadsheet where the steam input necessary for each of the three generators is calculated
21 using the respective unit heat rate curves. In this spreadsheet, the total steam required for

1 the turbines is calculated and then exported to a comma separated value (csv) file. The
2 csv file is imported into the RealTime® steam model as another steam load for the steam
3 system.

4 In the RealTime® steam model the electric turbine steam input from above is
5 combined with the hourly steam sales loads too produce 900-PSI boiler hourly steam load
6 input to the model. Boilers 1, 2, 3, and 4 are modeled as burning natural gas and Boiler 5
7 burns coal. The RealTime® steam model is then run using these steam loads to
8 determine the total fuel burn and fuel cost for the Lake Road 900-PSI boilers.

9 After running the RealTime® steam model the fuel allocation is performed on a
10 daily basis in the "Steam electric model" spreadsheet. To perform the allocation several
11 inputs are required. From the steam model: 1) daily fuel quantity burned, by fuel type, 2)
12 daily fuel cost by fuel type, and, 3) industrial steam sales mmBtu. From the electric model:
13 1) daily MW generated by the 900-PSI electric turbines, and, 2) the 900-PSI electric
14 turbines steam mmBtu from the "Unit to Steam" spreadsheet.

15 The fuel allocation is performed on a daily basis as is done in actual operations at
16 the Lake Road Generating Station. Fuel is expense allocated based on the following
17 equations:

18
$$F_S = [S / (E + S)] \times F$$

19
$$F_E = F - F_S$$

20 Where,

21 F is total 900-PSI boiler fuel

1 F_S is 900-PSI boiler fuel allocated to industrial steam sales

2 F_E is 900-PSI boiler fuel allocated to the electric turbines

3 S is industrial steam sales steam mmBtu from boilers

4 E is 900-PSI electric turbine steam mmBtu from boilers

5 The remaining fuel not allocated to the industrial steam sales system in the first equation
6 is allocated to the electric system as shown in the second equation. Because the variable
7 “F” shown above includes fuel burned for Lake Road plant auxiliary steam, fuel
8 consumed for that purpose is properly allocated between the electric and industrial steam
9 sales systems.

10 Q. Has the significant increase in steam load caused fuel costs charged to steam to change?

11 A. Yes.

12 Q. Why?

13 A. The steam capacity from Boiler 5 that burns coal for it fuel source has reached its
14 maximum output. Boilers 1, 2, 3 and 4, which use gas as the primary fuel, have to be
15 used to supply any additional steam load. Steam from Boilers 1, 2, 3 and 4 cost per
16 mmBtu is significantly higher than Boiler 5 causing the cost of service to increase.

17 **III. Natural Gas Pricing**

18 Q. What does Aquila propose as the price of natural gas?

19 A. Attached is Schedule TMN 3. This is the average of NYMEX futures prices for the 2006
20 time frame. Aquila proposes to use this average of actual market transactions as the
21 estimate for market prices.

