Exhibit No.:
Issues: Weather Normalized Sales; Peak Day Demand
Witness: James A. Gray
Sponsoring Party: *MO PSC Staff*
Type of Exhibit: Direct Testimony
Case No.: GR-2000-512

MISSOURI PUBLIC SERVICE COMMISSION

UTILITY OPERATIONS DIVISION

DIRECT TESTIMONY

OF

JAMES A. GRAY

UNION ELECTRIC COMPANY

d/b/a AmerenUE

CASE NO. GR-2000-512

Exhibit No. 12
Date 10-4-00 Case No. GR-2000-512
Reporter KE

Jefferson City, Missouri
August 2000

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JAMES A. GRAY

UNION ELECTRIC COMPANY

d/b/a AmerenUE

CASE NO. GR-2000-512

DIRECT TESTIMONY

OF

JAMES A. GRAY

UNION ELECTRIC COMPANY

d/b/a AmerenUE

CASE NO. GR-2000-512

Q. Please state your name and business address.

A. My name is James A. Gray. My business address is P. O. Box 360, Jefferson City, Missouri 65102.

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

A. I am employed by the Missouri Public Service Commission (Commission) as a Regulatory Economist in the Tariffs/Rate Design Section of the Commission's Gas Department.

Q. How long have been employed by the Commission?

A. I have been employed with the Commission for approximately twenty years.

Q. Please state your educational background.

A. I received a degree of Bachelor of Science in Psychology as well as one in General Studies from Louisiana State University, and I received a degree of Master of Science in Special Education from the University of Tennessee. Additionally, I completed several courses in research and statistics at the University of Missouri - Columbia.

Q. Please state your professional qualifications.

A. Prior to being employed by the Commission, I was a Research Analyst for two and a half years with the Missouri Department of Mental Health where I conducted statistical analyses. In 1980, I began my employment with the Commission as a Statistician in the Depreciation Department where I prepared depreciation, trended original cost, and trended original cost less depreciation studies.

Beginning in 1989 as a member of the Economic Analysis Department, I submitted testimony on weather normalized sales for natural gas, water, and electric utilities. In electric utilities' resource plans, I reviewed the residential electric load forecasts with their associated detailed end-use studies and marketing surveys.

Since December of 1997, I have been in the Tariffs/Rate Design Section of the Commission's Gas Department where my duties have been to review tariffs and applications of natural gas utilities. In my current duties, I have submitted testimony on weather normalized sales, certificates of convenience and necessity, and recommended minimum statistical sample sizes to be used in natural gas residential customer billing reviews.

Q. Please list all the cases in which you have submitted prepared written testimony before this Commission.

A. The cases in which I have submitted prepared, written testimony are enumerated in Schedule 1, attached to my testimony.

Q. What is the purpose of your testimony?

A. My testimony addresses the Commission Staff's (Staff) weather adjustment of natural gas sales for the firm natural gas customers of Union Electric Company d/b/a AmerenUE (AmerenUE or Company) for the test year ending June 30, 1999. I use the

results of my weather normalized sales studies to estimate weather normalized coincident peak day demand.

WEATHER NORMALIZED SALES

Q. What firm customer classes did you adjust test year natural gas sales to normal weather conditions?

A. I weather adjusted the residential (RES) and General Service (GS) customer classes of AmerenUE.

Q. How did you segregate AmerenUE's Missouri natural gas service area for your studies?

A. AmerenUE is supplied by three natural gas pipelines. The Panhandle Eastern Pipe Line Company (PEP) supplies AmerenUE's central and eastern Missouri communities, including Columbia, Jefferson City, Eldon, Mexico, Moberly, Louisiana, and Wentzville. Staff witness Dennis Patterson provided me with the weather data from the Columbia Regional Airport to study the PEP service area.

Natural Gas Pipeline Company of America (NGP) and Texas Eastern Transmission Corporation (TET) supply southeastern Missouri communities, including Fisk, Dexter, and Cape Girardeau. I combined AmerenUE's Texas Eastern service area and Natural Gas Pipeline service area into one for my analyses. Mr. Patterson provided me with the weather data from the Cape Girardeau FAA Airport to study the combined NGP/TET service area.

Q. Please identify the Staff witnesses who utilize the results of your weather adjusted volumes.

A. I provided the results of my weather normalized sales volumes to Staff witness Henry E. Warren, PhD for his allocation of the weather normalized sales to the GS rate blocks and to Staff witness John P. Cassidy of the Commission's Accounting Department for his customers' growth annualization and revenue calculations.

Q. Why is it important to adjust test year natural gas sales to normal weather?

A. Since rates are based on natural gas usage during the test year, it is important to remove the influence of abnormal weather. Otherwise, if natural gas usage volumes reflect the influence of abnormal weather, the rates will be distorted by these deviations from normal weather conditions during the test year. My adjustments to test year sales set the test year natural gas volumes at the levels that would be experienced under normal weather conditions.

Q. Why are natural gas sales dependent upon weather conditions?

A. Weather sensitive natural gas sales increase during colder weather, primarily because of space heating and, somewhat, because of water heating. Space heating refers to the amount of natural gas to heat the "space" of a residence or building structure during colder weather. In Missouri, the space heating season is usually from mid-November through mid-March.

