Exhibit No.:	
Issues:	Weather Normalized Sales; Weather-Normalized-Coincident-Peak-Day Demand
Witness:	James A. Gray
Sponsoring Party:	MoPSC Staff
Type of Exhibit:	Direct Testimony
Case No.:	GR-2001-629
Date Testimony Prepared:	October 10, 2001

MISSOURI PUBLIC SERVICE COMMISSION

UTILITY OPERATIONS DIVISION

DIRECT TESTIMONY

OF

JAMES A. GRAY

LACLEDE GAS COMPANY

CASE NO. GR-2001-629

Jefferson City, Missouri
October, 2001

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DIRECT TESTIMONY

OF

JAMES A. GRAY

LACLEDE GAS COMPANY

CASE NO. GR-2001-629

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 Energy Department.

Q. How long have been employed by the Commission?

A. I have been employed with the Commission for approximately twenty-one 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 submitted testimony regarding depreciation rates, trended-original cost, and trended-original cost less depreciation.

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. I reviewed residential-electric-load forecasts with associated detailed end-use studies and marketing surveys in electric resource plans.

From December of 1997 through June of 2001, I was in the Tariffs/Rate Design Section of the Commission's Gas Department. Since July of 2001, I have been in the Tariffs/Rate Design Section of the Commission's Energy Department. I have reviewed tariffs and applications of natural gas utilities and 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 general-service-natural-gas customers of Laclede

Gas Company (Laclede or Company) for the test year ending February 28, 2001. Then, I use the results of my weather-normalized-sales studies to estimate weather-normalized-coincident-peak-day demand.

WEATHER-NORMALIZED SALES

Q. What general service customer classes did you adjust the test-year-natural-gas sales to normal weather conditions?

A. I weather-adjusted the natural gas sales of the residential and the commercial and industrial classes of Laclede. Staff witness Daniel I. Beck of the Commission's Energy Department will address the weather-normalized sales of Laclede's large customer classes.

Q. What divisions and districts of Laclede did you study?

A. I studied the four Laclede divisions - the Laclede Division, the Missouri Natural Division, the Midwest Division, and the St. Charles Division. In addition, I studied Missouri Natural Division's Franklin County District separately, creating five district/division combinations.

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 John P. Cassidy of the Commission's Accounting Department for the Staff's customer growth annualization and revenue calculations and to Staff witness Henry E. Warren, PhD, of the Commission's Energy Department for the Staff's allocation of the

weather-normalized sales to the block rates of the general service classes. (Laclede's general service classes have different unit charges for consumption falling within various blocks of consumption.)

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. The predominate use of natural gas in Missouri is for space heating. Space heating refers to the use of mechanical equipment to heat all or part of a building. As the weather becomes colder, natural gas sales increase because of space-heating requirements.

Q. How do your analyses adjust test-year-natural-gas sales if the test year is warmer than normal?

A. Natural gas sales for the test year would be increased to reflect a normal year, because the Company would be expected to sell more natural gas volumes under normal weather conditions than it sells during a warmer than normal test year.

Q. How do your analyses adjust test-year-natural-gas sales if the test year is colder than normal?

A. Natural gas sales for the test year would be decreased to reflect a normal year, because the Company would be expected to sell less natural gas volumes under normal weather conditions than it sells during a colder than normal test year.

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

A. Staff witness Dennis Patterson of the Commission's Energy Department provided me with daily actual and daily-normal-heating-degree days for air temperatures (HDD) and heating-degree days for water temperatures (WHDD) for Laclede's service territory. Mr. Patterson's testimony discusses his calculations of HDD and WHDD.

Q. What measure of natural gas usage did you use in your analyses?

A. Laclede provided monthly natural gas sales in therms.

Q. What is a therm of natural gas?

A. A therm is a unit of heat equal to 100,000 British thermal units (Btu), which is the quantity of heat required to raise the temperature of one pound of water by one degree Fahrenheit. In volume, a therm is approximately one hundred cubic feet (Ccf) of natural gas.

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

A. Laclede provided monthly-natural-gas sales in therms and monthly numbers of customers for each billing cycle, by general-service-customer-rate class and division for the test year. Also, Laclede provided me with separate data for Missouri-Natural-Division's Franklin County District.

Q. What are billing cycles?

A. Billing cycles are clusters or groups of customers for billing purposes. These customers are grouped to facilitate the monthly reading of their natural gas meters.

Since there are approximately twenty-one working days in a month, customers are usually grouped into one of twenty-one billing cycles. The Company normally schedules each of the twenty-one clusters or billing cycles of natural gas meters to be read on different working days. Staggering the meter reading into monthly-regular-periodic intervals over the billing months evens the workload required to read meters and to bill the customers.

Since general service customers usually are billed monthly, the meters are usually read once a month. The billing month is approximately every thirty days, but it usually does not match a calendar month. It is not a calendar month, since not all natural gas meters are read on the first day of a calendar month.

