Exhibit No.:
Issues: Normalized Sales and Net System Input
Witness: Lena M. Mantle
Sponsoring Party: MO PSC Staff
Type of Exhibit: Direct Testimony
Case No.: EC-2002-1
Date Testimony Prepared: July 2, 2001

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
July 2, 2001

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OF

LENA M. MANTLE

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d/b/a AMERENUE

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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 a Utility Regulatory Engineer I in 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 am a registered Professional Engineer in the State of Missouri. I have been weather normalizing monthly electricity usage and hourly loads for the Staff since 1988.

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. What is the purpose of your direct testimony?

A. The purpose of my testimony is to recommend that the Commission adopt the weather and unbilled adjustments to customer sales and the normalized hourly net system loads for Union Electric Company d/b/a AmernUE (UE) and total Ameren summarized in Schedules 2 through 4 attached to my testimony. My testimony will describe the weather normalized monthly usage and how I normalized hourly net systems loads.

WEATHER NORMALIZATION ADJUSTMENT TO SALES

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

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 the high percentage of customers in their territories that have air conditioning and to the presence of some electric space heating in their territories.

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

A. No. I worked closely with UE in the development of its weather normalization methods and inputs and Staff has subsequently used the same method in three rate cases. This method also includes 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 unbilled adjustment. I reviewed UE's weather normalization of the twelve months ending June 2000 and found the results reasonable. I recommend that the Commission adopt the weather and unbilled adjustments as supplied by Ameren and shown on Schedule 2 attached to my testimony.

Q. Which Staff witness used the weather and unbilled 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 loads for UE and Ameren, as supplied to Staff to fulfill the requirements of Commission Rule 4 CSR 240-20.080. I used the hourly loads from October 1, 1999 through March 31, 2001. 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.

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), a deregulated subsidiary of Ameren which supplies generation for Ameren Energy Marketing (AEM.) To get an accurate representation of the costs of meeting UE's loads, it is necessary to model 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 January 1, 2000 through December 31, 2000.

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. The hourly loads also include station use. To get the data to meet the requirements of the production costing model, I had to remove station use from both UE and Ameren loads and remove AEM's wholesale customers loads from the UE hourly loads. I also adjusted both the UE and Ameren data for abnormal 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 1 of Ms. Pyatte's testimony. Summaries of the UE and Ameren hourly loads are shown on my Schedules 3 and 4. These adjustments are described in greater detail in the rest of my testimony.

Q. Why did you have to adjust for station use?

A. Station use refers to the electricity requirements of the generating plant that are necessary for the plant to generate electricity. To estimate normalized fuel costs, system loads of an electric utility are required to be at net system, which is the hourly electric supply necessary to meet the energy demands of its customers and as well as its own internal needs. It does not include station use. Monthly sums of station use provided by Ameren were allocated to each hour in the month, based on the magnitude of the actual load of that hour.

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

A. Ameren supplied the combined actual hourly loads of these customers. I weather normalized these hourly loads, added losses and subtracted these hourly loads from the weather normalized UE 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 former 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. 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 average load 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.

Q. Are checks for reasonableness a part of the process?

A. Yes, they are. The process starts with input data checks and ends with output data checks. Checks and balances 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 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 to Staff the hourly loads for ADM for the time period of August 3, 2000 through March 31, 2001. 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 this ADM's load with losses to the weather normalized loads. To account for the loads of ADM from January 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 January 1, 2000 through August 2, 2000?

A. I looked at the actual hourly data for ADM, that was supplied by Ameren, and determined that ADM's usage was not weather-sensitive so I was able to use the seven

months of hourly data to "create" loads for January 1, 2000 through August 2, 2000 taking into account the day of the week and the time of the year in creating these loads.

