Exhibit No.:	
Issues:	Weather Normalization
Witness:	Shawn E. Lange
Sponsoring Party:	MO PSC Staff
Type of Exhibit:	Direct Testimony
Case No.:	ER-2007-0004
Date Testimony Prepared:	January 18, 2007

MISSOURI PUBLIC SERVICE COMMISSION

UTILITY OPERATIONS DIVISION

DIRECT TESTIMONY

OF

SHAWN E. LANGE

AQUILA, INC.

D/B/A AQUILA NETWORKS – MPS

AND AQUILA NETWORKS – L&P

CASE NO. ER-2007-0004

Jefferson City, Missouri
January 2007

BEFORE THE PUBLIC SERVICE COMMISSION

OF THE STATE OF MISSOURI

In the matter of Aquila, Inc. d/b/a Aquila Networks-MPS and Aquila Networks-L&P, for authority to file tariffs increasing electric rates for the service provided to customers in the Aquila Networks-MPS and Aquila Networks-L&P service areas.	))))))	Case No. ER-2007-0004

AFFIDAVIT OF SHAWN E. LANGE

STATE OF MISSOURI)
) ss
COUNTY OF COLE)

Shawn E. Lange, of lawful age, on his oath states: that he has participated in the preparation of the following Direct Testimony in question and answer form, consisting of 10 pages of Direct Testimony to be presented in the above case, that the answers in the following 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.

Shawn E. Lange
Shawn E. Lange

Subscribed and sworn to before me this 16th day of January, 2007.

NOTARY PUBLIC NOTARY SEAL STATE OF MISSOURI

SUSAN L. SUNDERMEYER
My Commission Expires
September 21, 2010
Callaway County
Commission #06942086

Susan L. Sundermeyer
Notary Public

My commission expires 9-21-10

TABLE OF CONTENTS

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CASE NO. ER-2007-0004

DIRECT TESTIMONY

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AND AQUILA NETWORKS – L&P

CASE NO. ER-2007-0004

Q. Please state your name and business address.

A. My name is Shawn E. Lange and my business address is Missouri Public Service Commission, P.O. Box 360, Jefferson City, MO 65102.

Q. What is your present position with the Missouri Public Service Commission (Commission)?

A. I am a Utility Engineering Specialist II in the Engineering Analysis Section, Energy Department, Utility Operations Division.

Q. Would you please review your educational background and work experience.

A. In December of 2002, I received a Bachelor of Science Degree in Mechanical Engineering from the University of Missouri, at Rolla. Since then, I have pursued dual Masters Degrees in Mechanical Engineering at the University of Missouri, at Columbia and Business Administration at William Woods University. I joined the Commission Staff (Staff) in January 2005. I am a registered Engineer-in-Training in the State of Missouri.

Q. Have you filed testimony before this Commission before?

A. Yes, I have. A list of the cases in which I have filed testimony can be found in Schedule SEL-1.

EXECUTIVE SUMMARY

Q. Please summarize your direct testimony.

A. In my testimony I recommend that the Commission adopt the weather and days adjustments to class usage for the weather sensitive rate classes of Aquila Networks - MPS (MPS) and Aquila Networks - L&P (L&P). These adjustments are presented by rate class in Schedule SEL-2. Staff witness Curt Wells will discuss the corresponding adjustments to class revenues based on these adjustments to class usage. These adjustments to class usage were also included in my calculation of net system load.

I also recommend that the Commission adopt the hourly generation requirements and the hourly steam generation requirements that I calculated. Staff witness David W. Elliott used these hourly loads in his fuel model to calculate normal fuel and purchase power expenses for the test year. A monthly summary of the normalized net system load for MPS is shown on Schedule SEL-5 and for L&P on Schedule SEL-6.

Schedule SEL-3 and Schedule SEL-4 contain adjustments to attain the annual sum of the net-system load for MPS and L&P respectively, and Schedule SEL-7 contains a list of cases in which Staff's weather normalization method was used in the normalization of net system loads.

My testimony includes a discussion of how I calculated the normal weather variables that I used in the weather normalization of net system loads and why this methodology is appropriate for weather normalization.

My testimony ends with a discussion of how I calculated the hourly steam loads that were used in the development of Staff's fuel expense.

NORMALIZATION OF USAGE

Q. Why is it necessary to weather normalize electricity usage?

A. Electricity use is very sensitive to weather conditions. Because of the high saturation of air conditioning and the presence of some electric space heating in Aquila Network's (Aquila) Missouri territories, the magnitude of Aquila's load is directly related to daily temperatures. The weather during the test year differed from normal conditions. The winter months of January, February, and November 2005 were warmer than normal. These warmer than normal temperatures resulted in decreased energy consumption and lower than normal usage. The summer months of June through October 2005 were hotter than normal. The hotter than normal temperatures resulted in increased energy consumption and higher than normal usage.

Q. What method did you use to calculate the weather adjustments to class usage?

A. I used the Electric Power Research Institute (EPRI) Hourly Electric Load Model (HELM) to calculate the weather adjustments to class usage. In this model, the response to daily weather is first estimated for each of the rate classes from hourly class level load data. Weather normalized usage is then calculated for each month for each of the weather sensitive classes, given normal weather variables based on the estimated response. The weather variables are carefully matched to correspond to the usage in the time period over which usage was recorded. The weather adjustment to class usage is calculated as the difference between the weather normalized usage and the actual usage.

