Exhibit No.:
Issues: Fuel Model
Witness: Tim M. Nelson
Sponsoring Party: Aquila Networks-L&P
Case No.: HR-

Before the Public Service Commission
of the State of Missouri

Direct Testimony

of

Tim M. Nelson

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

Q. Please state your name and business address.

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

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

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

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

A. I am responsible for analyzing short-term production and purchases operations to meet the requirements of Aquila's domestic regulated electric utility operations.

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

A. In 1993 I received a Bachelor of Science degree in Mechanical Engineering from Iowa State University - Ames. Since graduation from Iowa State the majority of my work has been in the field of electric utility power supply and delivery. In 1994 I joined St. Joseph Light and Power Company as a production engineer at the Lake Road Generating Station. In that position I was responsible for engineering projects concerning electric and steam

production. My main duties as a Results Engineer included responsibilities of maintaining operating data and overseeing efficiency compliance.

Q. What is the purpose of your direct testimony?

A. The purpose of this testimony is to present and support Aquila's position in this case regarding the production and sale of continuous process steam from the Lake Road Generating Facility.

Q. How is your direct testimony organized?

A. My direct testimony is organized as follows:

I. Lake Road Generating Station Operating Description

II. Production Modeling Description

III. Modeling Results

Q. Are you sponsoring any schedules?

A. Yes. I am sponsoring two schedules:

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

Schedule TMN-2: Steam Production Model for Lake Road

I. Lake Road Generating Station Operating Description

Q. Please describe the Lake Road generating facilities.

A. The plant is located in south St. Joseph, Missouri, on the east bank of the Missouri River. The plant consists of four steam turbine-generators, three combustion turbines, and six steam boilers. The plant's generating units have a net electric generating capability of 253.8 MW. In addition to generating electricity, the plant also supplies steam in the form

of continuous process steam for sale to six industrial steam customers. The steam sales are provided at a nominal pressure of 150-PSI. Steam sales are also provided to one of the six customers at a nominal pressure of 850-PSI. When I refer to PSI, as in 150-PSI, I mean pressure measured in pounds per square inch. I will also use the term "pound" as in 900-pound system, which means the 900-PSI system.

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

A. The 900 PSI system, which is used to provide steam for the 900-pound turbine-generators and L&P industrial steam sales, operates at a nominal steam pressure of 900 PSI and is fed by four 900-PSI boilers (Boilers 1, 2, 4 & 5) and one 200-PSI boiler (Boiler 3). Boilers 1, 2, 3 and 4 burn natural gas as their primary fuel. With the exception of Boiler 3, these boilers use #2 fuel oil as a back-up fuel. The majority of the 900-PSI system energy is produced by Boiler 5, which burns coal for its primary fuel, and natural gas for its back-up fuel. Therefore, the 900-PSI system is a unique system where there are multiple boilers producing steam in a common header system which in turn can drive three turbine-generators (1, 2, and 3) and also supply steam for industrial steam sales.

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

A. There is no dedicated fuel source and there are no dedicated production systems for the steam customers. The configuration of this plant has common facilities used for both electric and steam production. Schedule TMN-1: Lake Road Generating Station – Fuel and Steam Flow Diagram, is attached. By inspection of this diagram it is evident that the

900-PSI system is common to multiple fuel inputs and produces steam for multiple turbines as well as the steam customers. The 150-PSI system also operates via multiple sources and has no dedicated production equipment.

II. Production Modeling System

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

A. We use the electric production modeling program RealTime® in an iterative process to simulate electrical and steam customer loads. An iterative process is required to find the balance point of costs in a system which has multiple fuel inputs and multiple steam outputs (generators and steam sales) from one common steam system. Schedule TMN-2: Steam Production Model for Lake Road is a diagram that describes the process flow for this method.

Q. How are the fuel expenses associated with the operation of the 900-PSI system allocated between the L&P division's electric and industrial steam jurisdictions?

A. Aquila allocates 900-pound fuel expense between its L&P division's electric jurisdiction and industrial steam jurisdiction using the allocation methodology approved by the Commission in its Case No. EO-94-36.

