Exhibit No.:	
Issues:	Normalized Sales and Net System Input
Witness:	Lena M. Mantle
Sponsoring Party:	MoPSC Staff
Type of Exhibit:	Direct Testimony
Case No.:	EC-2002-1
Date Testimony Prepared:	March 1, 2002

MISSOURI PUBLIC SERVICE COMMISSION

UTILITY OPERATIONS DIVISION

DIRECT TESTIMONY

OF

LENA M. MANTLE

UNION ELECTRIC d/b/a

AMERENUE

CASE NO. EC-2002-1

Jefferson City, Missouri
March 1, 2002

Exhibit No. 22
Date 7/10/02 Case No. EC-2002-1
Reporter KLM

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DIRECT TESTIMONY

OF

LENA M. MANTLE

UNION ELECTRIC COMPANY

d/b/a AMERENUE

CASE NO. EC-2002-1

Q. Please state your name and business address.

A. My name is Lena M. Mantle and my business address is Missouri Public Service Commission, P. O. Box 360, Jefferson City, Missouri 65102.

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

A. I am the Regulatory Engineering Supervisor of the Engineering Analysis section of the Energy Department, Utility Operations Division.

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

A. I received a Bachelor of Science Degree in Industrial Engineering from the University of Missouri, at Columbia, in May 1983. I joined the Commission Staff (Staff) in August 1983. I have been weather normalizing monthly electricity usage and hourly loads in rate cases, rate design cases and revenue complaint cases for the Staff since 1988. I am a registered Professional Engineer in the State of Missouri.

Q. Have you previously filed testimony before this Commission?

A. Yes, I have. Please refer to Schedule 1, attached to this direct testimony, for a list of cases in which I have previously filed testimony.

Q. Have you previously filed testimony in this case?

A. Yes, I have.

Q. What is the purpose of your direct testimony?

A. The purpose of my testimony is to recommend that the Commission adopt the weather and days adjustments to customer usage and the normalized hourly net system loads for Union Electric Company d/b/a AmerenUE (UE) and total Ameren system that are summarized in Schedules 2 through 4 attached to my testimony. My testimony describes the weather adjustments to monthly usage and how I normalized hourly net systems loads. These are the same issues that I addressed in my earlier testimony in this case.

WEATHER NORMALIZATION ADJUSTMENT TO CUSTOMER USAGE

Q. What are the results of the weather normalization analysis?

A. The weather normalization analysis shows that the usage in the test year was greater than it would have been, given normal weather. Of the summer months in the test year, July 2000 was cooler than normal and the months of August 2000, September 2000 and June 2001 were hotter than normal resulting in a net negative summer adjustment. While the winter months of January 2001 and February 2001 were warmer than normal, the adjustments due to the extreme cold that occurred in December 2000 resulted in a net negative adjustment for the non-summer months.

Q. Why is it necessary to adjust customer usage for deviations from normal weather?

A. Electricity use is very sensitive to weather conditions. The magnitude of customer usage for both UE and Ameren is directly related to daily temperatures due to a high percentage of customers that have air conditioning in the summer and due to the presence of electric space heating in the winter.

Q. Did you independently perform a weather impact analysis on customer usage in this investigation?

A. No. I reviewed the results of UE's weather analysis of the twelve months ending June 2001 and found the adjustments due to deviations from normal weather to be reasonable.

Q. Why did you not conduct an independent analysis?

A. I worked closely in the past with UE in the development of its weather normalization methods and inputs. Staff has subsequently used the same method in four rate cases. I have found that the method and results are reasonable.

Q. Are there benefits in using this method other than estimating an adjustment to usage due to deviations from normal weather?

A. Yes, there are. This method also provides an estimate of the adjustment necessary to convert the billing month sales, which is how customer meters are read, to calendar month sales. This adjustment is what is referred to as the days adjustment. I recommend that the Commission adopt the weather and days adjustments as supplied by Ameren and shown on Schedule 2 attached to my testimony.

Q. Which Staff witness used the weather and days adjustments?

A. Staff witness Janice Pyatte of the Commission's Energy Department included the adjustments in determining the UE normalized, test year, Missouri kWh sales. Ms.

Pyatte also calculated adjustments to revenue that correspond to these adjustments to customer usage.