Q. What are the inputs to this model?

A. There are four data inputs into the model – monthly class usage, hourly class load data, and actual and normal daily weather variables. Aquila supplied the monthly class usage and the hourly class loads. Staff witness Curt Wells supplied the actual high and low

temperatures for the test year and the history of high and low temperatures that I used to calculate daily normal weather.

Q. How was the days adjustment determined?

A. HELM includes a calculation of the adjustment necessary to convert the billing month sales, which corresponds to how customer meters are read, to calendar month sales. The model calculates the weather normalized usage on a daily basis and then aggregates these daily usages to estimate the weather adjustment to both billing and calendar month sales. I calculated the "days adjustment" from billing month sales resulting in annual sales for the twelve calendar months ending December 31, 2005. This days adjustment is the difference between the weather normalized calendar and billing month sales.

Q. Did you independently perform a weather impact analysis on class load data to determine the appropriate weather response functions?

A. Yes, Aquila supplied hourly class load data for the time period dating January 1, 2005 through December 31, 2005. The hourly loads were plotted against two-day weighted mean temperature (TDWMT) to ascertain the weather sensitivity of each class. The hourly loads from the classes that were found to be weather sensitive were then used to develop weather response functions in the HELM model.

Q. Which classes were weather sensitive?

A. For L&P, the residential classes and the small and large general service classes were weather sensitive. The large power class was not weather sensitive with respect to daily weather. There is a seasonal response in the load of the large power class, but not a clear daily weather response. For MPS, the residential, small general service secondary, large general service secondary, and schools & churches secondary classes were weather sensitive.

The small general service primary, large general service primary, schools & churches primary, and large power primary and secondary classes were not sensitive to daily weather. These classes do show sensitivity to seasonal changes and day-type changes.

Q. Did you make any adjustments or corrections to the billing cycle usage data?

A. Yes. The billing cycle data, provided by Aquila, was disaggregated by billing cycle. While reviewing the billing cycle data provided by Aquila, I noticed that some billing cycles showed extremely high usage and others showed negative usage. I used information provided by Aquila to adjust this data to remove these negative values and to adjust for extremely high usage.

Q. Which Staff witnesses relied on the adjustments to usage that you calculated?

A. These adjustments to class usage were also included in the net system load and total test year usage that was used by Staff witness David W. Elliott in the normalization of fuel costs. Staff witness Curt Wells calculated the corresponding adjustments to Missouri retail revenues. Staff witness Amanda C. McMellen used the normalized class usage in estimating the adjustment in class usage due to customer growth.

HOURLY NET SYSTEM LOADS

Q. What are hourly net system loads?

A. Hourly net system load is the hourly electric supply necessary to meet the energy demands of the company's customers and the company's own internal needs. It is net of (i.e., does not include) station use, which is the electricity requirement of the company's generating plants. The hourly loads used in my analysis of the test year, January 2005 through December 2005, were provided to Staff in response to Data Request numbers 35 and 36 and the respective supplements to those requests. I also used hourly load data submitted

by Aquila in response to the Commission's monthly reporting requirements in 4 CSR 240-3.190 to cross check and correct errors that were found in the data request response.

Q. What method did Staff use to weather normalize net system hourly loads?

A. Staff's weather normalization procedure was developed by the Economic Analysis Department of the Commission in 1988. The process is described in detail in the document "Weather Normalization of Electric Loads, Part A: Hourly Net System Loads" (November 28, 1990), written by Dr. Michael Proctor, Missouri Public Service Commission's Chief Economist.

Q. Briefly summarize the process you use.

A. In order to reflect normal weather, daily peak and average loads are adjusted independently, but using the same methodology. Independent adjustments are necessary because average loads respond differently to weather than peak loads.

Daily average load is calculated as the daily energy divided by twenty-four hours and the daily peak is the maximum hourly load for the day. Separate regression models estimate both a base component, which is allowed to fluctuate across time, and a weather sensitive component, which measures the response to daily fluctuations in weather for daily average loads and peak loads. The regression parameters, along with the difference between normal and actual cooling and heating measures, are used to calculate weather adjustments to both the average and peak loads for each day. The adjustments for each day are added respectively to the actual average and peak loads for each day. The starting point for allocating the weather normalized daily peak and average loads to the hours is the actual hourly loads. A unitized load curve is calculated for each day as a function of the actual peak and average loads for that day. The corresponding weather normalized daily peak and

average loads, along with the unitized load curves, are used to calculate weather normalized hourly loads.

This process includes many checks and balances, which are included in the spreadsheets that are used. In addition, the analyst is required to examine the data at several points in the process.

Q. Has this method been used in other rate cases?

A. Yes, this method has been used in several cases before this Commission. Please refer to Schedule SEL-7 for a list of these cases.

Q. What data was used in this process?

A. Actual hourly net system loads for the time period from October 1, 2003 through December 31, 2005 were provided by Aquila. The actual daily weather variables were supplied to me by Mr. Wells. I calculated the normal weather variables using a method developed by the staff in 1991. The process is described in the document "Weather Normalization of Electric Loads, Demonstration: Calculation of Weather Normals" (October 25, 1991), written by Martin Turner, former Staff manager, and Eve Lissik, former Staff engineer.

Q. Were modifications made to the test year weather normalized hourly net system loads to account for Staff adjustments to test year usage?

A. Yes. I adjusted the weather-normalized hourly net system loads to be consistent with Staff's weather-normalized, annualized test year usage.