Q. How does your analyses adjust test year weather sensitive sales if the test year is warmer or colder than normal?

A. If the test year is warmer than normal, weather adjusted natural gas sales for the test year would be increased to reflect a normal year because the Company would be expected to sell higher natural gas volumes during a normal, but colder year. Conversely, if the test year is colder than normal, weather adjusted natural gas sales for the test year

would be decreased to reflect a normal, but warmer year, because the Company would be expected under normal weather conditions to sell less natural gas than the Company sold during the test year. Thus, my weather normalized sales volumes adjust the test year natural gas sales to normal weather conditions.

Q. What weather measure for the test year did you use in your analyses?

A. Mr. Patterson provided me with daily actual and daily normal heating degree days (HDD) for the Columbia Regional Airport and the Cape Girardeau FAA Airport. Mr. Patterson's testimony discusses the calculation of HDD.

Q. What is the source of your test year billed natural gas usage data?

A. AmerenUE provided monthly natural gas sales in hundred cubic feet (Ccf) and monthly numbers of customers for each billing cycle, by customer class and service area for the test year.

Q. What are billing cycles?

A. The Company schedules groups of natural gas meters to be read throughout a month, followed by bills to be mailed throughout the month. These customers' natural gas meters are read approximately every thirty days (a billing month), not a calendar month, because not all natural gas meters are read on the first day of a calendar month. Staggering the meter reading dates by billing cycle over the billing months reduces the effort to bill AmerenUE's customers. Since there are approximately twenty-one working days in a month, customers are usually grouped into one of twenty-one billing cycles. The number of days between meter readings varies among the billing cycles within a billing month. Moreover, individual billing cycles may exhibit month to month variations in the numbers of days between scheduled meter readings, due to holidays and

variations in the number of days and in the placement of weekends, from one billing month to another.

Schedule 2, attached to this testimony, shows how the twenty-one billing cycles' scheduled meter reading dates are staggered for the billing month of January 1999. The billing month of January starts on December 30, 1998, and ends January 28, 1999. Using billing cycles allows each billing month's customer numbers and usage for a particular rate class to be combined and recorded into the approximately twenty-one billing cycle groups.

Q. Why do you rely on billing cycle usage data?

A. The Company's customer billing records are based on monthly billing cycles. That is, the Company records maintain grouped summary natural gas statistics by billing cycle for each billing month.

It would be ideal to have daily measures of both natural gas usage and weather, so the two can be precisely matched and studied. However, natural gas companies normally do not record daily usage data for RES or GS customers. Therefore, I relied on the Company's monthly billing cycle data.

Q. Did you encounter any discrepancies in AmerenUE's customer numbers and natural gas usage data?

A. Yes, the data furnished to Staff did not match AmerenUE witness James R. Pozzo's work papers in this case. Discrepancies in natural gas volumes were especially noticeable for the GS customers in July 1998. Discrepancies in July when there are no space heating requirements do not necessarily distort the relationship between natural gas space heating usage and HDD. I have also encountered similar problems with customer

numbers and Ccf in AmerenUE's Case No. GR-97-393. To properly estimate the relationship between natural gas heating usage and HDD, it is important for a Company to maintain and furnish accurate sales data to Staff.

Q. How did you analyze space heating natural gas volumes for the test year?

A. I performed the analyses for each of two service area classifications, PEP and NGP/TET. I calculated two sets of twelve billing month averages by customer class. One set of these averages was the daily average natural gas usage in Ccf and another set was the daily average HDD. These billing month averages were calculated from the data on numbers of customers, natural gas usage in Ccf, and summed HDD from approximately twenty-one billing cycles for each billing month by customer class.

Q. Why did you sum Mr. Patterson's daily HDD by billing cycle?

A. To match the daily HDD by billing cycle with the Company's customer billing records, I summed the daily HDD for the dates encompassing each billing cycle. This matches Mr. Patterson' daily heating degree weather series with the Company's customer billing records. These daily weather measures can be added over the dates between each billing cycle's meter readings, whereas monthly values cannot be analyzed or quantified by date or day. Therefore, calendar month weather measures would be inappropriate for billing cycles.

Q. How do the twelve billing month customer weighted averages of HDD reflect different customer levels among the different billing cycles throughout the test year?

A. Each billing month's daily average HDD in each billing cycle in the test year was weighted by the percentage of customers served in that billing cycle. Thus, the

billing cycles with the most customers are given more weight in computing the billing month daily average HDD.

Schedule 3, attached to this testimony shows the number of customers, Ccf used, and HDD for the billing month of January 1999 for AmerenUE's GS customers in the PEP service area. Note that the customer numbers vary from 206 for billing cycle number 13 to 814 customers for billing cycle number 9. Also, the HDD vary from 885 for billing cycle number 5 to 1,419.5 HDD for billing cycle number 20. This shows that there are significant differences between billing cycles within a billing month. This demonstrates the need to carefully average the HDD across the approximately twenty-one billing cycles for each of the billing months of the test year.

Q. How did you average billing month usage in Ccf?

A. I calculated twelve simple, unweighted averages representing daily usage per customer for each month of the test year, ending June 30, 1999. That is, I divided each cycle's volumes by the number of customers and the number of days in each billing cycle. This stated the Company's natural gas usage by billing cycle on a daily basis.

So, all billing cycles in a billing month are equated, regardless of the variations in the number of days between meter readings among the billing cycles within a billing month. Then I averaged all of the approximately twenty-one billing cycles' daily usages per customer over each billing month of the test year to calculate one month's daily average usage in Ccf.