NORMALIZATION ADJUSTMENTS TO HOURLY NET SYSTEM LOADS

Q. What was the starting point of your analysis of net system hourly loads?

A. I began my analysis with hourly net system loads for UE and Ameren, as supplied in response to Staff data request 2910. The temperature values that I used were from the St. Louis Airport National Oceanic and Atmospheric Association (NOAA) site with modifications. Staff and UE have agreed to these modifications in prior cases.

Q. What are net system loads?

A. Net system load is the hourly electric supply necessary to meet the energy demands of the customers and the company's internal needs. It does not contain station use, which is the electricity requirement of the generating plants that is required by the plants to generate energy. The hourly loads provided by UE for my analysis of the test year July 2000 through June 2001 were net system loads so no adjustment for station use was required.

Q. Why was it necessary to normalize the net system loads of both Ameren and UE?

A. As a part of the merger of UE with Central Illinois Public Service Company, UE signed a joint dispatch agreement (JDA) regarding the dispatch of the generation resources of each utility and the costs associated with the generation. With the advent of deregulation in Illinois, the JDA is now between UE and Ameren Energy Generating (AEG), the exempt wholesale generator that supplies energy and capacity for Ameren Energy Marketing (AEM). To get an accurate representation of the costs of fuel and purchase power

to meet UE's loads, it is necessary to model the loads of UE, AEM and total Ameren. I normalized the hourly loads of UE and total Ameren. AEM loads are the difference between Ameren and UE's loads.

Q. Over what time period did you normalize hourly loads?

A. I normalized the hourly loads for the test year of July 2000 through June 2001.

Q. What normalization adjustments did you make to the hourly loads?

A. The UE hourly loads supplied by Ameren contain the loads of some wholesale customers that are now customers of AEM but were previously wholesale customers of UE. In addition, there is some usage by customers in the AEM hourly loads that are not AEM customers. To estimate the fuel and purchase power expenses of UE and Ameren, the loads that are input into the production cost model must be only the load requirements of UE and Ameren. Therefore, I removed AEM's wholesale customers' loads from the UE hourly loads and the non-AEM customer usage from the Ameren loads. The loads of the AEM wholesale customers in Missouri remain in the Ameren hourly loads since AEM is required to serve these loads.

I also adjusted both the UE and Ameren data for deviations from normal weather and made adjustments to the Ameren loads to reflect the acquisition of a large customer, Archer-Daniels-Midland (ADM), by AEM in August 2000. The final adjustment that I made to the UE hourly loads was to reconcile the loads to the normalized kWh sales shown on Schedule 2 of Ms. Pyatte's testimony. These adjustments are described in greater detail later in my testimony. Summaries of the UE and Ameren hourly loads before and after normalization adjustments are shown on my Schedules 3 and 4.

Q. How did you remove the AEM wholesale customers loads from the UE hourly loads?

A. I received hourly loads for these customers from Ameren. I applied a loss percentage of 3.57% to these hourly loads and then removed them from UE's hourly loads prior to weather normalizing UE's net system loads. The same method was used to remove the non-AEM customer's loads from Ameren's hourly loads.

Q. What method did you use to weather normalize UE and Ameren's hourly net system loads?

A. The weather normalization procedure that I used was developed by the Economic Analysis Department of the Commission in 1989. 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 of the Commission.

Q. Briefly summarize the process you used.

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 a weather adjustment to both

the average and peak loads for each day. The adjustments for each day are added 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 incorporates many input and output data checks along with requiring the analyst to examine the data and results for reasonableness at several points in the process.

Q. Has this process been used in other cases?

A. Yes, it has. This method has been used to weather normalize net system load in several cases before this Commission. Please refer to Schedule 5 for a listing of these cases.

Q. How did you adjust the loads for ADM?

A. Ameren supplied the hourly loads for ADM for the time period of August 3, 2000 through June 30, 2001. As stated previously, I removed this load plus losses from the Ameren hourly loads prior to weather normalizing the Ameren loads. After I weather normalized Ameren's hourly loads, I added ADM's loads with losses to the weather normalized hourly loads. To account for the loads of ADM from July 1, 2000 through August 2, 2000, I estimated hourly loads and added these loads along with losses to the weather normalized loads.