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

Q. Have you prepared a schedule showing the meter read dates for the January 2001 billing month?

A. Yes, 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 2001. Those January-billing-month's cycle numbers are shown in red. For clarification, a billing month, as used in this testimony, refers to the interval (days) needed to read Laclede's twenty-one billing cycles. Accordingly, Schedule 2 shows the billing month of January starting on January 9, 2001, and ending on February 6, 2001.

Schedule 2 shows that the calendar month of January 2001 has two holidays. The two holidays require cycle 5 having its scheduled meter reading on Saturday, January 13, 2001.

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 are kept by grouping natural gas statistics by billing cycle for each billing month. The Company's use of 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.

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

Q. What two weather sensitive natural gas end-uses did you did you adjust the natural gas volumes to normal?

A. I weather-adjusted natural gas space-heating usage and water-heating usage separately.

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

A. My weather-normalization analyses consist of two major steps. The first major step is the subtraction of water-heating-natural-gas volumes from the total-test-year-natural-gas volumes. The second major step is the analysis of the remaining bulk of test-year-natural-gas volumes for space-heating usage.

Q. What Staff analyses did you use to subtract water-heating usage from total-test-year-natural-gas volumes?

A. Dr. Warren studied the relationship between natural gas usage for water heating and WHDD. Dr. Warren estimated that Laclede's residential-general-service customers use 0.01159 therms for a change of one WHDD and Laclede's commercial and industrial-general-service customers use 0.04590 therms for a change of one WHDD.

To estimate residential-test-year-natural-gas-water-heating usage, I multiplied Dr. Warren's estimated 0.01159 times Mr. Patterson's daily average WHDD and the number of customers for each billing cycle of the test year. To estimate the commercial and industrial-natural-gas-water-heating usage, I used the same formula, but instead of multiplying by 0.01159, I used Dr. Warren's estimated 0.04590 therms per WHDD that applied to Laclede's commercial and industrial customers. These calculations estimated natural-gas-water-heating usage-in-therms for the test year.

Then I subtracted the estimated water-heating usage from total-test-year-natural-gas volumes. The remainder is the estimated space-heating-natural-gas volumes. This allowed me to study the space-heating and water-heating-natural-gas volumes separately.

Q. Once you removed estimated water-heating-natural-gas volumes from total-test-year volumes, how did you analyze space-heating-natural-gas volumes for the test year?

A. I performed the same analyses for each of the five Laclede division/district combinations. I calculated two sets of twelve billing month averages by general service customer class. One set of these averages was the daily-average natural gas usage-in-

therms 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-therms, 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 and WHDD by billing cycle?

A. To match the daily HDD and WHDD by billing cycle with the Company's customer-billing records, I summed the daily HDD and WHDD for the dates encompassing each billing cycle. This matches Mr. Patterson's HDD and WHDD daily weather series with the Company's customer-billing records. These daily weather measures are added over the dates between each billing cycle's meter readings to calculate weather by billing cycle.

Calendar-month-weather values cannot be accurately analyzed or quantified by date or day. Accordingly, calendar-month-weather measures would be inappropriate for billing cycles. Therefore, I relied on the summed HDD and WHDD weather measures each billing cycle encompasses.

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

A. Each billing month's daily average HDD and WHDD in each billing cycle in the test year is weighted by the percentage of customers in that billing cycle. Thus, the billing cycles with the most customers are given more weight in computing the billing month daily average HDD and WHDD.

Schedule 3, attached to this testimony shows the number of customers, therms used, and HDD for the billing month of January 2001 for Laclede's commercial general service customers in the Laclede Division. Note that the customer numbers vary from 956 for billing cycle number 8 to 2,631 customers for billing cycle number 1. Also, the HDD vary from 993 for billing cycle number 21 to 1,549 HDD for billing cycle number 3. This shows that there are significant differences between billing cycles within a billing month. This demonstrates the need to carefully average the HDD across all the billing cycles for each of the billing months of the test year.

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

A. I calculated twelve simple, unweighted averages representing daily usage-per-customer for each month of the test year, ending February 28, 2001. That is, I divided each billing 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 on a use-per-day, regardless of the variations in the number-of-days between meter readings among the billing cycles within a billing month. Then, I averaged the approximately twenty-one billing cycles' entire daily usages-per-customer over each billing month of the test year to calculate one month's daily average usage-in-therms.

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

A. My studies estimate the change in usage in therms related to a change in HDD based on the two sets of twelve monthly billing month averages of average daily usage in therms 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-therms and colder weather.

I used regression analysis to estimate the relationship for each of the residential general service and the commercial and industrial-general-service-customer classes in Laclede's four divisions and the Franklin County District.

Q. What are advantages to using regression?

A. Regression develops quantitative measures that describe relationships. In my regression analysis, the regression equations describe the relationship between daily-space-heating sales-per-customer in therms to the daily HDD.

The regression equation calculates a straight line that best fits the relationship. The slope 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. 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-therms is for a change of one HDD.

For example in my analyses, the slope of the best-fitting regression line for Laclede Division's residential customers is 0.13887. This means that for every change of one HDD, that a Laclede Division residential customer's estimated usage will change approximately 0.13887 therms per day.