Q. How were the hourly loads adjusted to account for the annual adjustments to usage?

A. I added company usage and weather normalized wholesale sales to Staff's weather-normalized, annualized test year usage. Then, I increased the annual usage adjustment by the loss factor supplied to me by Staff witness Erin L. Maloney in order to obtain the additional amount of generation (net system input) necessary to serve this additional usage. A factor was applied to each hour of the weather-normalized loads to produce an annual sum of the hourly net-system loads that equals the adjusted test year usage, consistent with normalized revenues, plus losses. A monthly summary of the adjusted loads is shown on Schedule SEL-5 and SEL-6.

Q. Which Staff witness used your hourly-normalized net system loads?

A. Staff witness David W. Elliott used the test year hourly normalized system loads in developing test year fuel and purchase power expense.

NORMAL WEATHER VARIABLES

Q. What did you use to represent normal weather in these calculations?

A. The normal weather used in both the normalization of class usage and hourly net system loads was calculated using Staff's ranking method and daily weather values for the time period January 1, 1971 through December 31, 2000. Staff's ranking method estimates daily normal values for the test year, which range from the temperature value that is "normally" the hottest to the temperature value that is "normally" the coldest.

Using ranked normals to estimate the weather adjustment to usage is important because electricity use does not respond to temperature by a constant factor. Customer response to a change in temperature of one degree from 70 to 71 is very different from a change in temperature of one degree from 90 to 91. The ranking method of calculating

normals allows for a more accurate estimate of changes in usage due to deviations from normal weather.

Using ranked normals is also important in estimating fuel and purchased power expense because these expenses are greatly impacted by daily weather extremes. Since every year has days with extreme temperatures, the daily normals should also contain extremes. The ranking method that was used estimates normal extremes.

Q. How are the daily normals derived?

A. The daily normal variables are calculated by ranking the temperatures in each year of the history. These temperatures are then averaged by rank, not by the day of the year. This results in the normal extreme being the average of the most extreme temperatures in each year of the history. The second extreme normal variable is based on the average of the second most extreme day of each year and so forth. The normal variables calculated from this ranking are then assigned to the days in the test year based on the rankings of the actual temperatures in the year. This assignment results in as little weather normalization occurring on each day as is possible.

Q. Who supplied the history of daily temperatures used in your calculation of daily normals?

A. Staff witness Curt Wells supplied the history of daily temperatures that I used in calculating the daily normal weather values.

DETERMINATION OF HOURLY STEAM LOADS

Q. What changes did you make to the steam loads before they were used in the Staff's production cost simulation (fuel) model?

A. A factor was applied to each hour of the base load shapes used in the last steam rate case, to produce a monthly sum of the hourly steam loads that equals the adjusted monthly test year usage. Staff witness David C. Roos supplied the adjusted monthly steam MMBtu sales for each customer.

Q. Which Staff witness uses these hourly steam loads?

A. Staff witness David W. Elliott used these hourly steam loads in estimating the normalized fuel and purchase power expenses for the test year.

Q. Does this conclude your direct testimony?

A. Yes, it does.

Testimony of Shawn E. Lange

Direct Testimony

ER-2005-0436	(Aquila Inc.)
ER-2006-0315	(Empire District Electric Company)
ER-2006-0314	(Kansas City Power & Light Company)
ER-2007-0002	(Union Electric Company d/b/a AmerenUE)

Rebuttal Testimony

ER-2005-0436	(Aquila Inc.)
ER-2006-0315	(Empire District Electric Company)

Surrebuttal Testimony

ER-2005-0436	(Aquila Inc.)
ER-2006-0314	(Kansas City Power & Light Company)

Aquila Networks L&P
Case No. ER-2007-0004
Actual and Weather Normalized Sales (kWh)
Jan-Dec 2005
Residential General Use (MO910)

Billing Month	Actual	Weather Norm	Weather Adj	% Weather Adj
Jan-05	28,115,722	28,999,223	883,501	3.14%
Feb-05	22,817,472	23,511,453	693,981	3.04%
Mar-05	21,659,586	22,293,231	633,645	2.93%
Apr-05	19,082,702	19,105,273	22,571	0.12%
May-05	18,140,040	18,376,873	236,833	1.31%
Jun-05	25,081,542	23,625,051	(1,456,491)	-5.81%
Jul-05	39,581,202	38,009,174	(1,572,028)	-3.97%
Aug-05	42,496,666	41,195,420	(1,301,246)	-3.06%
Sep-05	36,483,614	32,181,972	(4,301,642)	-11.79%
Oct-05	24,419,628	20,561,954	(3,857,674)	-15.80%
Nov-05	18,924,248	19,061,415	137,167	0.72%
Dec-05	24,226,842	24,692,477	465,635	1.92%
Total	321,029,264	311,613,516	(9,415,748)	-2.93%

Days Adjustment:	(1,697,457)	

Aquila Networks L&P
Case No. ER-2007-0004
Actual and Weather Normalized Sales (kWh)
Jan-Dec 2005
Residential General Use (MO911)