Q. How did you estimate ADM's loads for July 1, 2000 through August 2, 2000?

A. First, I looked at the actual hourly data for ADM that was supplied by Ameren, and determined that ADM's usage was not weather-sensitive. Therefore, I was able to use the hourly data supplied by Ameren to "create" loads for July 1, 2000 through August 2, 2000. As part of the process of creating these loads, I took into account the day of the week and the time of the year.

Q. How did you adjust the hourly load to reconcile the net system loads to the normalized kWh sales as presented by Ms. Pyatte?

A. I took the adjusted customer usage for UE Missouri retail that Ms. Pyatte supplied and added the weather adjusted UE Illinois usage, the weather adjusted Missouri wholesale usage, the usage of customers that transferred to cooperatives in territorial agreements, and Company usage to obtain total UE requirements. Ameren supplied the weather adjustments to UE's Illinois usage and the wholesale customers in response to Staff Data Request 2914. Staff Witness Doyle Gibbs supplied the usage of the territorial agreement customers.

In order to obtain the amount of generation necessary to meet this usage, I multiplied this annual usage by the annual loss factor as supplied to me by Staff witness Alan Bax of the Commission's Energy Department. The ratio of this generation requirement to the sum of the normalized UE hourly loads for the test year was applied to each hourly load. This resulted in the annual sum of UE's hourly loads being equal to the adjusted test year usage plus losses.

Q. Did you make any similar adjustments to Ameren's hourly loads?

A. I only made one reconciliation adjustment to Ameren's hourly loads. I increased the Ameren normalized hourly loads by the amount of annual usage of the customers that transferred in the territorial agreements.

Q. How were the hourly normalized loads used?

A. Staff witness Leon Bender, also of the Commission's Energy Department, used the test year hourly normalized net system loads as an input to the production cost model, which Staff used to develop the normalized level of fuel expense.

NORMAL WEATHER

Q. What did you use to represent normal weather in the weather normalization of net system loads?

A. The normal weather was calculated using Staff's ranking method and the agreed to daily weather values for the time period January 1, 1961 through December 31, 1990. Staff's ranking method estimates daily normal values for the year, which range from the temperature value that is "normally" the hottest to the temperature value that is "normally" the coldest. This is important in estimating generation costs because these costs are greatly impacted by daily weather extremes. Since every year normally has some days with extreme temperatures, the daily normal variables should also contain some extremes. The ranking method that I used estimates normal extremes.

Q. How are these extremes derived?

A. The calculation of daily normal values begins with ranking the actual mean daily temperatures in each year of the history from hottest to coldest. These actual mean daily temperatures are then averaged across the rank, not the day of the year. This results in

the normal extreme being the average of the most extreme mean daily temperatures in each year of the history. The second extreme normal value is based on the average of the second most extreme day of each year and so forth. The normal values calculated from this ranking are then assigned to the days in the test year based on the rankings of the actual mean daily temperatures in the year. This minimizes the weather normalization occurring on each day.

Q. Does this conclude your direct testimony?

A. Yes, it does.

BEFORE THE PUBLIC SERVICE COMMISSION

OF THE STATE OF MISSOURI

The Staff of the Missouri Public Service Commission, Complainant,	)	
vs.	)	Case No. EC-2002-1
Union Electric Company, d/b/a AmerenUE, Respondent.	)	

AFFIDAVIT OF LENA M. MANTLE

STATE OF MISSOURI)
) **ss**
COUNTY OF COLE)

Lena M. Mantle, of lawful age, on her oath states: that she has participated in the preparation of the foregoing written Direct Testimony in question and answer form, consisting of 10 pages of testimony to be presented in the above case, that the answers in the attached written Direct Testimony were given by her; that she has knowledge of the matters set forth in such answers; and that such matters are true to the best of her knowledge and belief.

Lena M Mantle
Lena M. Mantle

Subscribed and sworn to before me this 28th day of February, 2002.