Also, regression calculates a measure of the goodness or quality of fit. The measure is an *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 4-5, attached to this testimony, show the regression best-fitting blue lines and each billing month's actual-average-daily natural gas sales-per-customer (in red) 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's r^2 values were above 0.917638, which also indicates a good fit.

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

A. No, the estimated daily usage-per-therm-per-customer was based on actual HDD and the actual number of days in each billing cycle for the test year.

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, normal HDD, and WHDD. Failure to equalize the normal HDD and WHDD in the test year will result in some billing cycles having the wrong annual or total number of normal HDD and WHDD for the test year.

Once each billing cycle has the proper normal HDD and WHDD, the second step is to calculate each billing cycle's difference between normal and actual (normal - actual) for HDD and WHDD.

The third step is to multiply these differences times the appropriate estimates. I used the estimated relationship between space-heating usage-in-therms and HDD from my regression studies to adjust the test-year-actual HDD to the normal HDD provided to me by Mr. Patterson.

For the estimated water-heating daily usage, I used the estimated relationship between WHDD and water-heating usage-in-therms, developed by Dr. Warren, to adjust test-year-actual WHDD to the normal WHDD provided to me by Mr. Patterson. That is, I multiplied the differences between normal and actual WHDD times one of Dr. Warren's estimates, to weather adjust water heating to normal.

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-therms to total-monthly-natural-gas sales for the test year.

My total adjustment to test-year sales included a water-heating adjustment based on the studies of Dr. Warren and a space-heating adjustment based on my studies. That is, after I studied and normalized space-heating-natural-gas volumes separately, I added the normalized-natural-gas-usage for space heating and the normalized-natural-gas-usage for water heating together again for my total-estimated-weather-normalized-natural-gas sales for the test year.

Q. Was the weather adjustment for test-year space-heating a larger adjustment to test-year-natural-gas volumes than the weather adjustment for water heating?

A. Yes, as I stated earlier, test-year-space-heating usage usually predominates.

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

A. The Commission's Accounting Department calculates the customer growth annualization by multiplying customer levels by 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 revenue for the test year.

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

A. No, I did not select typical customers. Laclede provided me with all bills rendered during the test year. The data include some partial bills, such as final bills or new customers receiving service in the middle of the month. Also, billing adjustments to a current or a prior billing month are included in the data.

Moreover, I did not segregate those customers into customers using natural gas for space heating and customers using natural gas only for water heating.

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

A. My analyses result in a decrease to test-year-natural-gas sales because the weather during the test year was colder than normal. My analyses result in an approximate 1.2 percent decrease from actual-test-year-natural-gas sales for the residential-general-service-customer class and approximately a 1.4 percent decrease for the commercial-and-industrial-general-service-customer class. These percentage decreases 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-therms-per-customer by general service customer class for each Laclede Division and the Franklin County District. 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.

Second, for Dr. Warren's allocation of weather-normalized sales to the general-service-rate blocks, I provided him with monthly-weather-adjustment volumes for the same general service rate classes by division/district combination. Schedule 6, attached to my testimony, contains the monthly-weather-adjustment volumes.

Q. Were you able to weather-adjust natural gas sales for each Laclede division's general service rate classes?

A. No, the three small industrial customers in the Midwest Division did not exhibit any weather sensitivity. I did not make a weather adjustment to those customers' natural gas usage.

Q. Please briefly summarize your methodology.

A. It is to study the "agreement" between space-heating volumes and colder weather. Specifically, I selected a method to estimate how space heating depends upon the colder weather.

The first step is to select the data for the studies. I selected the billed usage data from Laclede's records. To measure weather, I selected the HDD and WHDD values calculated by Mr. Patterson.

The second step is to calculate twelve billing-month-average usages and weather. The third step is to separate the estimated water-heating usage from the space-heating usage.

The fourth step is to quantify the relationship between space-heating usage and weather over the twelve billing months of the test year. I chose regression analysis. It estimates how usage and weather, during the test year, are related. Schedule 4 shows the blue, best-fitting regression line that indicates the relationship between space-heating usage and weather during the test year. The steeper the slope of the blue, best-fitting regression lines, the closer the agreement between usage and weather, over the test year. To reiterate, my regression studies attempt to estimate how space-heating usage changes or depend upon the weather during the test year.

The fifth step is to use the estimated relationship between usage and weather experienced during the test year to adjust monthly sales, during the test year, to normal weather conditions. These adjustments are reflected in my Schedule 5 and Schedule 6. These adjustments restate test-year volumes to the estimated during a test year, experiencing normal weather.

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 general service customer class on Mr. Patterson's normally occurring coldest days. The daily peak is the highest

daily-expected 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 residential general service and commercial and industrial general service natural-gas-peak usages are estimated to be at the time (coincident) of a utility's system daily peak.

Q. Why are estimates of weather-normalized-coincident-peak-day demand important?

A. These estimates of weather-normalized-coincident-peak-day demand quantify the relative contributions towards that estimated single-day system peak by the residential general service, commercial, and industrial general service customers. For cost-of-service studies, it is important to determine the class contributions to the peak-day responsibility.