Q. How did you quantify the relationship of natural gas sales to HDD?

A. My studies estimate a change in usage in Ccf to a change in HDD based on the two sets of twelve monthly billing month averages of average daily usage in Ccf per

customer and the customer weighted average daily HDD. These two sets of billing month averages (usage and weather) were used to study the relationship between space heating natural gas usage in Ccf and colder weather.

Regression analysis estimates the relationship for each of the RES and GS customer classes in the PEP and NGP/TET service areas. Regression analysis describes the relationship between daily space heating sales per customer in Ccf to the daily HDD.

Q. What are advantages to using regression?

A. The main advantage is that regression is easily understood and interpreted. Also, regression develops quantitative measures that describe relationships.

The regression equation calculates a straight line that best fits the relationship. The slope (or slant) of the best fitting straight line estimates a change in the daily natural gas usage per customer whenever the daily average HDD change one HDD. For example in my analyses, the slope of the best fitting regression line for AmerenUE's RES in the PEP service area is 0.124054. This means that, in AmerenUE PEP service area, a RES customer's estimated usage will change approximately 0.124054 Ccf per day for every change of one HDD. The steeper the slopes of the regression lines or the larger the numerical value of the slope, the greater the estimated change in space heating usage in Ccf for a change of one HDD.

Also, regression calculates a measure of the goodness of fit. The measure is referred to as *r squared* (r^2). The r^2 ranges from 0.00 to 1.00, with 1.00 being a perfect fit.

Q. How closely did your regression results match actual average daily natural gas sales per customer for the billing months in the test year?

A. Schedules 4-1 through 4-2, attached to this testimony, show the regression best fitting lines and each billing month's actual average daily natural gas sales per customer plotted against the billing month's actual average daily HDD. The plots demonstrate that the regression lines fit the data very closely. Moreover, all of Staff r^2 values were above 0.95826, which also indicates a good fit.

Q. Up to this point, is your daily estimated usage Ccf based on any normal values?

A. No, the estimated daily usage per Ccf per customer was based on actual HDD and the actual number of days in each billing cycle for the test year. I used the estimated relationship between space heating usage in Ccf and HDD to adjust the test year actual HDD to the normal HDD provided to me by Mr. Patterson.

Q. How did you adjust monthly natural gas volumes to normal?

A. The first step is to equalize each billing cycle's annual total normal HDD over the test year. I added or subtracted a few days to make each billing cycle's annual total days match 365 days, the number of calendar days in the test year. This adjustment for days, set each billing cycle to the same total number of days and normal HDD. Failure to equalize the normal HDD in the test year will result in some billing cycles having the wrong annual or total number of normal HDD for the test year.

Once each billing cycle has the proper normal HDD, the second step is to calculate each billing cycle's difference between normal and actual (normal - actual) for HDD. The third step is to multiply these differences times the appropriate estimate from the regression results.

The fourth step is to sum each billing cycle's adjustment volumes by billing month. The fifth step is to add the monthly adjustments in Ccf to total monthly natural gas sales for the test year.

Q. Why do you state natural gas usage on a per customer usage basis?

A. After calculating its customers' growth annualization, the Commission's Accounting Department can multiply its customer levels times my weather normalized sales per customer. Therefore, stating the results of my studies on a monthly per customer basis facilitates calculating total test year weather normalized sales for the test year.

Q. Are your normalized sales stated in daily usage per customer equivalent to what a typical customer would use?

A. No, I did not select typical customers. AmerenUE provided me with all bills rendered during the test year. I did not segregate those customers into heating categories, such as, customers using natural gas for space heating and customers using natural gas only for water heating. The data include partial bills, such as final bills or new customers receiving service in the middle of the month. Also, billing adjustments to current or prior months are included in the data.

Q. What were the results of your weather normalized sales studies?

A. My analyses result in an increase to test year natural gas sales because the weather during the test year was warmer than normal. My analyses result in an approximate 11.1 percent increase from actual test year natural gas sales for the RES customer class and an approximate 9.8 percent increase for the GS customer class. These increases do not include the Staff's customer growth annualization.

Q. What results did you provide to Mr. Cassidy for his customers' growth annualization and revenue calculations?

A. I provided monthly, normalized natural gas usage in Ccf per customer by customer class for the PEP and NGP/TET service areas. These results are contained in Schedule 5, attached to my testimony. Schedule 5 demonstrates the higher natural gas usage per customer in the colder, winter months because of space heating requirements.

WEATHER NORMALIZED COINCIDENT PEAK DAY DEMAND

Q. What are estimates of weather normalized coincident peak day demand by customer class?

A. Briefly, it is the estimated usage per customer by firm customer class on Mr. Patterson's normally occurring coldest days. The daily peak is the highest daily load or draw of natural gas on a system, and the demand is the rate or amount of natural gas used on that day. My estimates of RES and GS natural gas peak usage are at the time (coincident) of a utility's system peak. These estimates of weather normalized coincident peak day demand quantify the relative contributions towards that single-day system peak by the RES and GS customers. For cost-of-service studies, it is important to determine the class contributions to the peak day responsibility.

RES and GS customers would be expected to use more natural gas on those colder days since their demand for natural gas are highly dependent upon the daily weather in HDD. My studies of weather normalized sales have verified this weather sensitive usage through such measures as the r^2 and my plots of the relationship between space heating daily usage in Ccf and daily HDD.

Q. What weather data did Mr. Patterson provide to you for estimating weather normalized coincident peak day demand?

A. Mr. Patterson provided me with two sets (one for the PEP service area and one for the NGP/TET service area) of thirteen HDD calculated from his estimated weather normalized coldest day for each month as well as a weather normalized estimate of an annually occurring coldest day. Mr. Patterson's testimony discusses how he calculated his estimated weather normalized coldest days.

