

Exhibit No.:
Issue: Weather Normalization
Witness: Lena M. Mantle
Type of Exhibit: Direct
Sponsoring Party: MoPSC Staff
Case Nos.: EO-97-144 and
EC-97-362

MISSOURI PUBLIC SERVICE COMMISSION
POLICY & PLANNING DIVISION

DIRECT TESTIMONY

OF

LENA M. MANTLE

UTILICORP UNITED INC., d/b/a
MISSOURI PUBLIC SERVICE

CASE NO. EO-97-144
CASE NO. EC-97-362

Jefferson City, Missouri

March, 1997

FILED

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PUBLIC SERVICE COMMISSION

1 DIRECT TESTIMONY

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4 UTILICORP UNITED, INC

5 MISSOURI PUBLIC SERVICE DIVISION

6 CASE NO. EO-97-144

7 AND CASE NO. EC-97-362

8
9 Q. Please state your name and business address.

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

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

14 A. I am an Utility Regulatory Engineer in the Economic Analysis
15 Department, Policy and Planning Division.

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

18 A. In May 1983, I received a Bachelor of Science Degree in Industrial
19 Engineering from the University of Missouri at Columbia. I joined the Commission Staff
20 (Staff) in August 1983. I am a registered Professional Engineer in the State of
21 Missouri.

22 Q. What is the purpose of your direct testimony?

23 A. The purpose of my testimony is to present the Staff's adjusted
24 hourly net system loads used to calculate fuel and purchase power costs. I also

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1 describe how the results from Staff's weather normalization of the net system loads
2 were used to determine the effects of weather on the revenues of Utilicorp United,
3 Inc.- Missouri Public Service Division (MPS). A summary of the adjusted net system
4 loads is shown on Schedule I.

5 Q. Why is it necessary to weather normalize loads?

6 A. Electricity use is very sensitive to weather conditions.
7 Because of the high saturation of air conditioning in MPS's territory, the magnitude of
8 MPS's load is directly related to daily temperatures.

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

11 A. The weather normalization procedure used by the Staff was
12 developed by the Economic Analysis Department of the Commission in 1988. The process
13 is described in detail in the document Weather Normalization of Electric Loads, Part A:
14 Hourly Net System Loads (November 28, 1990), written by Dr. Michael Proctor, Manager of
15 the Economic Analysis department.

16 Q. Why was this document written?

17 A. This document was written as supporting documentation for a
18 workshop that the Economic Analysis Staff conducted to teach utility personnel the
19 method that Staff uses to weather normalize net system loads. The three day workshop
20 was designed to convey to utility personnel the method that the Staff developed as well
21 as to give hands-on training using the spread sheets that we use in our weather
22 normalization process.

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1 Q. Who attended this workshop?

2 A. Utility personnel from all five of the investor owned electric
3 utilities in the state of Missouri attended, including personnel from MPS.

4 Q. Briefly summarize the process Staff uses.

5 A. Daily peaks and average loads are independently adjusted to
6 reflect normal weather using the same methodology. Daily average load is calculated as
7 the daily energy divided by twenty-four hours. A regression model estimates both a
8 base component, which is allowed to fluctuate across time, and a weather sensitive
9 component, which measures the response to daily fluctuations in weather. The
10 regression parameters, along with the difference between normal and actual cooling and
11 heating weather measures, are used to calculate a weather adjustment for each day. The
12 adjustment for each day is added to the actual load for that day.

13 Q. How are hourly loads estimated?

14 A. The starting point for estimating hourly loads is the actual
15 hourly loads. A unitized load curve is calculated for each day as a function of the
16 actual peak and average loads for that day. The corresponding weather normalized daily
17 peak and average loads, along with the unitized load curves, are used to calculate
18 weather normalized hourly loads.

19 Q. Are checks for reasonableness a part of the method?

20 A. Yes, they are. Our process starts with input data checks and
21 ends with output data checks. Checks and balances are included in the spread sheets

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1 that are used. In addition, the analyst is required to examine the data at several
2 points in the process.

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

4 A. Yes, it has. This method has been used to weather normalize net
5 system loads in two MPS rate cases (EO-91-101 and ER-93-37), four Empire District
6 Electric Company rate cases (ER-90-138, ER-94-174, ER-95-279 and ER-97-81) and two St.
7 Joseph Light and Power Company rate cases (ER-93-41 and ER-94-163). It has also been
8 used to weather normalize class loads in rate design cases for Union Electric Company
9 (EO-87-175), Missouri Public Service (EO-91-245), Empire District Electric Company
10 (EO-91-74) and St. Joseph Light and Power Company (EO-93-351).