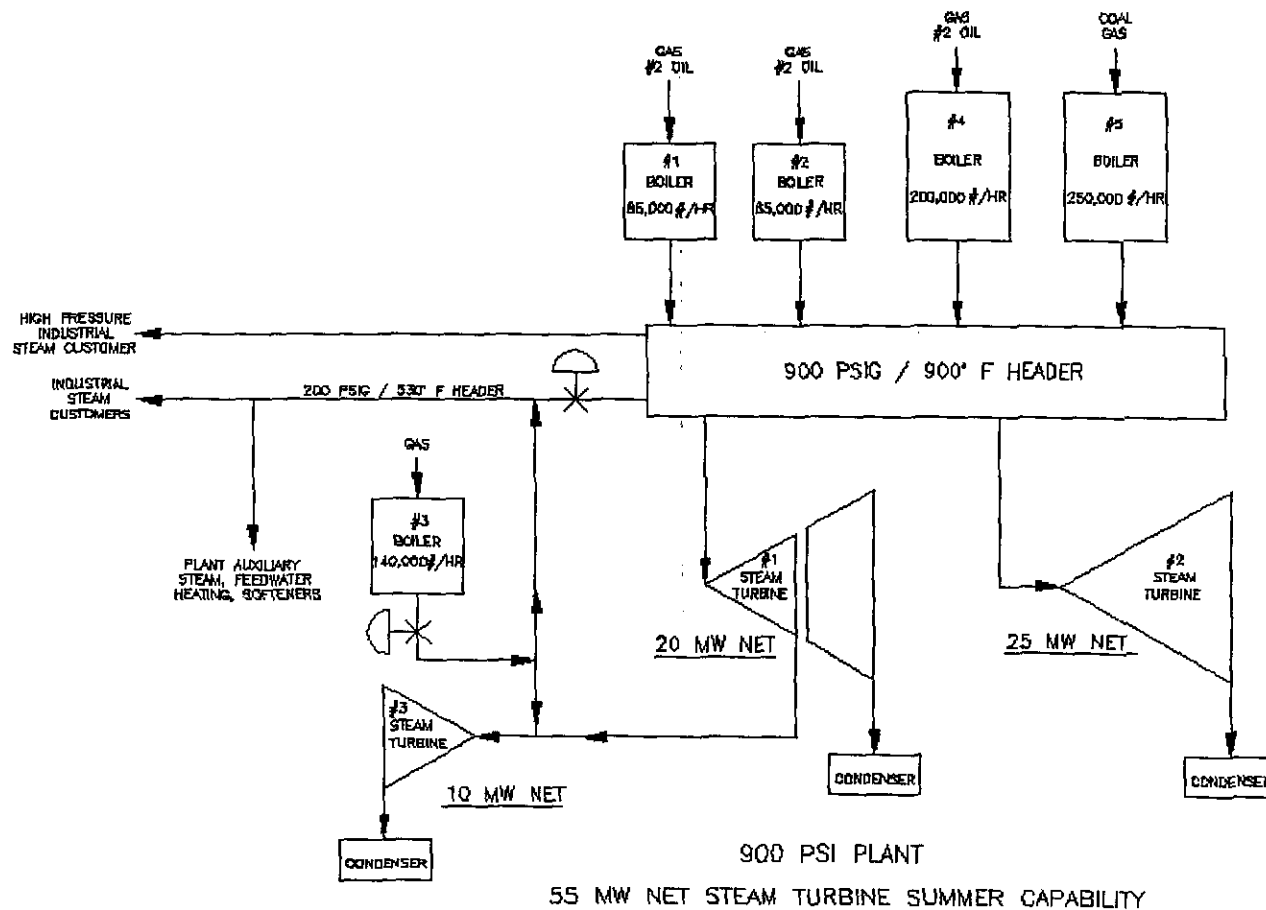
1 Q. Does this estimate include basis or transportation charges to bring the gas to the
2 generating plant?

3 A. No. This estimate only includes the market price for the energy delivered to Henry Hub.
4 The basis price, the price differential between Henry Hub and the pipeline that serves a
5 particular plant, and any other burner-tip charges are included as part of the production
6 cost model.