Billing Month	Actual	Weather Norm	Weather Adj	% Weather Adj
Jan-05	216,416	222,708	6,292	2.91%
Feb-05	159,969	165,735	5,766	3.60%
Mar-05	177,589	180,911	3,322	1.87%
Apr-05	147,426	148,291	865	0.59%
May-05	87,617	88,238	621	0.71%
Jun-05	290,129	269,412	(20,717)	-7.14%
Jul-05	293,848	286,123	(7,725)	-2.63%
Aug-05	262,928	252,187	(10,741)	-4.09%
Sep-05	307,814	266,603	(41,211)	-13.39%
Oct-05	189,364	160,790	(28,574)	-15.09%
Nov-05	148,830	154,721	5,891	3.96%
Dec-05	195,508	196,406	898	0.46%
Total	2,477,438	2,392,125	(85,313)	-3.44%

Days Adjustment:	(4,250)	

Aquila Networks L&P
Case No. ER-2007-0004
Actual and Weather Normalized Sales (kWh)
Jan-Dec 2005
Residential Water Heat (MO913)

Billing Month	Actual	Weather Norm	Weather Adj	% Weather Adj
Jan-05	9,133,766	9,462,142	328,376	3.60%
Feb-05	7,617,255	7,880,550	263,295	3.46%
Mar-05	7,079,127	7,321,808	242,681	3.43%
Apr-05	6,232,400	6,250,396	17,996	0.29%
May-05	5,497,480	5,590,928	93,448	1.70%
Jun-05	6,389,331	6,144,569	(244,762)	-3.83%
Jul-05	9,152,413	8,852,000	(300,413)	-3.28%
Aug-05	9,542,147	9,278,225	(263,922)	-2.77%
Sep-05	8,525,816	7,697,979	(827,837)	-9.71%
Oct-05	6,340,819	5,584,022	(756,797)	-11.94%
Nov-05	5,698,044	5,851,654	153,610	2.70%
Dec-05	7,573,947	7,741,716	167,769	2.22%
Total	88,782,545	87,655,989	(1,126,556)	-1.27%

Days Adjustment:	(487,260)	

Aquila Networks L&P
Case No. ER-2007-0004
Actual and Weather Normalized Sales (kWh)
Jan-Dec 2005
Residential Water Heat (MO914)

Billing Month	Actual	Weather Norm	Weather Adj	% Weather Adj
Jan-05	5,443	5,655	212	3.89%
Feb-05	4,659	4,794	135	2.90%
Mar-05	5,067	5,286	219	4.32%
Apr-05	3,899	3,899	0	0.00%
May-05	3,578	3,641	63	1.76%
Jun-05	3,573	3,461	(112)	-3.13%
Jul-05	6,456	6,228	(228)	-3.53%
Aug-05	7,562	7,391	(171)	-2.26%
Sep-05	9,062	8,189	(873)	-9.63%
Oct-05	7,112	6,210	(902)	-12.68%
Nov-05	7,807	7,918	111	1.42%
Dec-05	6,582	6,772	190	2.89%
Total	70,800	69,444	(1,356)	-1.92%

Days Adjustment:	334	

Aquila Networks L&P
Case No. ER-2007-0004
Actual and Weather Normalized Sales (kWh)
Jan-Dec 2005
Residential General Use (MO915)

Billing Month	Actual	Weather Norm	Weather Adj	% Weather Adj
Jan-05	743,214	767,232	24,018	3.23%
Feb-05	502,642	516,802	14,160	2.82%
Mar-05	369,705	381,574	11,869	3.21%
Apr-05	304,111	303,965	(146)	-0.05%
May-05	247,189	250,855	3,666	1.48%
Jun-05	261,350	247,549	(13,801)	-5.28%
Jul-05	456,450	436,227	(20,223)	-4.43%
Aug-05	575,797	562,051	(13,746)	-2.39%
Sep-05	464,770	416,170	(48,600)	-10.46%
Oct-05	627,371	526,099	(101,272)	-16.14%
Nov-05	863,508	850,515	(12,993)	-1.50%
Dec-05	614,438	631,250	16,812	2.74%
Total	6,030,545	5,890,289	(140,256)	-2.33%

Days Adjustment:	(109,193)	

Aquila Networks L&P
Case No. ER-2007-0004
Actual and Weather Normalized Sales (kWh)
Jan-Dec 2005
Residential Space Heat (MO920)

Billing Month	Actual	Weather Norm	Weather Adj	% Weather Adj
Jan-05	46,437,644	49,970,457	3,532,813	7.61%
Feb-05	38,829,504	42,050,959	3,221,455	8.30%
Mar-05	32,442,482	35,376,281	2,933,799	9.04%
Apr-05	22,891,165	23,200,392	309,227	1.35%
May-05	17,456,905	17,865,827	408,922	2.34%
Jun-05	17,577,997	17,202,351	(375,646)	-2.14%
Jul-05	23,265,510	22,734,913	(530,597)	-2.28%
Aug-05	23,943,216	23,399,478	(543,738)	-2.27%
Sep-05	21,834,186	20,215,662	(1,618,524)	-7.41%
Oct-05	17,158,212	16,086,379	(1,071,833)	-6.25%
Nov-05	19,628,834	21,391,623	1,762,789	8.98%
Dec-05	38,145,808	39,380,048	1,234,240	3.24%
Total	319,611,463	328,874,370	9,262,907	2.90%

Days Adjustment:	(2,183,490)	

Aquila Networks L&P
Case No. ER-2007-0004
Actual and Weather Normalized Sales (kWh)
Jan-Dec 2005
Residential Space Heat (MO921)