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

A. Aquila created two models in RealTime®, one for electric and one for steam, and two Microsoft Excel® spreadsheets to determine the annualized fuel and purchase power

expense costs for the L&P system. The RealTime® "electric" model is used first to dispatch all of the L&P electric system to meet the system load. One unique aspect of this model is that the fuel price (in $/mmBtu) for the 900-pound electric turbines (Lake Road turbine generators 1, 2, and 3) is not known since the average fuel cost is affected by the dispatch of the units. For the first iteration this fuel price must be estimated, then after the RealTime® "steam" model is run, a new fuel price can be calculated and the electric model rerun with the new prices. The method for determining the average fuel price for the 900-pound electric turbines will be discussed in more detail later.

After the electric model has been run the 900-pound electric turbines hourly MW load is exported to a text file. This text file is then imported into the "Unit to Steam" spreadsheet where the steam input necessary for each of the three generators is calculated using the respective unit heat rate curves. In this spreadsheet, the total steam required for the turbines is calculated and then exported to a comma separated value (csv) file. The csv file is imported into the RealTime® steam model as another steam load for the steam system.

In the RealTime® steam model the electric turbine steam input from above is combined with the 2002 steam sales loads too produce 900-pound boiler hourly steam load input to the model. Boilers 1, 2, 3, and 4 are modeled as burning natural gas and Boiler 5 is modeled as burning a 60% PRB and 40% high Btu coal on an mmBtu basis (which is approximately a 65% / 35% when blended by weight). This is based on what the actual average coal blend ratio for Boiler 5 was for 2002. The RealTime® steam

model is then run using these steam loads to determine the total fuel burn and fuel cost for the Lake Road 900-pound boilers.

After running the RealTime® steam model the fuel allocation is performed on a daily basis in the Allocation spreadsheet. To perform the allocation several inputs are required. From the steam model: 1) daily fuel quantity burned, by fuel type, and, 2) daily fuel cost by fuel type. From the electric model: 1) daily MW generated by the 900-pound electric turbines, 2) monthly MW generated by the 900-pound electric turbines, 3) industrial steam sales mmBtu, and, 4) the 900-pound electric turbines steam mmBtu from the Unit to Steam spreadsheet.

The fuel allocation is performed on a daily basis and is based on the following equations:

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

$$F_E = F - F_S$$

Where,

F is total 900-pound boiler fuel

F_S is 900-pound boiler fuel allocated to industrial steam sales

F_E is 900-pound boiler fuel allocated to the electric turbines

S is industrial steam sales steam mmBtu from boilers

E is 900-pound electric turbine steam mmBtu from boilers

Once the allocation process is complete, the actual average fuel cost (in $/mmBtu) for the 900-pound electric turbines can be calculated and compared to the price used in the

RealTime® electric model. To calculate this, divide the total dollars of fuel allocated to the 900-pound electric turbines by the total mmBtu of fuel allocated to the turbines. This fuel price is calculated on a monthly basis and then compared to the monthly price used in the electric model. If the any of the calculated monthly fuel prices vary significantly from those used in the electric model then the new calculated fuel prices are inputted into the electric model and the whole model is rerun. This process is iterated until the calculated average fuel price for the 900-pound electric turbines matches the previous iteration.

III. Modeling Results

Q. What are the fuel and energy costs allocated to the steam business as determined by the steam model?

A. The fuel costs allocated to the steam business are $2,169,731 for coal and $3,678,427 for natural gas for a total of $5,848,158 for fuel. The steam business is also allocated costs associated with its auxiliary power use and demand. These costs are $192,092 for the energy component and $397,252 for the demand component. This brings the total cost for the steam business to $6,245,410.