11 Q. What data was used in Staff's weather normalization analysis?

12 A. MPS net system load for the time period October 1, 1994 through
13 March 31, 1996 was used. The daily temperature values used were from the National
14 Oceanic and Atmospheric Administration (NOAA) Kansas City International Airport
15 weather station.

16 Q. Were any adjustments made to the weather normalized hourly loads
17 before they were used to calculate fuel and purchase power costs?

18 A. Yes, there were. The weather normalized hourly loads were
19 adjusted to equal the total system input as calculated by Staff Witness Mike Brosch.
20 In addition to weather normalization, this net system input includes other adjustments
21 to sales. The adjustment applied to the weather normalized net system hourly loads was

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1 the ratio of the net system input to the annual sum of the weather normalized hourly
2 loads. This ratio was applied to every hour.

3 Q. Which Staff witness used these hourly loads?

4 A. Staff witness Leon Bender used these adjusted hourly loads.

5 Q. How did Staff use the weather normalized net system loads to
6 estimate the effects of weather on sales?

7 A. Because Staff had neither the data or the time necessary to
8 weather normalize class loads to estimate the effects of weather on revenues, the net
9 system weather normalization was used as a proxy. The actual and weather normalized
10 loads were aggregated over time periods that approximate billing months to estimate a
11 weather adjustment for each billing month. This aggregation and the resulting weather
12 adjustments are shown on Schedule 2. To get an estimate of the impact on revenues, I
13 summed the weather adjustments for the summer months (June through September 1995) and
14 for the non-summer months. This was necessary because different rates are in effect
15 for the summer months versus the rest of the year and therefore the weather would have a
16 different impact on revenues depending on the time of the year abnormal weather
17 occurred.

18 Q. What was Staff's conclusion about the need for an adjustment to
19 revenues due to abnormal weather?

20 A. Staff's analysis showed that the weather adjustments for the
21 summer billing months combined for a total summer adjustment of 1,523 MWH or 0.09%.
22 This adjustment is close enough to zero that no adjustment should be made to the

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1 revenues for the four summer months. The combined weather adjustment for the other
2 months totaled an increase of 58,428 MWH or 2.31%.

3 Q. So were the sales in the non-summer months adjusted for weather?

4 A. Yes they were. Because Staff was not able to weather normalize
5 the class loads and the weather adjustment to net system load for these non-summer
6 months was significant, I reviewed the results of MPS's weather normalization of class
7 loads for these months. Schedule 2 also contains the results of the weather
8 normalization analysis conducted by MPS as supplied to Staff in response to data
9 request number 257. Although the amount of weather normalization between methods
10 varies from month to month in the non-summer months, the weather adjustment to sales
11 aggregated over the non-summer months for both my analysis and MPS was only 0.39%
12 different. Therefore, I recommended to Staff witness Brosch that MPS's weather
13 adjustment to class sales for the non-summer months be used.

14 Q. Will Staff conduct a weather normalization analysis on class
15 sales?

16 A. Yes, we intend to. However it will only be as good as the data
17 that is input into the analysis. To do a proper analysis, current load research along
18 with billing cycle data is needed. MPS has supplied the billing cycle data. We have
19 requested current load research but have been told by MPS that this data will not be
20 available before April 21, 1997. At that time we will have to review the data to see if
21 it is free of errors so that we can use it. If it contains errors, as load research data
22 usually does when we receive it from any of the electric utilities, we may have to use

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1 data from 1990 and 1991 that we used in the MPS's last rate design case. The age of this
2 data makes it less desirable to use. This old data may also be unusable. If so, a less
3 detailed weather analysis requiring more billing cycle data from MPS will be
4 conducted.

5 Q. Was the billing cycle data that you reference sent to you on a
6 timely basis?

7 A. No, it was not. I requested the billing cycle data along with
8 documentation on MPS's weather normalization method on November 6, 1996. I received a
9 response from MPS on January 15, 1997.

10 Q. Was MPS's response to the data requests complete?

11 A. No, they were not. I have talked with personnel at MPS regarding
12 information that I requested that was not included in the response and have received
13 more of the information that I requested. However, I notified MPS of the absence of a
14 response to a section of one of the data requests in a memorandum on February 5, 1997.
15 I have yet to hear from MPS regarding this portion of the data request that they failed
16 to respond to on January 15, 1997.

17 Q. You said that MPS has stated that they will supply Staff with
18 load research data on April 21, 1997. When did Staff request that information?