Billing Month	Actual	Weather Norm	Weather Adj	% Weather Adj
Jan-05	1,008,746	1,086,524	77,778	7.71%
Feb-05	863,046	927,985	64,939	7.52%
Mar-05	774,408	856,079	81,671	10.55%
Apr-05	567,023	571,792	4,769	0.84%
May-05	414,699	428,320	13,621	3.28%
Jun-05	372,485	365,281	(7,204)	-1.93%
Jul-05	480,636	467,710	(12,926)	-2.69%
Aug-05	483,802	474,574	(9,228)	-1.91%
Sep-05	452,051	422,679	(29,372)	-6.50%
Oct-05	385,410	356,761	(28,649)	-7.43%
Nov-05	440,215	468,511	28,296	6.43%
Dec-05	696,475	732,519	36,044	5.18%
Total	6,938,996	7,158,735	219,739	3.17%

Days Adjustment:	(65,828)	

Aquila Networks L&P
Case No. ER-2007-0004
Actual and Weather Normalized Sales (kWh)
Jan-Dec 2005
Residential Space Heat (MO922)

Billing Month	Actual	Weather Norm	Weather Adj	% Weather Adj
Jan-05	86,558	92,891	6,333	7.32%
Feb-05	62,871	68,412	5,541	8.81%
Mar-05	51,328	55,520	4,192	8.17%
Apr-05	33,384	33,953	569	1.70%
May-05	23,969	24,500	531	2.22%
Jun-05	29,935	29,185	(750)	-2.51%
Jul-05	44,467	43,561	(906)	-2.04%
Aug-05	48,001	46,785	(1,216)	-2.53%
Sep-05	38,818	35,850	(2,968)	-7.65%
Oct-05	22,975	21,644	(1,331)	-5.79%
Nov-05	25,521	28,120	2,599	10.18%
Dec-05	60,687	62,238	1,551	2.56%
Total	528,514	542,659	14,145	2.68%

Days Adjustment:	(5,281)	

Aquila Networks L&P
Case No. ER-2007-0004
Actual and Weather Normalized Sales (kWh)
Jan-Dec 2005
Small General Service (MO930)

Billing Month	Actual	Weather Norm	Weather Adj	% Weather Adj
Jan-05	2,471,457	2,555,341	83,884	3.39%
Feb-05	2,136,557	2,220,623	84,066	3.93%
Mar-05	1,837,931	1,919,781	81,850	4.45%
Apr-05	1,681,782	1,692,545	10,763	0.64%
May-05	1,429,185	1,443,903	14,718	1.03%
Jun-05	1,706,806	1,650,009	(56,797)	-3.33%
Jul-05	2,163,031	2,121,460	(41,571)	-1.92%
Aug-05	2,245,610	2,202,507	(43,103)	-1.92%
Sep-05	2,032,736	1,910,299	(122,437)	-6.02%
Oct-05	1,738,966	1,621,135	(117,831)	-6.78%
Nov-05	1,562,480	1,588,019	25,539	1.63%
Dec-05	2,157,973	2,202,940	44,967	2.08%
Total	23,164,514	23,128,562	(35,952)	-0.16%

Days Adjustment:	(122,277)	

Aquila Networks L&P
Case No. ER-2007-0004
Actual and Weather Normalized Sales (kWh)
Jan-Dec 2005
Small General Service (MO931)

Billing Month	Actual	Weather Norm	Weather Adj	% Weather Adj
Jan-05	3,796,335	3,926,321	129,986	3.42%
Feb-05	3,455,921	3,591,022	135,101	3.91%
Mar-05	3,327,596	3,481,963	154,367	4.64%
Apr-05	3,223,440	3,244,052	20,612	0.64%
May-05	3,282,368	3,316,284	33,916	1.03%
Jun-05	4,104,855	3,968,317	(136,538)	-3.33%
Jul-05	5,160,627	5,060,434	(100,193)	-1.94%
Aug-05	5,298,032	5,197,403	(100,629)	-1.90%
Sep-05	4,952,741	4,657,341	(295,400)	-5.96%
Oct-05	3,888,976	3,621,865	(267,111)	-6.87%
Nov-05	3,268,285	3,321,621	53,336	1.63%
Dec-05	3,893,048	3,978,830	85,782	2.20%
Total	47,652,224	47,365,453	(286,771)	-0.60%

Days Adjustment:	25,548	

Aquila Networks L&P
Case No. ER-2007-0004
Actual and Weather Normalized Sales (kWh)
Jan-Dec 2005
Small General Service (MO932)

Billing Month	Actual	Weather Norm	Weather Adj	% Weather Adj
Jan-05	568,150	587,242	19,092	3.36%
Feb-05	514,019	533,580	19,561	3.81%
Mar-05	423,828	444,150	20,322	4.79%
Apr-05	311,110	313,245	2,135	0.69%
May-05	266,356	268,971	2,615	0.98%
Jun-05	290,421	281,139	(9,282)	-3.20%
Jul-05	353,723	346,569	(7,154)	-2.02%
Aug-05	360,579	353,958	(6,621)	-1.84%
Sep-05	307,099	289,485	(17,614)	-5.74%
Oct-05	214,498	200,293	(14,205)	-6.62%
Nov-05	230,126	234,677	4,551	1.98%
Dec-05	433,885	441,885	8,000	1.84%
Total	4,273,794	4,295,194	21,400	0.50%

Days Adjustment:	(63,496)

Aquila Networks L&P
Case No. ER-2007-0004
Actual and Weather Normalized Sales (kWh)
Jan-Dec 2005
Small General Service (MO933)