Q. Why did you calculate your weather normalized coincident peak day demand estimates from the Company's billing data?

A. Acceptable load research data are unavailable for the RES and GS customer classes. Load research is the systematic gathering, recording, and analyzing of data describing utility customers' patterns of energy usage. The customer billing data are the best available surrogate data to estimate the relationship between the weather normalized coincident peak day demand by firm customer class and HDD on the normally occurring coldest days.

Q. How did you estimate weather normalized coincident peak day usage in Ccf per customer by customer class for each month of the test year?

A. I used the relationships between natural gas usage per customer and HDD from my weather normalized sales studies based on the Company's billing data. My regression studies were based on daily usage per customer. So, the results of my weather normalized sales studies were directly applied to estimate weather normalized coincident peak day demand.

My natural gas sales regression studies estimated a change in space heating natural gas usage per customer for a change of one HDD. For example, the slope of the best fitting line for the RES customers in the PEP service area is 0.124054. I multiplied that estimate times Mr. Patterson's thirteen coldest HDD values calculated from his weather normalized coldest days.

Then, I added these results or mathematical products to another estimate from my weather normalized sales studies. It is an estimate of non-weather sensitive usage in Ccf per customer calculated from the regression equation. Non-weather sensitive usage occurs in the summer months when there is no space heating requirement. That non-weather sensitive usage estimate is the left, bottom point on each regression line (intercept) in Schedules 4-1 and 4-2. It is non-weather sensitive because it does not depend upon HDD. Accordingly, I added the preceding thirteen products to the estimated non-weather sensitive usage per customer during the summer months to calculate a total estimated weather normalized coincident peak day demand per customer.

In this manner, I used my weather normalized sales studies results to estimate the natural gas usage in Ccf per customer on the weather normalized coldest day of each month and for the entire year (annual). Thus, my studies allocate the weather normalized coincident peak day responsibility to the RES and GS customer classes for the PEP and NGP/TET service areas.

Schedule 6, attached to this testimony, shows the estimated weather normalized coincident peak day natural gas usage in Ccf per customer by billing month and customer class for the PEP and NGP/TET service areas. This information was provided to Staff

witness Daniel I. Beck for his calculation of total peak day demand across all customer classes.

Q. Why did you state the weather normalized coincident peak day responsibilities on a per customer basis?

A. This allows Mr. Beck to multiply my weather normalized coincident peak day demand estimates times the appropriate customer numbers to calculate total weather normalized coincident peak day demand volumes by customer class.

Q. What is the primary difference in methodology between your adjusting sales volumes to normal weather and your weather normalized coincident peak day demand studies?

A. My studies of weather normalized sales starts with the test year sales volumes and adjusts those volumes to normal weather conditions. In contrast, I lacked acceptable load research data to determine the actual coincident peak day demand for the test year and adjust it. Therefore, I used the regression results from my weather normalized sales studies to estimate my weather normalized coincident peak day demands by customer class on Mr. Patterson's normally occurring coldest days.

RECOMMENDATIONS

Q. Would you please summarize your recommendations?

A. I recommend that the Commission utilize the results of my sales volumes adjustments for normal weather including the weather adjusted normalized usage per

customer shown in Schedule 5 and my estimated weather normalized coincident peak day demand in Ccf per customer shown in Schedule 6, attached to this testimony.

Q. Does this conclude your Direct Testimony?

A. Yes, it does.

BEFORE THE PUBLIC SERVICE COMMISSION

OF THE STATE OF MISSOURI

In the matter of Union Electric Company d/b/a AmerenUE for Authority to File Tariffs Increasing Rates for Gas Service Provided to Customers in the Company's Missouri Service Area.	)))))	Case No. GR-2000-512

AFFIDAVIT OF JAMES A. GRAY

STATE OF MISSOURI)
) ss.
COUNTY OF COLE)

James A. Gray, is, of lawful age, on his oath states: that he has participated in the preparation of the foregoing Direct Testimony in question and answer form, consisting of 16 pages to be presented in the above case; that the answers in the foregoing Direct Testimony were given by him; that he has knowledge of the matters set forth in such answers; and that such matters are true and correct to the best of his knowledge and belief.

James A Gray
JAMES A. GRAY

Subscribed and sworn to before me this 7th day of August 2000.