Q. Are the general service customers' peak-daily demand weather-sensitive?

A. Yes, residential, commercial, and industrial general service 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-therms 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 thirteen HDD and thirteen WHDD 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. As stated earlier, natural gas companies normally do not record daily usage for residential, commercial, and industrial general service customers. Moreover, acceptable load-research data are unavailable for the general service customer classes. Load research is the systematic gathering, recording, and analyzing of data describing utility customers' patterns of energy usage. Therefore, the customer billing data are the best available surrogate data to estimate weather-normalized-coincident-peak-day demand by general service customer rate class on Mr. Patterson's normally occurring coldest days.

Q. Why must peak-day estimates be adjusted to normal weather conditions?

A. They must be adjusted to normal weather conditions for the same reasons stated previously for my weather-normalized-sales studies. Briefly, it is important to remove the influence of abnormal weather from the test year.

Q. How did you calculate your estimates of weather-normalized-coincident-peak-day usage-in-therms-per-customer by general service class for each month of the test year?

A. I used the relationships between natural gas usage and HDD from my weather-normalized-sales studies. 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 residential customers in the Laclede

Division is 0.13887. I multiplied that estimate times Mr. Patterson's thirteen coldest HDD values calculated from his weather-normalized coldest days. Also, Dr. Warren estimated a change in water-heating usage-per-customer for a change-of-one WHDD. So, I used Dr. Warren's study results and my studies to estimate the natural gas usage-in-therms-per-customer on the peak (or coldest day) of each month and for the entire year (annual).

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-therms-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 through 4-5. 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-therms-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 residential, commercial, and industrial general service customer classes for the four divisions and the Franklin County District.

Schedule 7, attached to this testimony, shows the estimated-weather-normalized-coincident-peak-day-natural-gas usage-in-therms-per-customer by billing

month and customer class for the four Laclede Divisions and the Franklin County District. This information was provided to Mr. Beck for his calculation of total-peak-day demand across Laclede's customer classes.

Q. How did you estimate daily-peak-natural-gas usage-in-therms-per-customer-by-month for the three small industrial general service customers in the Midwest Division that were not weather-adjusted?

A. Since those customers did not exhibit any weather-sensitivity, I did not adjust their test-year-natural-gas volumes to Mr. Patterson's estimated peak or coldest day. Therefore, I calculated the unadjusted daily usage-per-customer as my estimate of daily-peak-natural-gas usage-in-therms-per-customer as my estimate of daily peak-demand. Since these customers did not exhibit any weather sensitivity, the peak-month may or may not be during the colder weather months.

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 general service 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 start with the test-year-sales volumes and adjust those volumes to normal weather conditions. Since I lacked

acceptable load-research data to estimate the actual-coincident-peak-day demand-by-firm-class for the test year to adjust it for normal weather conditions. I used the regression results from my weather-normalized-sales studies to directly estimate my weather-normalized-coincident-peak-day demands-by-customer class on Mr. Patterson's normally occurring coldest days. If the actual-peak-day demand were available, I would use approximately the same methodology as my weather-normalized-sales studies.

RECOMMENDATIONS

Q. Would you please summarize your recommendations?

A. I recommend that the Commission utilize the results of my weather-adjusted-normalized usage-per-customer shown in Schedule 5, my sales-volumes adjustments to normal weather shown in Schedule 6, and my estimated weather-normalized-coincident-peak-day demand-in-therms-per-customer shown in Schedule 7, 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 Laclede Gas Company's)
Tariff to Revise Natural Gas Rate Schedules) Case No. GR-2001-629

AFFIDAVIT OF JAMES A. GRAY

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

James A. Gray, 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 21 pages of direct testimony 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 to the best of his knowledge and belief.

James A. Gray
James A. Gray

Subscribed and sworn to before me this 10th day of October, 2001.

Dawn L. Hake
Notary Public

My commission expires_____

Laclede Gas Company
Case No. GR-2001-629

Testimonies Submitted by James A. Gray

COMPANY	CASE NO.
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

COMPANY	CASE NO.
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 **
AmerenUE	GA-99-107
Laclede Gas Company	GA-99-236
St. Joseph Light & Power Company	GR-99-42 **
Laclede Gas Company	GR-99-315 **
AmerenUE	GR-2000-512 **
Missouri Gas Energy	GR-2001-292 **
Gateway Pipeline Company, Inc., et al.	GM-2001-585