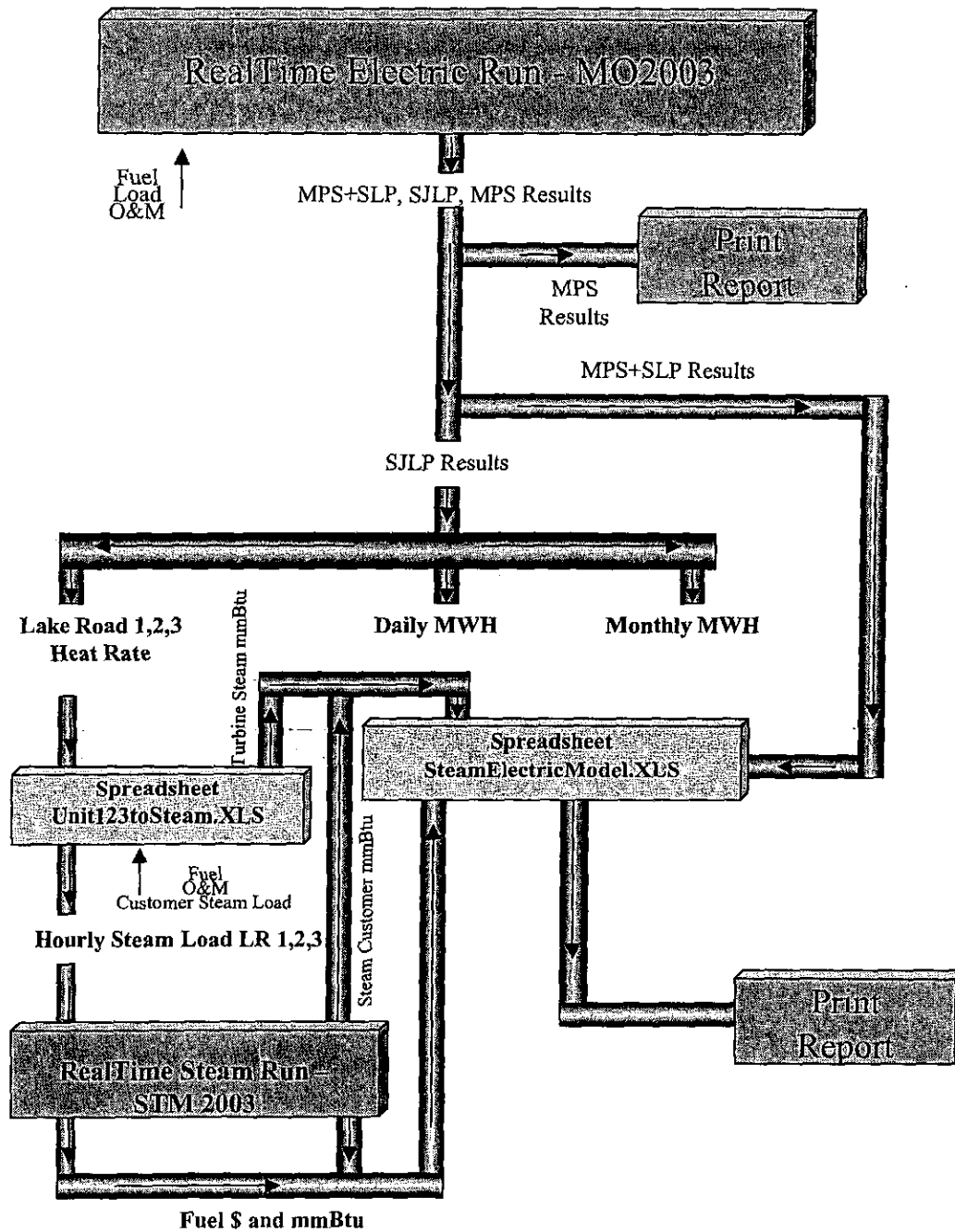
7 Q. Does this conclude your direct testimony?

8 A. Yes.

TMN 1: Lake Road Generating Station – Fuel and Steam Flow Diagram



TMN 2: Missouri Steam/Electric Production Model Process



Direct Testimony:
Tim M. Nelson

Schedule TMN - 3: 3-Month Average 2006 NYMEX Strip, Oct 1 to Dec 31, 2004

2006 Futures Average	
Jan	7.529
Feb	7.507
Mar	7.286
Apr	6.298
May	6.129
Jun	6.147
Jul	6.168
Aug	6.190
Sep	6.162
Oct	6.189
Nov	6.488
Dec	6.764
Annual	6.571

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

In the matter of Aquila, Inc. d/b/a Aquila)
Networks-L&P, for authority to file tariffs)
Increasing steam rates for the service provided)
To customers in the Aquila Networks-L&P area)

Case No. HR-_____

County of Jackson)
) ss
State of Missouri)

AFFIDAVIT OF TIMOTHY M. NELSON

Timothy M. Nelson, being first duly sworn, deposes and says that he is the witness who sponsors the accompanying testimony entitled "Direct Testimony of Timothy M. Nelson;" that said testimony was prepared by him and under his direction and supervision; that if inquiries were made as to the facts in said testimony and schedules, he would respond as therein set forth; and that the aforesaid testimony and schedules are true and correct to the best of his knowledge, information, and belief.

Timothy M Nelson

Timothy M. Nelson

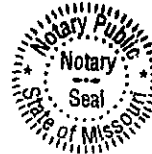
Subscribed and sworn to before me this 27th day of May, 2005.

Terry D. Lutes

Notary Public
Terry D. Lutes

My Commission expires:

8/20-2008



TERRY D. LUTES
Jackson County
My Commission Expires
August 20, 2008