19 A. Staff requested that information on March 7, 1997.

20 Q. Does this conclude your testimony?

21 A. Yes, it does.

In the matter of the Earnings Review of)
UtiliCorp United, Inc., d/b/a/ Missouri Public Service) CASE NO. EO-97-144

The Staff of the Missouri Public Service Commission, Complainant, v. UtiliCorp United, Inc., d/b/a Missouri Public Service, Respondent. CASE NO. EC-97-362

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 testimony in question and answer form, to be presented in the above case; that the answers in the attached written 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 March, 1997.

Joyce C. Maurer
Notary Public

JOYCE C NEUNER
NOTARY PUBLIC STATE OF MISSOURI
OSAGE COUNTY

My commission expires OSAGE COUNTY ☒
MY COMMISSION EXP JUNE 18, 1997

Utilicorp United, Inc.
Missouri Public Service

Adjusted Net System Load

Calendar Month	Monthly Usage (MWh)				Monthly Peaks (MW)				Load Factor	
	Actual	Adjusted	Diff	% Adj	Actual	Adjusted	Diff	% Adj	Actual	Adjusted
9501	353,702	391,280	37,578	10.62%	651	725	74.08	11.37%	0.729822	0.724915
9502	305,470	340,615	35,146	11.51%	615	692	76.39	12.41%	0.738774	0.732800
9503	317,336	339,524	22,189	6.99%	616	634	17.97	2.92%	0.692751	0.720174
9504	282,641	310,725	28,084	9.94%	513	557	44.24	8.62%	0.765069	0.774318
9505	299,370	343,460	44,090	14.73%	605	754	149.50	24.73%	0.665640	0.612254
9506	378,101	421,137	43,036	11.38%	891	1,021	130.26	14.62%	0.589515	0.572848
9507	489,326	535,373	46,048	9.41%	1,064	1,148	84.41	7.93%	0.618193	0.626651
9508	530,709	534,632	3,924	0.74%	1,046	1,146	99.68	9.53%	0.681753	0.627055
9509	342,642	380,819	38,177	11.14%	924	1,041	117.28	12.70%	0.515201	0.508094
9510	305,467	333,813	28,346	9.28%	583	687	104.26	17.90%	0.704847	0.653317
9511	318,190	337,322	19,132	6.01%	625	669	44.96	7.20%	0.707655	0.699820
9512	360,689	391,866	31,177	8.64%	681	780	99.00	14.53%	0.711681	0.675081
Annual	4,283,641	4,660,566	376,925	8.80%	1,064	1,148	84.41	7.93%	0.459630	0.463315

Weather Normalized Net System Billing Month Energy Staff					Sum of Weather Adjustments to Class Sales UtiliCorp United - MPS DR# 257				
Billing Month	Actual	Normal	Wthr Adj	% Adj	Billing Month	Actual	Normal	Wthr Adj	% Adj
9501	346,504	357,969	11,465	3.31%	9501	326,084	336,810	10,727	3.29%
9502	323,193	333,981	10,788	3.34%	9502	306,523	320,072	13,549	4.42%
9503	313,116	313,070	(46)	-0.01%	9503	299,528	305,633	6,105	2.04%
9504	290,052	302,504	12,452	4.29%	9504	280,816	287,548	6,732	2.40%
9505	290,783	309,059	18,276	6.29%	9505	263,556	276,298	12,743	4.83%
9506	353,586	369,413	15,827	4.48%	9506	315,895	326,934	11,040	3.49%
9507	460,778	471,507	10,729	2.33%	9507	398,560	390,892	(7,668)	-1.92%
9508	522,989	498,160	(24,829)	-4.75%	9508	449,862	420,371	(29,491)	-6.56%
9509	404,323	404,120	(203)	-0.05%	9509	449,928	411,157	(38,771)	-8.62%
9510	303,770	309,209	5,440	1.79%	9510	281,406	298,564	17,158	6.10%
9511	318,208	316,000	(2,208)	-0.69%	9511	286,860	285,023	(1,837)	-0.64%
9512	347,275	349,536	2,261	0.65%	9512	314,115	312,591	(1,524)	-0.49%
Annual	4,274,576	4,334,527	59,951	1.40%	Annual	3,973,132	3,971,895	(1,237)	-0.03%
Summer	1,741,676	1,743,200	1,523	0.09%	Summer	1,614,244	1,549,355	(64,889)	-4.02%
Other	2,532,900	2,591,328	58,428	2.31%	Other	2,358,888	2,422,539	63,652	2.70%