Sharon S. Wiles
Notary Public

SHARON S WILES
NOTARY PUBLIC STATE OF MISSOURI
COLE COUNTY
MY COMMISSION EXP. AUG. 23,2002

My Commission Expires: _____

Union Electric Company

d/b/a AmerenUE

Case No. GR-2000-512

Summary of Cases in Which Prepared Testimony Was Submitted by

James A. Gray

Missouri Public Service Company	GR-81-312
Missouri Public Service Company	ER-82-39
Missouri Public Service Company	GR-82-194
Laclede Gas Company	GR-82-200
St. Louis County Water Company	WR-82-249
Missouri Public Service Company	ER-83-40
Kansas City Power & Light Company	ER-83-49
Osage Natural Gas Company	GR-83-156
Missouri Public Service Company	GR-83-186
The Gas Service Company	GR-83-225
Laclede Gas Company	GR-83-233
Missouri Water Company	WR-83-352
Missouri Cities Water Company	WR-84-51
Le-Ru Telephone Company	TR-84-132
Union Electric Company	ER-84-168
Union Electric Company	EO-85-17
Kansas City Power & Light Company	ER-85-128
Great River Gas Company	GR-85-136
Missouri Cities Water Company	WR-85-157
Missouri Cities Water Company	SR-85-158
United Telephone Company of Missouri	TR-85-179
Osage Natural Gas Company	GR-85-183
Kansas City Power & Light Company	EO-85-185
ALLTEL Missouri, Inc.	TR-86-14
Sho-Me Power Corporation	ER-86-27
Missouri-American Water Company, Inc.	WR-89-265 **
The Empire District Electric Company	ER-90-138 **
Associated Natural Gas Company	GR-90-152
Missouri-American Water Company, Inc.	WR-91-211 **
United Cities Gas Company	GR-91-249 **
Laclede Gas Company	GR-92-165 **
St. Joseph Light & Power Company	GR-93-42 **
United Cities Gas Company	GR-93-47 **
Missouri Public Service Company	GR-93-172 **
Western Resources, Inc.	GR-93-240 **
Laclede Gas Company	GR-94-220 **
United Cities Gas Company	GR-95-160 **
The Empire District Electric Company	ER-95-279 **
Laclede Gas Company	GR-96-193 **
Missouri Gas Energy	GR-96-285 **
Associated Natural Gas Company	GR-97-272 **
Union Electric Company	GR-97-393 **
Missouri Gas Energy	GR-98-140 **
Laclede Gas Company	GR-98-374 **
Union Electric Company	GA-99-107
Laclede Gas Company	GA-99-236
St. Joseph Light & Power Company	GR-99-42 **
Laclede Gas Company	GR-99-315 **

** Concerns Weather Normalized Sales

Union Electric Company
d/b/a AmerenUE
Case No. GR-2000-512

Scheduled Meter Read Dates by Billing Cycle
For the Test Year of July 1, 1998 - June 30, 1999

Applicable to All Service Areas and Firm Rate Classes

December 1998

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		1 Cycle 7 Read	2 Cycle 8 Read	3 Cycle 9 Read	4 Cycle 10 Read	5
6	7 Cycle 11 Read	8 Cycle 12 Read	9 Cycle 13 Read	10 Cycle 14 Read	11 Cycle 15 Read	12
13	14 Cycle 16 Read	15 Cycle 17 Read	16 Cycle 18 Read	17 Cycle 19 Read	18 Cycle 20 Read	19
20	21 Cycle 21 Read	22 Cycle 1 Read	23 Cycle 2 Read	24 HOLIDAY	25 HOLIDAY	26
27	28 Cycle 3 Read →	29 Cycle 4 Read → December Billing Month Ends	30 Cycle 5 Read → January Billing Month Starts	31 Cycle 6 Read		

January 1999

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
					1 HOLIDAY	2
3	4 Cycle 7 Read	5 Cycle 8 Read	6 Cycle 9 Read	7 Cycle 10 Read	8 Cycle 11 Read	9
10	11 Cycle 12 Read	12 Cycle 13 Read	13 Cycle 14 Read	14 Cycle 15 Read Cycle 16 Read	15 Cycle 17 Read	16
17	18 HOLIDAY	19 Cycle 18 Read	20 Cycle 19 Read	21 Cycle 20 Read	22 Cycle 21 Read	23
24	25 Cycle 1 Read	26 Cycle 2 Read	27 Cycle 3 Read →	28 Cycle 4 Read → January Billing Month Ends	29 Cycle 5 Read → February Billing Month Starts	30
31						

Union Electric Company
d/b/a AmerenUE
Case No. GR-2000-512

Total Customers, Usage in Ccf, and Heating Degree Days by Billing Cycle
For the Test Year of July 1, 1998 - June 30, 1999

General Service Customers Supplied by Panhandle Eastern Pipe Line Company

December 1998

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		1 Cycle 7 Cust = 590 Ccf = 184,981 HDD = 540.5	2 Cycle 8 Cust = 328 Ccf = 104,332 HDD = 542.5	3 Cycle 9 Cust = 807 Ccf = 211,786 HDD = 501	4 Cycle 10 Cust = 300 Ccf = 94,308 HDD = 484	5
6	7 Cycle 11 Cust = 211 Ccf = 51,431 HDD = 508	8 Cycle 12 Cust = 421 Ccf = 139,455 HDD = 511.5	9 Cycle 13 Cust = 200 Ccf = 68,954 HDD = 514.5	10 Cycle 14 Cust = 551 Ccf = 209,542 HDD = 482.5	11 Cycle 15 Cust = 338 Ccf = 153,214 HDD = 497.5	12
13	14 Cycle 16 Cust = 383 Ccf = 146,672 HDD = 535	15 Cycle 17 Cust = 662 Ccf = 254,996 HDD = 542	16 Cycle 18 Cust = 553 Ccf = 164,831 HDD = 517.5	17 Cycle 19 Cust = 723 Ccf = 201,436 HDD = 529	18 Cycle 20 Cust = 355 Ccf = 106,891 HDD = 534.5	19
20	21 Cycle 21 Cust = 330 Ccf = 183,092 HDD = 623	22 Cycle 1 Cust = 500 Ccf = 158,588 HDD = 654.5	23 Cycle 2 Cust = 324 Ccf = 114,211 HDD = 660.5	24 HOLIDAY	25 HOLIDAY	26
27	28 Cycle 3 Cust = 516 ~~Ccf = 213,654~~ HDD = 828.5	29 Cycle 4 Cust = 340 Ccf = 235,227 HDD = 856 December Billing Month Ends	30 Cycle 5 Cust = 247 Ccf = 157,531 HDD = 885 January Billing Month Starts	31 Cycle 6 Cust = 252 Ccf = 144,375 HDD = 925.5		