Dawn L. Hake
Notary Public

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

My commission expires _____

PREVIOUS TESTIMONY OF
LENA M. MANTLE

CASE NUMBER	TYPE OF TESTIMONY	ISSUES
ER-84-105	Direct	Demand-Side Update
ER-85-20	Direct	Demand-Side Update
ER-85-128, et. al	Direct	PURPA Standards
EC-87-114, et. al.	Surrebuttal	Annualization & Normalization of Sales
EO-90-101	Direct, Rebuttal, and Surrebuttal	Weather Normalization of Sales Normalization of Net System
ER-90-138	Direct	Normalization of Net System
EO-90-251	Rebuttal	Promotional Practice Variance
EO-91-74, et. al.	Direct	Weather Normalization of Class Sales Normalization of Net System
ER-93-37	Direct	Weather Normalization of Class Loads Normalization of Net System
ER-94-163	Direct	Normalization of Net System
ER-94-174	Direct	Weather Normalization of Class Sales Normalization Net System
EO-94-199	Direct	Weather Normalization of Sales
ET-95-209	Rebuttal and Surrebuttal	New Construction Pilot
ER-95-279	Direct	Normalization of Net System
ER-97-81	Direct	Weather Normalization of Class Hourly Loads, TES Tariff, Normalization of Net System

PREVIOUS TESTIMONY
OF LENA M. MANTLE (cont.)

CASE NUMBER	TYPE OF TESTIMONY	ISSUES
EO-97-144	Direct	Weather Normalization of Class Loads Normalization of Net System
ER-97-394, et. al.	Direct, Rebuttal and Surrebuttal	Weather Normalization of Class Loads Normalization of Net System Energy Audit Tariff
EM-97-575	Direct	Normalization of Net System
EM-2000-292	Direct	Normalization of Net System Load Research
ER-2001-299	Direct	Weather Normalization of Class Loads Normalization of Net System
EM-2000-369	Direct	Load Research
ER-2002-1	Direct	Weather Normalization of Class Loads Normalization of Net System
ER-2001-672	Direct and Rebuttal	Weather Normalization of Class Loads Normalization of Net System
EC-2002-1	Direct	Weather Normalization of Class Loads Normalization of Net System

Weather and Days Adjustment to Class Usage
June 2000 through July 2001
MWh

	Residential	Small General Service	Large General Service	Small Power	Large Power
Jul-00	23,514	2,563	2,648	1,114	388
Aug-00	(106,220)	(11,939)	(11,329)	(4,493)	(2,598)
Sep-00	(223,395)	(24,788)	(26,088)	(10,101)	(2,890)
Oct-00	(51,563)	(8,198)	(10,748)	(4,239)	(1,763)
Nov-00	(18,185)	(8,007)	(16,992)	(5,905)	(1,328)
Dec-00	(100,647)	(16,694)	(20,889)	(3,227)	(276)
Jan-01	(85,991)	(14,169)	(22,760)	(2,612)	(175)
Feb-01	45,876	7,948	9,324	2,284	243
Mar-01	6,694	2,424	3,576	933	181
Apr-01	(24,280)	(5,157)	(8,277)	(3,632)	(2,349)
May-01	(69,612)	(14,875)	(22,906)	(8,461)	(3,827)
Jun-01	(66,588)	(10,582)	(13,848)	(4,735)	(1,453)
Total	(670,397)	(101,474)	(138,289)	(43,074)	(15,847)
Summer	(372,689)	(44,746)	(48,617)	(18,215)	(6,553)
Other	(297,708)	(56,728)	(89,672)	(24,859)	(9,294)
Days Adjustment	17,795	(2,395)	15,387	(21,831)	21,396