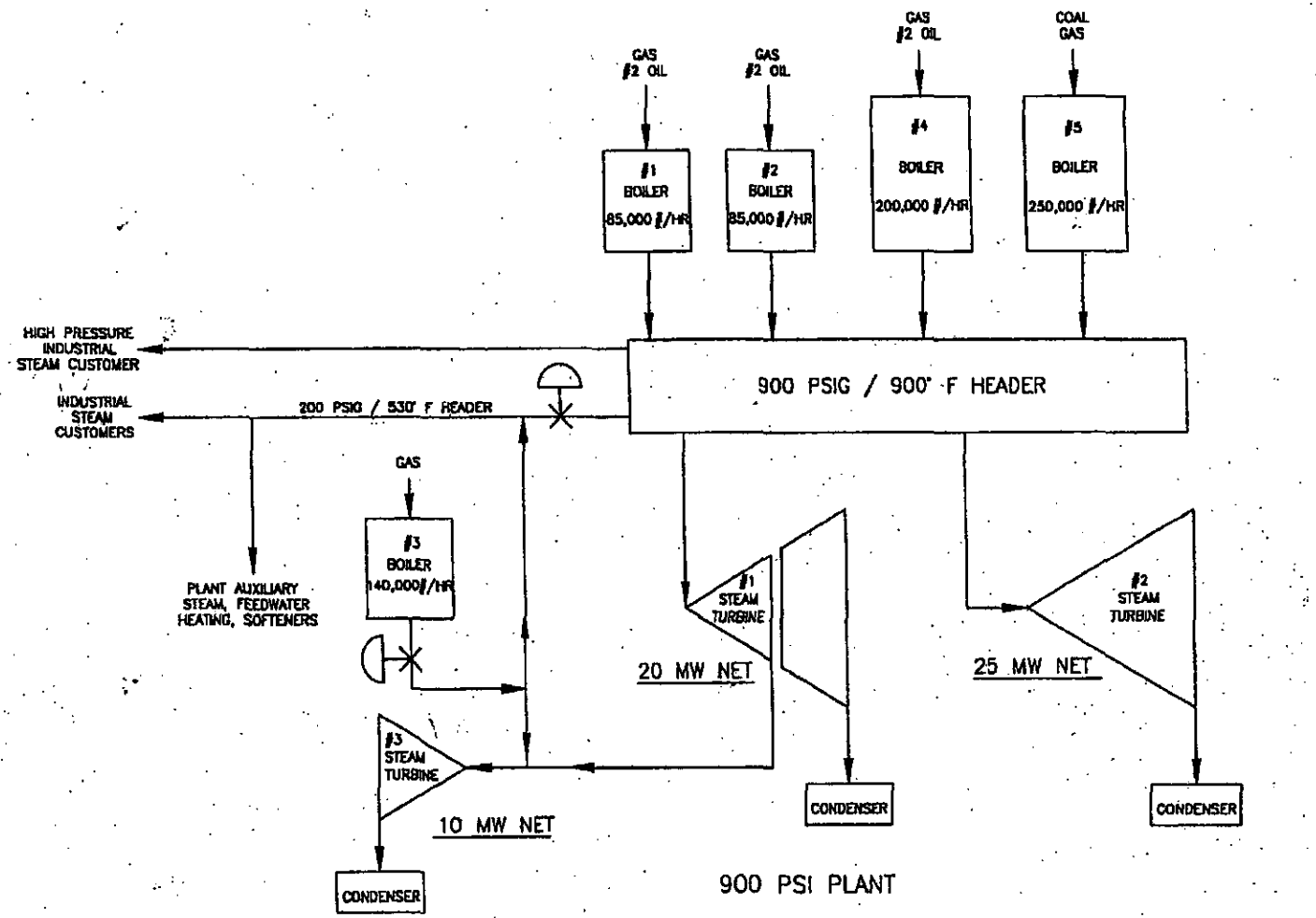
Q. Does the fuel and energy allocation accurately reflect how the Lake Road Plant operates and does it properly allocate the fuel and energy costs?