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

A. I took the adjusted customer usage for UE Missouri retail and wholesale customers that Ms. Pyatte supplied and added the UE Illinois retail usage to obtain total UE requirements. In order to obtain the amount of generation necessary to meet this usage, I multiplied this annual usage by the loss factor percent as supplied to me by Staff witness Allen 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. 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 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. What are the results of the system weather normalization analysis?

A. The last part of the winter of 1999-2000 was milder than normal so the weather adjustments to January 2000 through March 2000 were positive. The first part of the winter of 2000-2001 was colder than normal so the adjustments to October 2000 through December 2000 were negative. The first part of the summer of 2000 was cooler than normal so positive adjustments were made in June 2000 and July 2000. However, August and September were hotter than normal resulting in downward adjustments to these months.

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 8 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

Subscribed and sworn to before me this 2nd day of July, 2001.

Michelle Schwartze
Notary Public

MICHELLE SCHWARTZE
NOTARY PUBLIC STATE OF MISSOURI
COLE COUNTY
MY COMMISSION EXP. APR. 25,2005

My commission expires ~~MY COMMISSION EXP. APR. 25,2005~~

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

Union Electric Company
Weather and Unbilled Adjustments (MWh)
12 Months Ending 6/30/2000

Weather Adjustments		Small General Service		Large General Service		Small Primary		Large Primary		
	Residential	Commercial	Industrial	Commercial	Industrial	Commercial	Industrial	Commercial	Industrial	Total
January 2000	98,232	18,163	2,183	20,497	0	4,059	0	401	0	143,535
February	121,769	19,750	1,101	29,776	0	4,599	0	586	0	177,581
March	118,202	13,711	917	16,324	0	1,303	0	(97)	0	150,360
April	53,686	6,247	357	9,405	0	919	0	345	0	70,959
May	(20,374)	(5,875)	(290)	(5,940)	0	(1,641)	0	(1,488)	0	(35,608)
June	(33,070)	(7,383)	(396)	(10,942)	0	(3,732)	0	(786)	0	(56,309)
July 1999	(182,379)	(19,296)	(1,025)	(23,227)	0	(8,004)	0	(6,798)	0	(240,729)
August	(175,871)	(19,869)	(1,165)	(24,245)	0	(13,406)	0	(2,179)	0	(236,735)
September	(59,811)	(7,858)	(463)	(7,987)	0	(3,900)	0	(1,560)	0	(81,579)
October	(14,931)	(3,428)	(189)	(6,441)	0	(2,082)	0	(877)	0	(27,948)
November	27,915	2,001	103	(1,726)	0	(2,025)	0	(1,772)	0	24,496
December	86,167	13,515	2,022	13,178	0	917	0	(350)	0	115,449
Total	19,535	9,678	3,155	8,672	0	(22,993)	0	(14,575)	0	3,472
Unbilled Adjustment	(80,237)	(17,669)	(2,761)	(30,446)	8,302	(29,724)	(13,694)	(6,644)	(16,579)	(189,452)