Billing Month	Actual	Weather Norm	Weather Adj	% Weather Adj
Jan-05	2,722,944	2,816,428	93,484	3.43%
Feb-05	2,463,786	2,557,667	93,881	3.81%
Mar-05	2,096,992	2,195,924	98,932	4.72%
Apr-05	1,696,438	1,707,703	11,265	0.66%
May-05	1,481,099	1,496,426	15,327	1.03%
Jun-05	1,608,243	1,555,563	(52,680)	-3.28%
Jul-05	1,883,277	1,845,648	(37,629)	-2.00%
Aug-05	2,004,619	1,966,732	(37,887)	-1.89%
Sep-05	1,839,191	1,730,031	(109,160)	-5.94%
Oct-05	1,522,229	1,417,537	(104,692)	-6.88%
Nov-05	1,525,363	1,550,702	25,339	1.66%
Dec-05	2,178,372	2,226,392	48,020	2.20%
Total	23,022,553	23,066,753	44,200	0.19%

Days Adjustment:	(128,333)

Aquila Networks L&P
Case No. ER-2007-0004
Actual and Weather Normalized Sales (kWh)
Jan-Dec 2005
Small General Service (MO934)

Billing Month	Actual	Weather Norm	Weather Adj	% Weather Adj
Jan-05	423,134	438,484	15,350	3.63%
Feb-05	364,636	377,318	12,682	3.48%
Mar-05	351,274	368,669	17,395	4.95%
Apr-05	296,450	298,803	2,353	0.79%
May-05	261,582	264,498	2,916	1.11%
Jun-05	329,324	318,670	(10,654)	-3.24%
Jul-05	550,047	538,483	(11,564)	-2.10%
Aug-05	617,840	607,268	(10,572)	-1.71%
Sep-05	521,063	491,469	(29,594)	-5.68%
Oct-05	380,923	352,761	(28,162)	-7.39%
Nov-05	247,336	250,993	3,657	1.48%
Dec-05	346,556	355,575	9,019	2.60%
Total	4,690,165	4,662,991	(27,174)	-0.58%

Days Adjustment:	(30,423)	

Aquila Networks L&P
Case No. ER-2007-0004
Actual and Weather Normalized Sales (kWh)
Jan-Dec 2005
Large General Service (MO940)

Billing Month	Actual	Weather Norm	Weather Adj	% Weather Adj
Jan-05	34,484,115	35,076,880	592,765	1.72%
Feb-05	30,179,485	31,002,818	823,333	2.73%
Mar-05	29,213,855	30,163,439	949,584	3.25%
Apr-05	27,291,920	27,411,353	119,433	0.44%
May-05	28,115,500	28,118,392	2,892	0.01%
Jun-05	32,449,429	31,884,576	(564,853)	-1.74%
Jul-05	34,987,497	34,622,019	(365,478)	-1.04%
Aug-05	37,170,628	36,838,045	(332,583)	-0.89%
Sep-05	35,732,478	34,573,174	(1,159,304)	-3.24%
Oct-05	33,250,891	32,064,249	(1,186,642)	-3.57%
Nov-05	28,730,722	28,717,723	(12,999)	-0.05%
Dec-05	31,334,348	31,459,710	125,362	0.40%
Total	382,940,868	381,932,378	(1,008,490)	-0.26%

Days Adjustment:	(2,586,295)	

Aquila Networks L&P
Case No. ER-2007-0004
Actual and Weather Normalized Sales (kWh)
Jan-Dec 2005
Small General Service (MO941)

Billing Month	Actual	Weather Norm	Weather Adj	% Weather Adj
Jan-05	370,676	383,535	12,859	3.47%
Feb-05	365,810	378,794	12,984	3.55%
Mar-05	297,183	311,240	14,057	4.73%
Apr-05	216,042	217,581	1,539	0.71%
May-05	153,749	155,543	1,794	1.17%
Jun-05	138,744	134,197	(4,547)	-3.28%
Jul-05	161,840	158,559	(3,281)	-2.03%
Aug-05	203,938	200,148	(3,790)	-1.86%
Sep-05	176,653	166,526	(10,127)	-5.73%
Oct-05	160,857	149,606	(11,251)	-6.99%
Nov-05	171,936	175,639	3,703	2.15%
Dec-05	288,355	294,222	5,867	2.03%
Total	2,705,783	2,725,590	19,807	0.73%

Days Adjustment:	(7,605)

Aquila Networks MPS
Case No. ER-2007-0004
Actual and Weather Normalized Sales (kWh)
Jan-Dec 2005
Small General Service (MO710 & MO711)

Billing Month	Actual	Weather Norm	Weather Adj	% Weather Adj
Jan-05	66,541,092	68,094,475	1,553,383	2.33%
Feb-05	59,746,917	61,387,312	1,640,395	2.75%
Mar-05	58,206,112	59,623,623	1,417,511	2.44%
Apr-05	54,348,938	54,279,015	(69,923)	-0.13%
May-05	55,390,866	55,226,862	(164,004)	-0.30%
Jun-05	65,231,621	63,337,397	(1,894,224)	-2.90%
Jul-05	76,120,453	74,921,332	(1,199,121)	-1.58%
Aug-05	78,988,079	77,707,571	(1,280,508)	-1.62%
Sep-05	74,583,338	70,558,281	(4,025,057)	-5.40%
Oct-05	61,500,091	57,321,487	(4,178,604)	-6.79%
Nov-05	53,200,071	53,336,816	136,745	0.26%
Dec-05	60,439,629	60,980,759	541,130	0.90%
Total	764,297,207	756,774,930	(7,522,277)	-0.98%