** Concerns Weather Normalized Sales

Laclede Gas Company
Case No. GR-2001-629

Scheduled Meter Read Dates by Billing Cycle

Applicable to All General Service Rate Classes

January 2001

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

February 2001

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

Note: January Billing Month Starts January 9, 2001, and ends February 6, 2001

Laclede Gas Company
Case No. GR-2001-629

Total Customers, Usage in Therms, and Heating Degree Days by Billing Cycle

Laclede Division's Commercial General Service

January 2001

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	1 Holiday	2 Cycle 17 Cust = 1,277 Therms = 1,611,981 Heat deg day = 1,503	3 Cycle 18 Cust = 1,609 Therms = 2,458,222 Heat deg day = 1,526	4 Cycle 19 Cust = 1,343 Therms = 1,938,349 Heat deg day = 1,539	5 Cycle 20 Cust = 1,322 Therms = 1,838,023 Heat deg day = 1,468	6
7	8 Cycle 21 Cust = 1,441 Therms = 1,810,761 Heat deg day = 1,535	9 Cycle 1 Cust = 2,631 Therms = 3,303,762 Heat deg day = 1,539	10 Cycle 2 Cust = 1,729 Therms = 2,178,320 Heat deg day = 1,541	11 Cycle 3 Cust = 2,067 Therms = 3,623,268 Heat deg day = 1,549	12 Cycle 4 Cust = 1,490 Therms = 1,395,337 Heat deg day = 1,487	Cycle 5 13 Cust=1,753 Therms = 3,570,598 HDD= 1,474
14	15 Holiday	16 Cycle 6 Cust = 1,041 Therms = 1,229,126 Heat deg day = 1,510	17 Cycle 7 Cust = 960 Therms = 1,423,657 Heat deg day = 1,497	18 Cycle 8 Cust = 956 Therms = 986,078 Heat deg day = 1,486	19 Cycle 9 Cust = 1,249 Therms = 2,109,312 Heat deg day = 1,378	20
21	22 Cycle 10 Cust = 1,203 Therms = 1,714,037 Heat deg day = 1,448	23 Cycle 11 Cust = 1,255 Therms = 2,695,779 Heat deg day = 1,426	24 Cycle 12 Cust = 1,571 Therms = 1,799,319 Heat deg day = 1,406	25 Cycle 13 Cust = 1,280 Therms = 1,617,753 Heat deg day = 1,183	26 Cycle 14 Cust = 1,623 Therms = 1,358,515 Heat deg day = 1,177	27
28	29 Cycle 15 Cust = 1,107 Therms = 1,110,596 Heat deg day = 1,223	30 Cycle 16 Cust = 1,141 Therms = 1,399,332 Heat deg day = 1,193	31 Cycle 17 Cust = 1,281 Therms = 1,611,188 Heat deg day = 1,015			

February 2001

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
				1 Cycle 18 Cust = 1,618 Therms = 1,712,302 Heat deg day = 996	2 Cycle 19 Cust = 1,344 Therms = 1,415,059 Heat deg day = 1,001	3
4	5 Cycle 20 Cust = 1,327 Therms = 1,472,766 Heat deg day = 1,067	6 Cycle 21 Cust = 1,444 Therms = 1,377,891 Heat deg day = 993	7 Cycle 1 Cust = 2,621 Therms = 2,407,849 Heat deg day = 974	8 Cycle 2 Cust = 1,732 Therms = 1,481,708 Heat deg day = 950	9 Cycle 3 Cust = 2,067 Therms = 2,329,384 Heat deg day = 930	10
11	12 Cycle 4 Cust = 1,494 Therms = 1,729,008 Heat deg day =1,000	13 Cycle 5 Cust = 1,753 Therms = 2,375,416 Heat deg day = 995	14 Cycle 6 Cust = 1,044 Therms = 760,100 Heat deg day = 928	15 Cycle 7 Cust = 961 Therms = 926,240 Heat deg day = 920	16 Cycle 8 Cust = 949 Therms = 595,790 Heat deg day = 920	17
18	19 Holiday	20 Cycle 9 Cust = 1,244 Therms = 1,476,710 Heat deg day =1,023	21 Cycle 10 Cust = 1,203 Therms = 1,087,198 Heat deg day = 935	22 Cycle 11 Cust = 1,257 Therms = 1,683,841 Heat deg day = 939	23 Cycle 12 Cust = 1,576 Therms = 921,830 Heat deg day = 942	24
25	26 Cycle 13 Cust = 1,263 Therms = 1,277,352 Heat deg day = 973	27 Cycle 14 Cust = 1,623 Therms = 1,319,404 Heat deg day = 961	28 Cycle 15 Cust = 1,106 Therms = 835,177 Heat deg day = 901			