January 1999

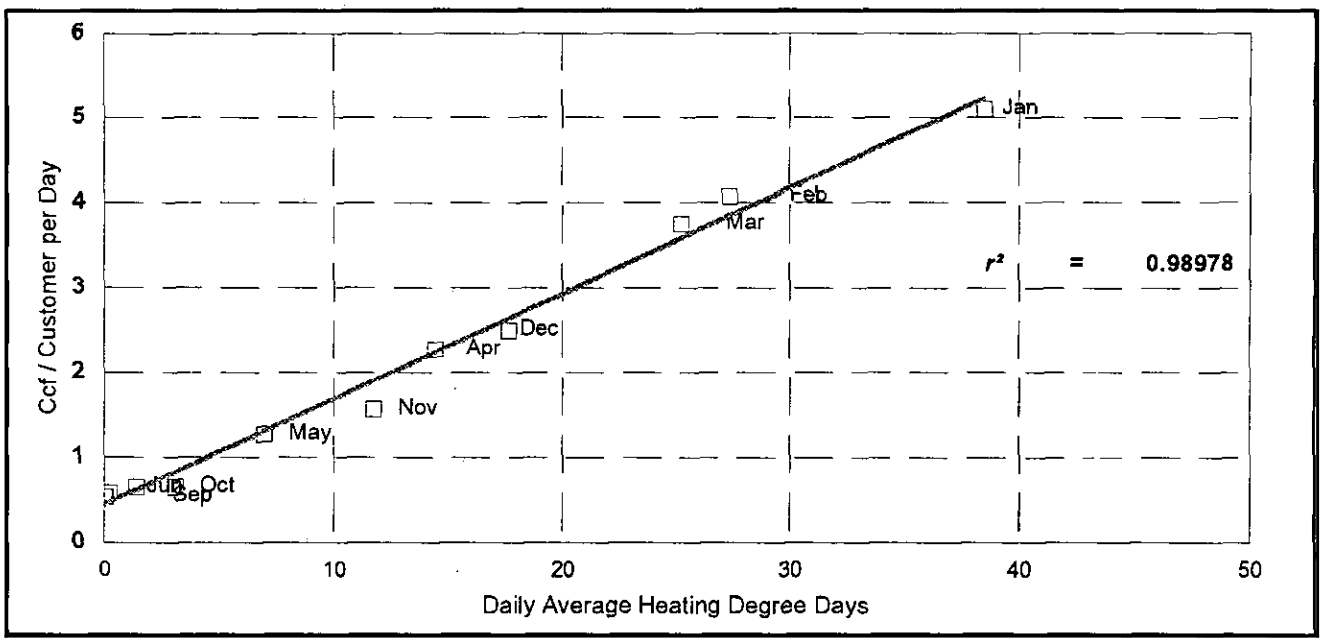
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
					1 HOLIDAY	2
3	4 Cycle 7 Cust = 592 Ccf = 352,342 HDD = 1,132	5 Cycle 8 Cust = 324 Ccf = 222,039 HDD = 1,177.5	6 Cycle 9 Cust = 814 Ccf = 540,163 HDD = 1,214.5	7 Cycle 10 Cust = 300 Ccf = 1,080,753 HDD = 1,262.5	8 Cycle 11 Cust = 216 Ccf = 129,291 HDD = 1,266.5	9
10	11 Cycle 12 Cust = 424 Ccf = 330,182 HDD = 1,377	12 Cycle 13 Cust = 206 Ccf = 185,897 HDD = 1,375.5	13 Cycle 14 Cust = 552 Ccf = 469,033 HDD = 1,389.5	14 Cycle 15 Cust = 338 Ccf = 321,425 HDD = 1,401.5 Cycle 16 Cust = 399 Ccf = 304,840 HDD = 1,322.5	15 Cycle 17 Cust = 670 Ccf = 551,467 HDD = 1,331	16
17	18 HOLIDAY	19 Cycle 18 Cust = 553 Ccf = 419,570 HDD = 1,410	20 Cycle 19 Cust = 725 Ccf = 544,226 HDD = 1,412	21 Cycle 20 Cust = 357 Ccf = 257,695 HDD = 1,419.5	22 Cycle 21 Cust = 334 Ccf = 312,717 HDD = 1,335	23
24	25 Cycle 1 Cust = 500 Ccf = 214,256 HDD = 734.5	26 Cycle 2 Cust = 330 Ccf = 171,062 HDD = 736	27 Cycle 3 Cust = 525 Ccf = 238,388 HDD = 736	28 Cycle 4 Cust = 343 Ccf = 283,622 HDD = 763.5 January Billing Month Ends	29 Cycle 5 Cust = 250 Ccf = 203,817 HDD = 1,139 February Billing Month Starts	30