Days Adjustment:	(3,022,554)

Aquila Networks MPS
Case No. ER-2007-0004
Actual and Weather Normalized Sales (kWh)
Jan-Dec 2005
Large General Service (MO720)

Billing Month	Actual	Weather Norm	Weather Adj	% Weather Adj
Jan-05	61,166,660	62,106,086	939,426	1.54%
Feb-05	63,017,856	64,330,911	1,313,055	2.08%
Mar-05	58,255,969	59,705,244	1,449,275	2.49%
Apr-05	61,306,592	61,171,191	(135,401)	-0.22%
May-05	62,134,664	61,727,890	(406,774)	-0.65%
Jun-05	69,779,746	68,471,500	(1,308,246)	-1.87%
Jul-05	76,525,293	75,852,541	(672,752)	-0.88%
Aug-05	80,955,076	80,149,401	(805,675)	-1.00%
Sep-05	80,194,728	77,351,039	(2,843,689)	-3.55%
Oct-05	69,910,687	67,162,332	(2,748,355)	-3.93%
Nov-05	62,398,852	62,103,977	(294,875)	-0.47%
Dec-05	65,785,146	65,985,023	199,877	0.30%
Total	811,431,269	806,117,135	(5,314,134)	-0.65%

Days Adjustment:	(513,119)

Aquila Networks MPS
Case No. ER-2007-0004
Actual and Weather Normalized Sales (kWh)
Jan-Dec 2005
Schools and Churches (MO740)

Billing Month	Actual	Weather Norm	Weather Adj	% Weather Adj
Jan-05	2,475,362	2,605,400	130,038	5.25%
Feb-05	2,369,546	2,488,026	118,480	5.00%
Mar-05	2,224,033	2,338,628	114,595	5.15%
Apr-05	1,926,067	1,939,754	13,687	0.71%
May-05	1,852,345	1,860,801	8,456	0.46%
Jun-05	2,387,862	2,271,285	(116,577)	-4.88%
Jul-05	3,191,513	3,106,101	(85,412)	-2.68%
Aug-05	3,607,269	3,528,292	(78,977)	-2.19%
Sep-05	3,373,628	3,089,685	(283,943)	-8.42%
Oct-05	2,563,370	2,238,667	(324,703)	-12.67%
Nov-05	1,911,656	1,925,928	14,272	0.75%
Dec-05	2,302,757	2,341,635	38,878	1.69%
Total	30,185,408	29,734,202	(451,206)	-1.49%

Days Adjustment:	(63,045)	

Aquila Networks MPS
Case No. ER-2007-0004
Actual and Weather Normalized Sales (kWh)
Jan-Dec 2005
Residential General Use (MO860)

Billing Month	Actual	Weather Norm	Weather Adj	% Weather Adj
Jan-05	136,362,146	140,974,201	4,612,055	3.38%
Feb-05	116,785,076	120,473,671	3,688,595	3.16%
Mar-05	109,997,594	114,039,887	4,042,293	3.67%
Apr-05	100,530,009	100,348,998	(181,011)	-0.18%
May-05	97,018,418	97,142,150	123,732	0.13%
Jun-05	141,178,657	131,937,524	(9,241,133)	-6.55%
Jul-05	211,211,774	203,583,973	(7,627,801)	-3.61%
Aug-05	224,090,237	217,481,718	(6,608,519)	-2.95%
Sep-05	196,586,563	175,362,318	(21,224,245)	-10.80%
Oct-05	133,928,860	112,467,793	(21,461,067)	-16.02%
Nov-05	99,199,177	98,814,735	(384,442)	-0.39%
Dec-05	121,853,794	123,752,962	1,899,168	1.56%
Total	1,688,742,305	1,636,379,930	(52,362,375)	-3.10%

Days Adjustment:	(4,650,780)	

Aquila Networks MPS
Case No. ER-2007-0004
Actual and Weather Normalized Sales (kWh)
Jan-Dec 2005
Residential Space Heat (MO870)

Billing Month	Actual	Weather Norm	Weather Adj	% Weather Adj
Jan-05	110,143,100	117,596,084	7,452,984	6.77%
Feb-05	100,006,868	107,003,483	6,996,615	7.00%
Mar-05	82,274,382	89,043,022	6,768,640	8.23%
Apr-05	64,789,773	65,169,206	379,433	0.59%
May-05	51,771,874	52,317,383	545,509	1.05%
Jun-05	60,569,611	57,468,112	(3,101,499)	-5.12%
Jul-05	83,195,310	80,511,226	(2,684,084)	-3.23%
Aug-05	88,146,874	85,965,320	(2,181,554)	-2.47%
Sep-05	80,458,313	73,012,359	(7,445,954)	-9.25%
Oct-05	60,009,454	53,770,943	(6,238,511)	-10.40%
Nov-05	57,489,087	61,492,649	4,003,562	6.96%
Dec-05	99,053,212	102,867,277	3,814,065	3.85%
Total	937,907,858	946,217,064	8,309,206	0.89%

Days Adjustment:	(741,680)	