A. Yes, all costs associated with operating the steam business are accounted for and properly allocated.

Q. Does this conclude your direct testimony?

A. Yes it does.

Diagram 1 - Lake Road Generating Station - Fuel and Steam Flow Schematic

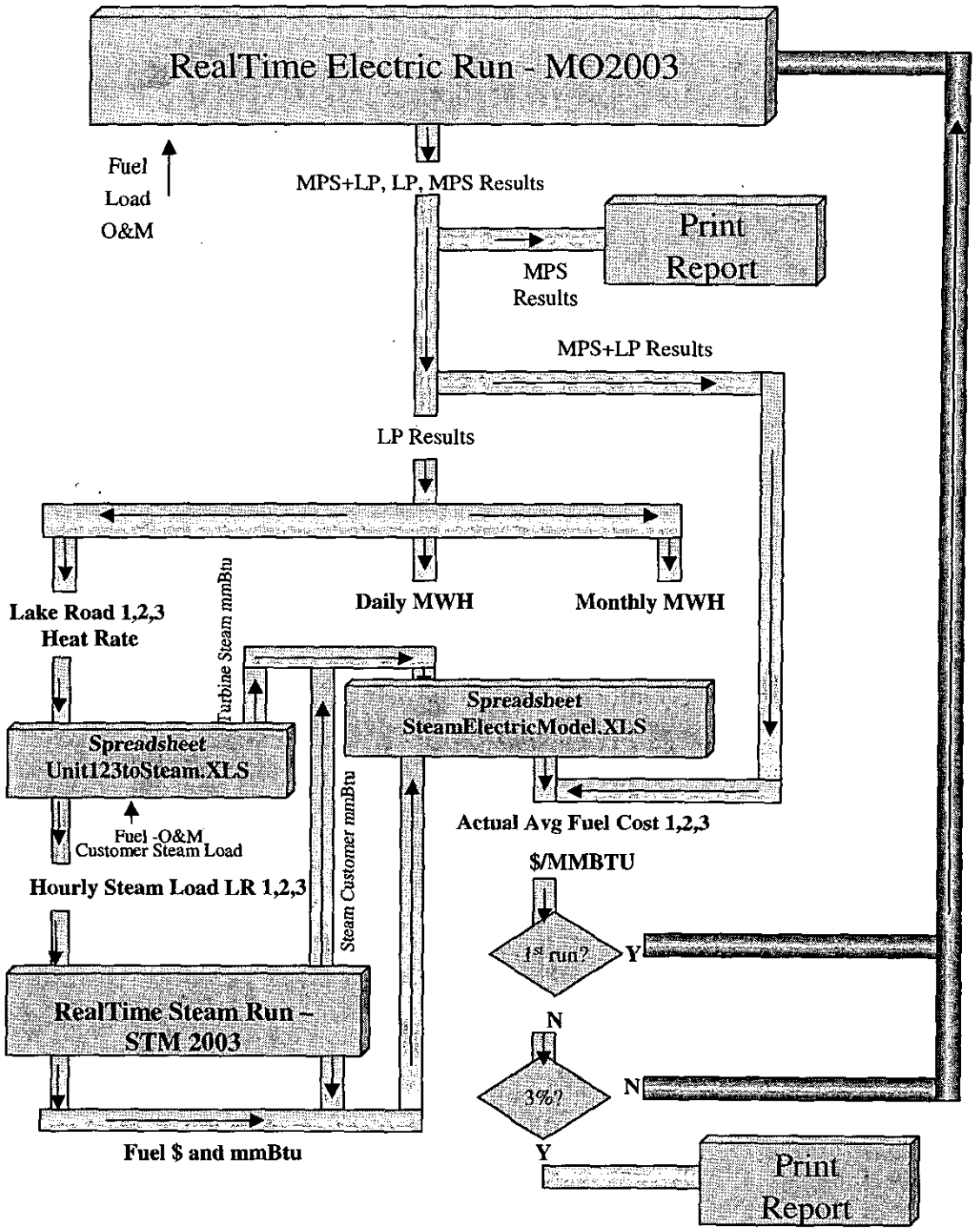


900 PSI PLANT

55 MW NET STEAM TURBINE SUMMER CAPABILITY

Schedule TMN-1

Missouri Steam/Electric Production Model Process



Schedule TMN-2

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	)	Case No. HR-_____
To customers in the Aquila Networks-L&P area	)	

County of Jackson	)	
	)	ss
State of Missouri	)	

AFFIDAVIT OF TIM M. NELSON

Tim M. Nelson, being first duly sworn, deposes and says that he is the witness who sponsors the accompanying testimony entitled "Direct Testimony of Tim 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.

Tim M. Nelson

Subscribed and sworn to before me this 16th day of June, 2003.

Notary Public
Linda C. Howell

My Commission expires:

May 4, 2004

Linda C.Howell
Notary Public-Notary Seal
State of Missouri
Jackson County
My Commission Expires: May4, 2004