Union Electric Company
d/b/a AmerenUE
Case No. GR-2000-512

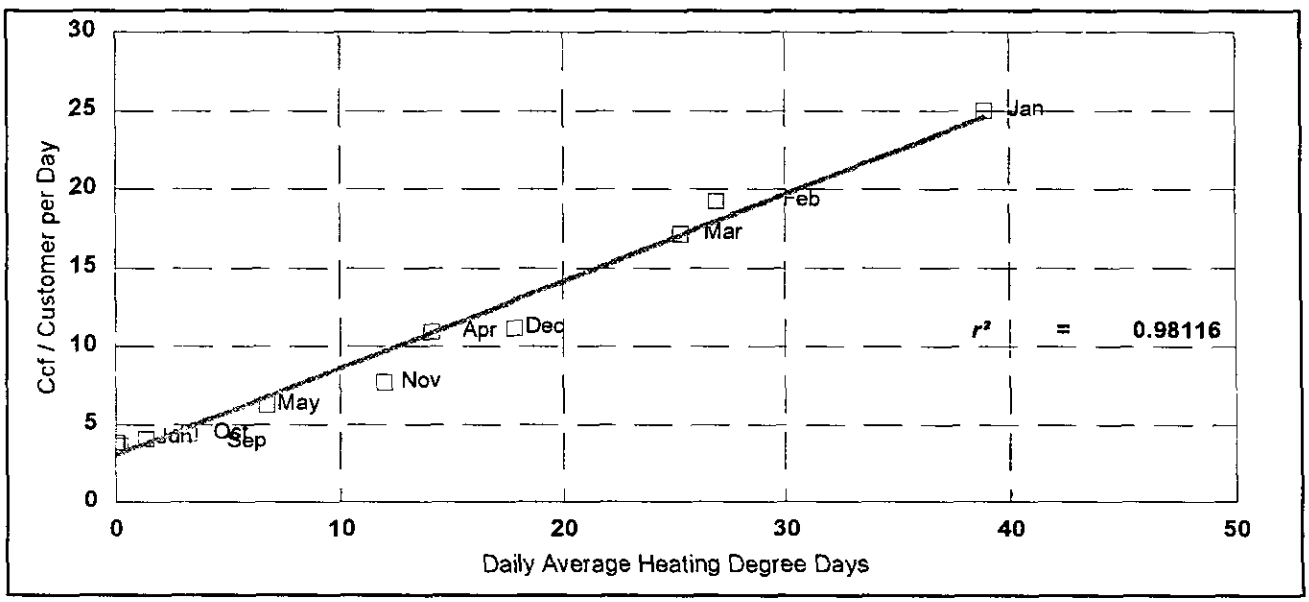
Plots of Billing Month Actual & Estimated Usage vs. Heating Degree Days