Schedule 2

AmerenUE
Net System Load
Normalized Year Ending 12/2000
EC-2002-1

Month	Monthly Usage (MWh)				Monthly Peaks (MW)				Load Factor	
	Actual	Normal	Adj	% Adj	Actual	Normal	Wthr Adj	% Adj	Actual	Normal
Jan-00	3,290,168	3,440,639	150,470	4.57%	5,679	6,292	612.72	10.79%	0.778655	0.734973
Feb-00	2,868,204	3,084,708	216,504	7.55%	5,426	5,990	563.50	10.38%	0.759458	0.739944
Mar-00	2,858,175	2,956,986	98,812	3.46%	4,690	5,082	391.34	8.34%	0.819031	0.782094
Apr-00	2,571,136	2,612,804	41,668	1.62%	4,438	4,712	273.66	6.17%	0.804634	0.770182
May-00	3,023,834	2,863,079	(160,755)	-5.32%	6,878	6,339	(538.84)	-7.83%	0.590894	0.607035
Jun-00	3,321,080	3,412,936	91,856	2.77%	6,853	7,132	279.50	4.08%	0.673095	0.664605
Jul-00	3,808,193	3,910,858	102,665	2.70%	7,606	7,869	262.65	3.45%	0.672959	0.668033
Aug-00	4,140,623	3,775,768	(364,855)	-8.81%	8,023	7,578	(445.20)	-5.55%	0.693665	0.669704
Sep-00	3,216,793	3,113,107	(103,686)	-3.22%	7,690	7,191	(498.92)	-6.49%	0.580959	0.601240
Oct-00	2,863,920	2,780,428	(83,492)	-2.92%	5,803	5,414	(388.82)	-6.70%	0.663364	0.690277
Nov-00	2,999,681	2,885,747	(113,934)	-3.80%	5,408	5,308	(99.99)	-1.85%	0.770382	0.755082
Dec-00	3,741,972	3,414,630	(327,341)	-8.75%	6,297	6,056	(240.97)	-3.83%	0.798708	0.757838
Annual	38,703,778	38,251,689	(452,089)	-1.17%	8,023	7,869	(154.44)	-1.92%	0.550689	0.554939
Summer	14,486,689	14,212,669	(274,020)	-1.89%	8,023	7,869	(154.44)	-1.92%	0.616673	0.616884
Other	24,217,089	24,039,020	(178,069)	-0.74%	6,878	6,339	(538.84)	-7.83%	0.60371	0.650209

Schedule 3

Ameren
Net System Load
Normalized Test Year Ending 12/2000
EC-2002-1

Month	Monthly Usage (MWh)				Monthly Peaks (MW)				Load Factor	
	Actual	Normal	Adj	% Adj	Actual	Normal	Adj	% Adj	Actual	Normal
Jan-00	4,394,356	4,790,723	396,367	9.02%	7,594	8,690	1,095.80	14.43%	0.777793	0.741019
Feb-00	3,845,698	4,342,906	497,208	12.93%	7,250	8,324	1,074.26	14.82%	0.762154	0.749616
Mar-00	3,809,818	4,143,100	333,282	8.75%	6,267	7,037	770.43	12.29%	0.817089	0.791292
Apr-00	3,453,305	3,698,871	245,566	7.11%	5,937	6,455	517.23	8.71%	0.807796	0.795905
May-00	3,972,491	3,971,441	(1,050)	-0.03%	8,763	8,329	(434.24)	-4.96%	0.609318	0.640918
Jun-00	4,368,224	4,683,343	315,120	7.21%	8,980	9,652	671.61	7.48%	0.675579	0.673915
Jul-00	5,004,878	5,345,655	340,777	6.81%	9,955	10,626	670.60	6.74%	0.675717	0.676178
Aug-00	5,552,138	5,289,886	(262,252)	-4.72%	10,758	10,454	(303.48)	-2.82%	0.693687	0.680107
Sep-00	4,430,418	4,492,099	61,681	1.39%	10,358	9,994	(363.59)	-3.51%	0.594068	0.624251
Oct-00	4,009,257	4,108,804	99,547	2.48%	7,746	7,274	(471.53)	-6.09%	0.695688	0.759176
Nov-00	4,207,562	4,247,131	39,569	0.94%	7,493	7,618	124.65	1.66%	0.779876	0.774329
Dec-00	5,167,816	4,917,115	(250,701)	-4.85%	8,608	8,585	(23.24)	-0.27%	0.806932	0.769864
Annual	52,215,959	54,031,073	1,815,114	3.48%	10,758	10,626	(131.88)	-1.23%	0.554084	0.580461
Summer	19,355,657	19,810,983	455,326	2.35%	10,758	10,626	(131.88)	-1.23%	0.614488	0.636749
Other	32,860,302	34,220,091	1,359,788	4.14%	8,763	8,690	(73.28)	-0.84%	0.642996	0.67525

Schedule 4

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

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