AmerenUE
Net System Load
Normalized Year Ending 6/2001
EC-2002-1

Month	Monthly Usage (MWh)				Monthly Peaks (MW)				Load Factor	
	Actual	Normal	Adj	% Adj	Actual	Normal	Wthr Adj	% Adj	Actual	Normal
Jul-00	3,780,752	3,974,140	193,388	5.12%	7,665	8,051	386.76	5.05%	0.663007	0.663442
Aug-00	4,110,878	3,866,755	(244,123)	-5.94%	8,084	7,789	(294.98)	-3.65%	0.683476	0.667235
Sep-00	3,192,776	3,141,915	(50,861)	-1.59%	7,782	7,469	(313.59)	-4.03%	0.569800	0.584266
Oct-00	2,846,767	2,764,503	(82,264)	-2.89%	5,854	5,653	(201.06)	-3.43%	0.653592	0.657279
Nov-00	2,974,838	2,823,001	(151,837)	-5.10%	5,416	5,248	(167.47)	-3.09%	0.762920	0.747083
Dec-00	3,710,118	3,339,781	(370,337)	-9.98%	6,319	6,007	(311.56)	-4.93%	0.789168	0.747238
Jan-01	3,467,352	3,489,353	22,001	0.63%	5,974	6,134	160.17	2.68%	0.780099	0.764551
Feb-01	2,947,146	2,962,795	15,649	0.53%	5,918	5,990	71.21	1.20%	0.741023	0.736101
Mar-01	3,028,347	2,946,414	(81,933)	-2.71%	5,087	5,141	53.74	1.06%	0.800082	0.770298
Apr-01	2,700,064	2,571,965	(128,099)	-4.74%	5,617	4,884	(733.01)	-13.05%	0.667637	0.731410
May-01	2,986,997	2,844,408	(142,589)	-4.77%	6,736	6,028	(708.62)	-10.52%	0.595990	0.634260
Jun-01	3,371,111	3,435,572	64,461	1.91%	7,309	7,352	43.15	0.59%	0.640598	0.649016
Annual	39,117,146	38,160,602	(956,544)	-2.45%	8,084	8,051	(32.90)	-0.41%	0.552363	0.541058
Summer	14,455,517	14,418,383	(37,135)	-0.26%	8,084	8,051	(32.90)	-0.41%	0.610695	0.611615
Other	24,661,628	23,742,219	(919,409)	-3.73%	6,736	6,134	(602.02)	-8.94%	0.627742	0.663649

Schedule 3

Total Ameren
Net System Load
Normalized Year Ending 6/2001
EC-2002-1

Month	Monthly Usage (MWh)				Monthly Peaks (MW)				Load Factor	
	Actual	Normal	Adj	% Adj	Actual	Normal	Wthr Adj	% Adj	Actual	Normal
Jul-00	4,942,076	5,520,985	578,909	11.71%	9,902	10,960	1,057.91	10.68%	0.670835	0.677078
Aug-00	5,487,631	5,350,646	(136,985)	-2.50%	10,698	10,645	(52.95)	-0.49%	0.689457	0.675591
Sep-00	4,376,401	4,448,683	72,281	1.65%	10,302	10,226	(75.81)	-0.74%	0.590017	0.604208
Oct-00	3,963,988	3,979,979	15,992	0.40%	7,758	7,707	(51.00)	-0.66%	0.686748	0.694082
Nov-00	4,144,719	4,072,838	(71,882)	-1.73%	7,437	7,452	14.84	0.20%	0.774053	0.759113
Dec-00	5,073,485	4,777,081	(296,404)	-5.84%	8,503	8,424	(78.93)	-0.93%	0.801939	0.762162
Jan-01	4,772,194	4,938,256	166,062	3.48%	8,052	8,535	482.83	6.00%	0.796629	0.777714
Feb-01	4,117,880	4,259,251	141,371	3.43%	8,150	8,514	364.12	4.47%	0.751887	0.744440
Mar-01	4,241,144	4,260,305	19,161	0.45%	7,049	7,318	268.36	3.81%	0.808640	0.782505
Apr-01	3,770,567	3,723,643	(46,924)	-1.24%	7,352	6,593	(759.02)	-10.32%	0.712305	0.784424
May-01	4,137,759	4,070,308	(67,451)	-1.63%	8,971	8,310	(661.42)	-7.37%	0.619916	0.658347
Jun-01	4,627,409	4,839,518	212,110	4.58%	9,764	10,108	344.20	3.53%	0.658217	0.664948
Annual	53,655,254	54,241,493	586,239	1.09%	10,698	10,960	261.81	2.45%	0.572537	0.564966
Summer	19,433,518	20,159,832	726,314	3.74%	10,698	10,960	261.81	2.45%	0.620406	0.628218
Other	34,221,736	34,081,661	(140,075)	-0.41%	8,971	8,535	(436.83)	-4.87%	0.654071	0.684735

Schedule 4

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

EO-87-175	EO-93-351	EM-97-575
EO-90-101	ER-94-163	EM-2000-292
EO-90-138	ER-94-174	ER-2001-299
ER-93-37	ER-95-279	ER-2001-672
ER-93-41	ER-97-81	EC-2002-1