Service Areas Supplied by Panhandle Eastern Pipe Line Company

Residential Service Customers



General Service Customers

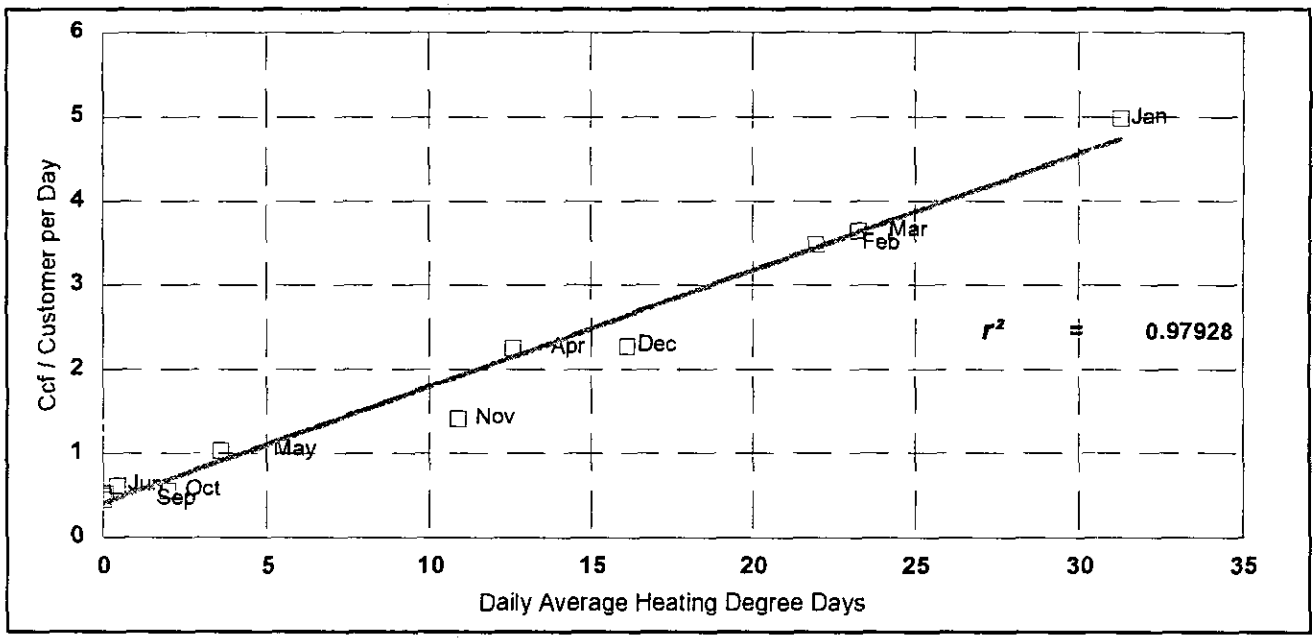


Union Electric Company
d/b/a AmerenUE
Case No. GR-2000-512

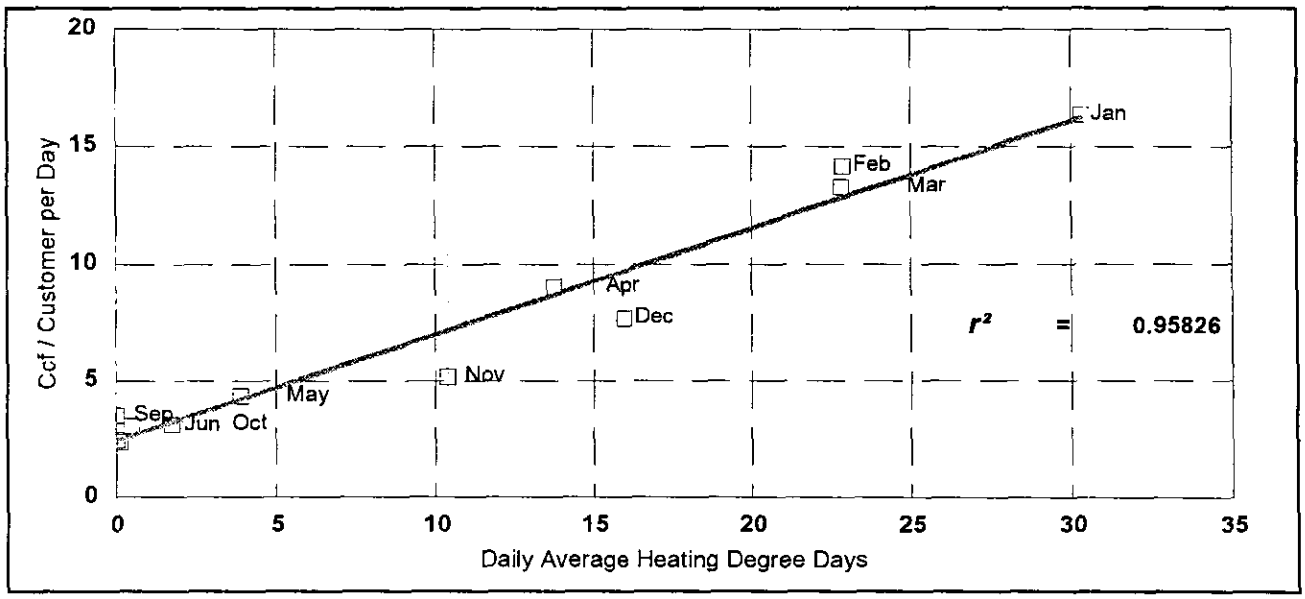
Plots of Billing Month Actual & Estimated Usage vs. Heating Degree Days

Service Areas Supplied by Texas Eastern Transmission Corporation and Natural Gas Pipeline Company of America

Residential Service Customers



General Service Customers



d/b/a AmerenUE
Case No. GR-2000-512

Weather Normalized Billing Month Usage in Ccf per Customer
For the Test Year of July 1, 1998 - June 30, 1999

Service Areas Supplied by Panhandle Eastern Pipe Line Company

	Residential Service Customers	General Service Customers
Jul '98	17.2501	109.2530
Aug	15.8261	114.3668
Sep	16.6792	117.4498
Oct	23.2626	147.1696
Nov	52.5020	257.4728
Dec '98	109.7413	493.8810
Jan '99	157.7215	776.2235
Feb	154.9171	731.4372
Mar	122.2096	552.9536
Apr	76.0568	365.2264
May	38.6745	191.8081
Jun '99	22.4785	135.4543
Annual	814.5588	4,023.5532

Service Areas Supplied by
Texas Eastern Transmission Corporation and
Natural Gas Pipeline Company of America

	Residential Service Customers	General Service Customers
Jul '98	15.6693	71.5517
Aug	14.6507	72.4790
Sep	13.7390	104.4121
Oct	20.9877	107.8821
Nov	44.2346	162.0511
Dec '98	98.2493	321.8211
Jan '99	167.3943	557.3637
Feb	145.8462	549.0668
Mar	109.3955	411.2438
Apr	68.4388	267.7106
May	34.4792	142.7961
Jun '99	20.7040	101.4831
Annual	757.2062	2,878.7051

Union Electric Company
d/b/a AmerenUE
Case No. GR-2000-512

Weather Normalized Coincident Peak Day Demand in Ccf per Customer
For the Test Year of July 1, 1998 - June 30, 1999

Service Areas Supplied by Panhandle Eastern Pipe Line Company

	Residential Service Rate	General Service Rate
Jul '98	0.4637	3.1157
Aug	0.5530	3.5150
Sep	1.8717	9.4097
Oct	3.4050	16.2639
Nov	5.2311	24.4267
Dec '98	7.5000	34.5692
Jan '99	8.4478	38.8059
Feb	7.7320	35.6062
Mar	5.5177	25.7077
Apr	3.7611	17.8554
May	2.2067	10.9070
Jun '99	0.8929	5.0344
Annual	8.4478	38.8059

Service Areas Supplied by
Texas Eastern Transmission Corporation and
Natural Gas Pipeline Company of America

	Residential Service Rate	General Service Rate
Jul '98	0.4010	2.4182
Aug	0.4038	2.4273
Sep	1.6409	6.4856
Oct	3.3019	11.9346
Nov	5.2054	18.1788
Dec '98	7.1850	24.6730
Jan '99	8.3210	28.3996
Feb	7.5826	25.9773
Mar	5.3647	18.7014
Apr	3.5956	12.8980
May	1.9332	7.4445
Jun '99	0.4869	2.7000
Annual	8.3210	28.3996