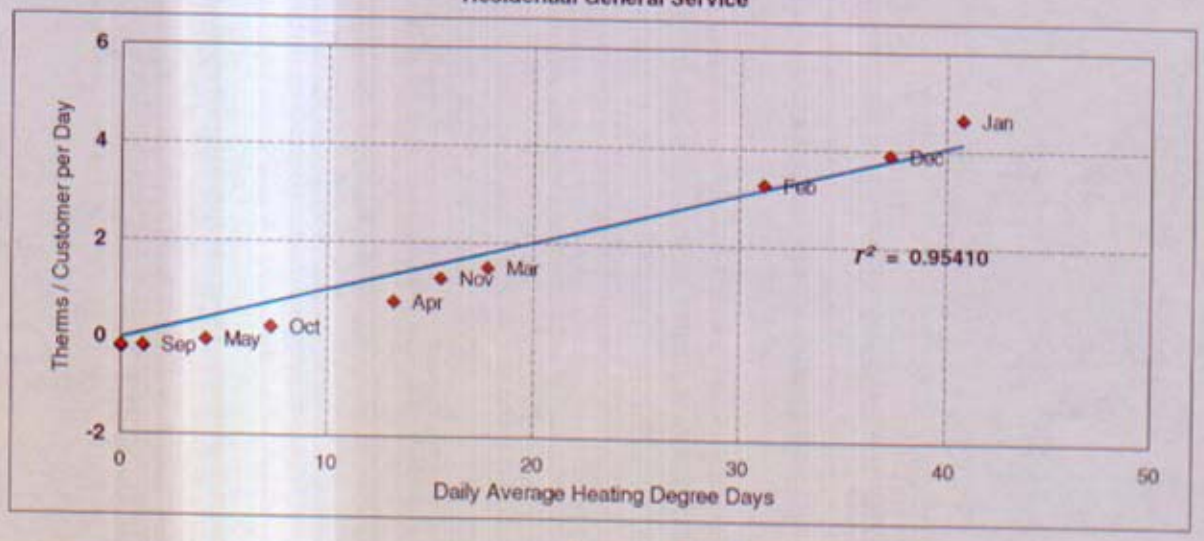
Note: January Billing Month Starts January 9, 2001, and ends February 6, 2001

Laclede Gas Company
Case No. GR-2001-629

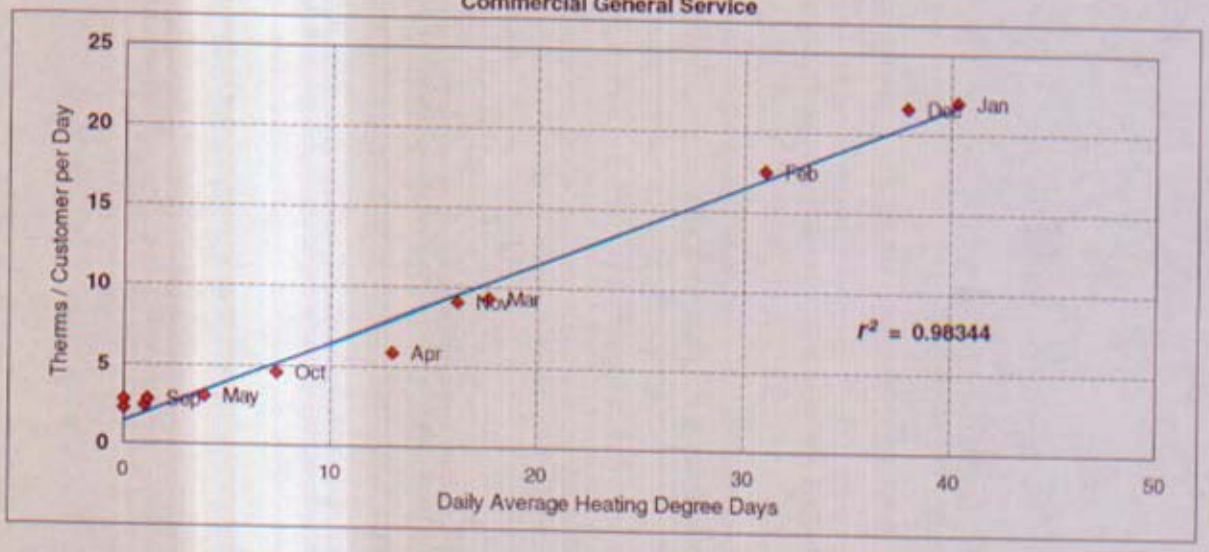
Plots of Billing Month Actual & Estimated Usage vs. Heating Degree Days