AQUILA NETWORKS - L&P
COMPONENTS OF ANNUAL NET SYSTEM INPUT
ER-2007-0004

	Energy (kwh) As Billed	Annualizations to kWh sales	Normalization for Weather	Additional kWh from Cust Growth & Large Power	Total L&P Normalized kWh
Retail	1,915,179,254	(7,365,303)	(2,545,418)	107,248,724	2,012,517,257
Company Use	4,272,292	-	-	-	4,272,292
NSI w/o losses	1,919,451,546	(7,365,303)	(2,545,418)	107,248,724	2,016,789,549

Losses: 8.45%

Total NSI: 2,202,937,792 kwh

AQUILA NETWORKS - MPS
COMPONENTS OF ANNUAL NET SYSTEM INPUT
ER-2007-0004

	Energy (kwh) As Billed	Annualizations to kWh sales	Normalization for Weather	Additional kWh from Cust Growth & Large Power	Total MPS Normalized kWh
Retail	5,665,263,707	(32,777,999)	(57,340,786)	158,425,077	5,733,569,999
Wholesale	31,697,374	-	(366,579)	-	31,330,795
Company Use	8,899,837	-	-	-	8,899,837
NSI w/o losses	5,705,860,918	(32,777,999)	(57,707,365)	158,425,077	5,773,800,631
Losses:	6.63%				
Total NSI:	6,183,785,617	kwh			

AQUILA NETWORKS - L&P
NET SYSTEM LOAD
NORMALIZED FOR CALENDAR YEAR 2005*
ER-2007-0004

	Monthly Usage (MWh)				Monthly Peaks (MW)				Load Factor	
Month	Actual	Normal	Adj	% Adj	Actual	Normal	Adj	% Adj	Actual	Normal
Jan-05	197,011	215,293	18,282	9.28%	357	399	42	11.87%	0.74	0.72
Feb-05	155,928	177,071	21,143	13.56%	323	375	52	15.97%	0.72	0.70
Mar-05	159,874	172,272	12,398	7.75%	299	336	37	12.45%	0.72	0.69
Apr-05	138,324	148,396	10,072	7.28%	242	273	31	12.78%	0.79	0.76
May-05	147,759	155,506	7,747	5.24%	287	318	31	10.82%	0.69	0.66
Jun-05	181,534	189,273	7,739	4.26%	392	414	22	5.65%	0.64	0.63
Jul-05	204,534	218,360	13,826	6.76%	409	432	23	5.73%	0.67	0.68
Aug-05	198,457	207,760	9,303	4.69%	403	429	26	6.41%	0.66	0.65
Sep-05	172,600	172,771	171	0.10%	350	367	17	4.89%	0.68	0.65
Oct-05	155,942	162,244	6,302	4.04%	336	291	(45)	-13.34%	0.62	0.75
Nov-05	157,148	173,588	16,440	10.46%	308	335	27	8.87%	0.71	0.72
Dec-05	197,922	210,405	12,483	6.31%	374	395	21	5.64%	0.71	0.72
Annual	2,067,033	2,202,938	135,905	6.57%	409	432	23	5.73%	0.58	0.58

* Normalized for weather, growth, large customers, and including losses

AQUILA NETWORKS - MPS
NET SYSTEM LOAD
NORMALIZED FOR CALENDAR YEAR 2005*
ER-2007-0004

	Monthly Usage (MWh)				Monthly Peaks (MW)				Load Factor	
Month	Actual	Normal	Adj	% Adj	Actual	Normal	Adj	% Adj	Actual	Normal
Jan-05	529,928	553,198	23,270	4.39%	937	989	52	5.52%	0.76	0.75
Feb-05	431,280	465,038	33,758	7.83%	875	953	78	8.89%	0.73	0.73
Mar-05	448,654	462,300	13,646	3.04%	791	839	48	6.05%	0.76	0.74
Apr-05	397,431	403,465	6,034	1.52%	749	729	(20)	-2.70%	0.74	0.77
May-05	452,943	454,830	1,887	0.42%	1,019	1,056	37	3.64%	0.60	0.58
Jun-05	578,215	574,502	(3,713)	-0.64%	1,317	1,329	12	0.89%	0.61	0.60
Jul-05	663,340	677,890	14,550	2.19%	1,422	1,457	35	2.48%	0.63	0.63
Aug-05	642,730	641,121	(1,609)	-0.25%	1,403	1,415	12	0.88%	0.62	0.61
Sep-05	542,469	507,546	(34,923)	-6.44%	1,199	1,180	(19)	-1.62%	0.63	0.60
Oct-05	442,250	434,717	(7,533)	-1.70%	1,073	828	(245)	-22.82%	0.55	0.71
Nov-05	438,138	459,517	21,379	4.88%	906	949	43	4.72%	0.67	0.67
Dec-05	539,057	549,661	10,604	1.97%	1,048	1,064	16	1.56%	0.69	0.69
Annual	6,106,435	6,183,786	77,351	1.27%	1,422	1,457	35	2.48%	0.49	0.48

* Normalized for weather, growth, large customers, and including losses

Cases in Which Staff's Weather Normalization Method Was Used
in the Normalization of Net System Loads

EO-87-175	ER-94-163	EM-2000-292
EO-90-101	ER-94-174	ER-2001-299
EO-90-138	ER-95-279	ER-2001-672
ER-93-37	ER-97-81	EC-2002-1
ER-93-41	EM-97-575	ER-2002-424
EO-93-351	ER-2004-0034	ER-2004-0570
ER-2005-0436	ER-2006-0314	ER-2006-0315
ER-2007-0002		