Franklin County District

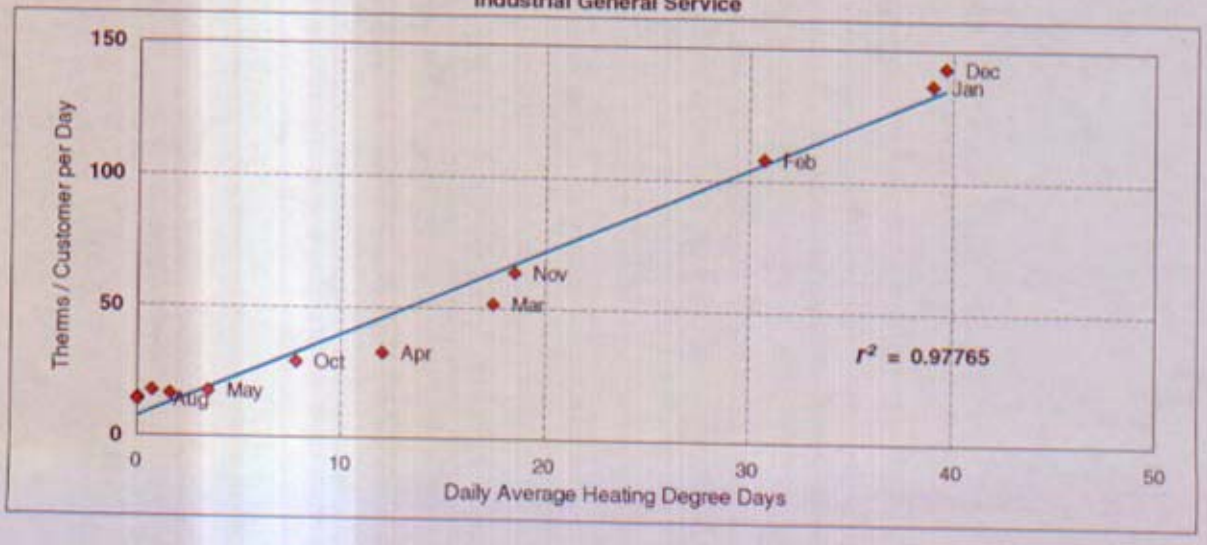
Residential General Service



Commercial General Service



Industrial General Service

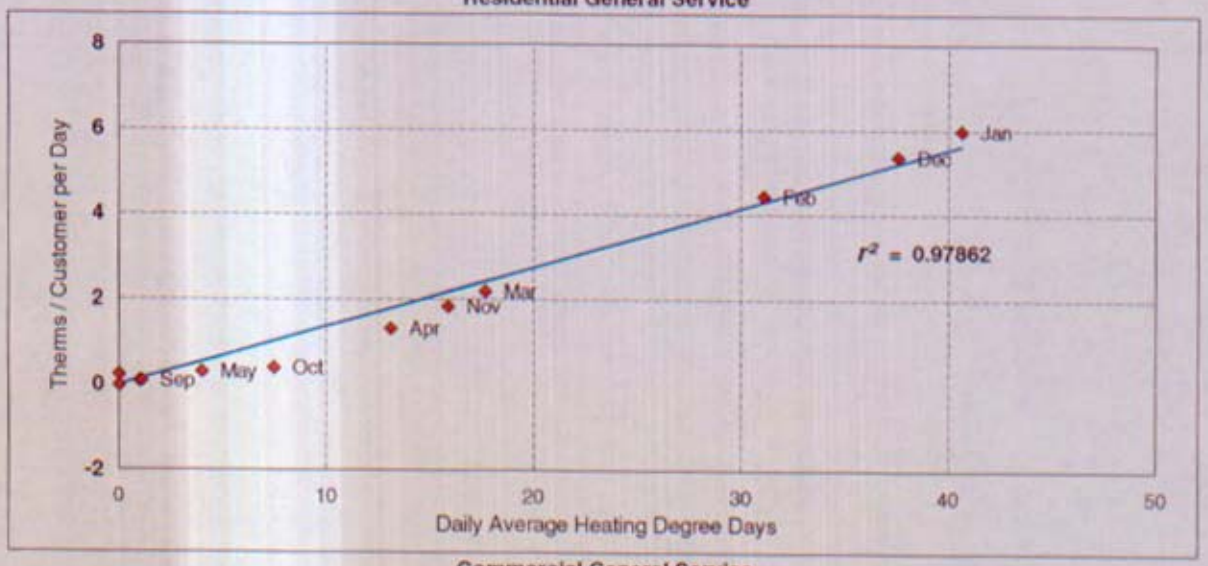


Laclede Gas Company
Case No. GR-2001-629

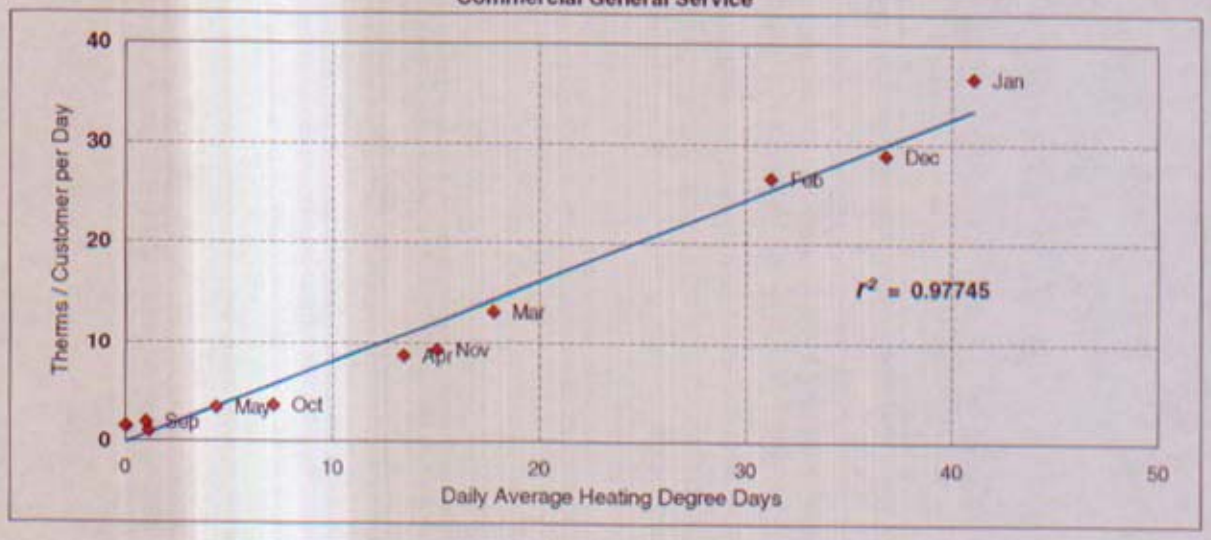
Plots of Billing Month Actual & Estimated Usage vs. Heating Degree Days

Laclede Division

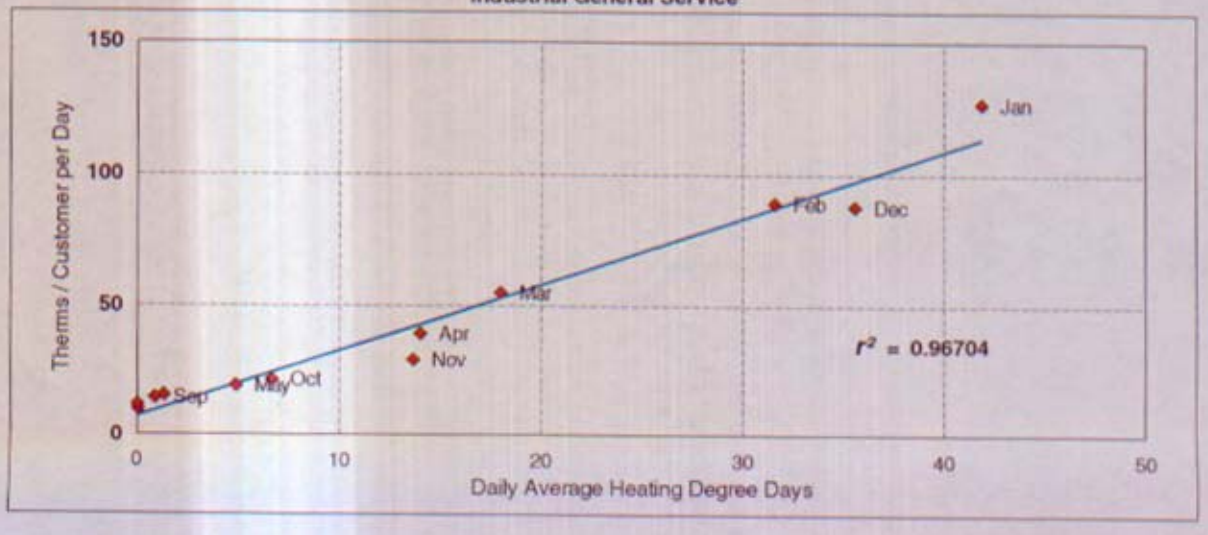
Residential General Service



Commercial General Service



Industrial General Service

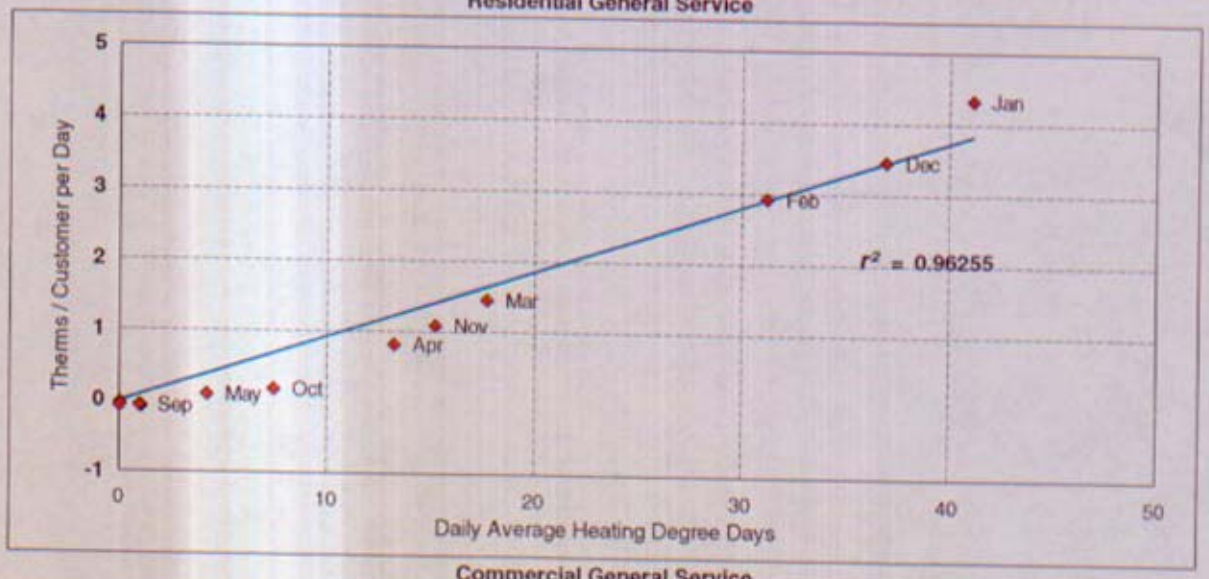


Laclede Gas Company
Case No. GR-2001-629

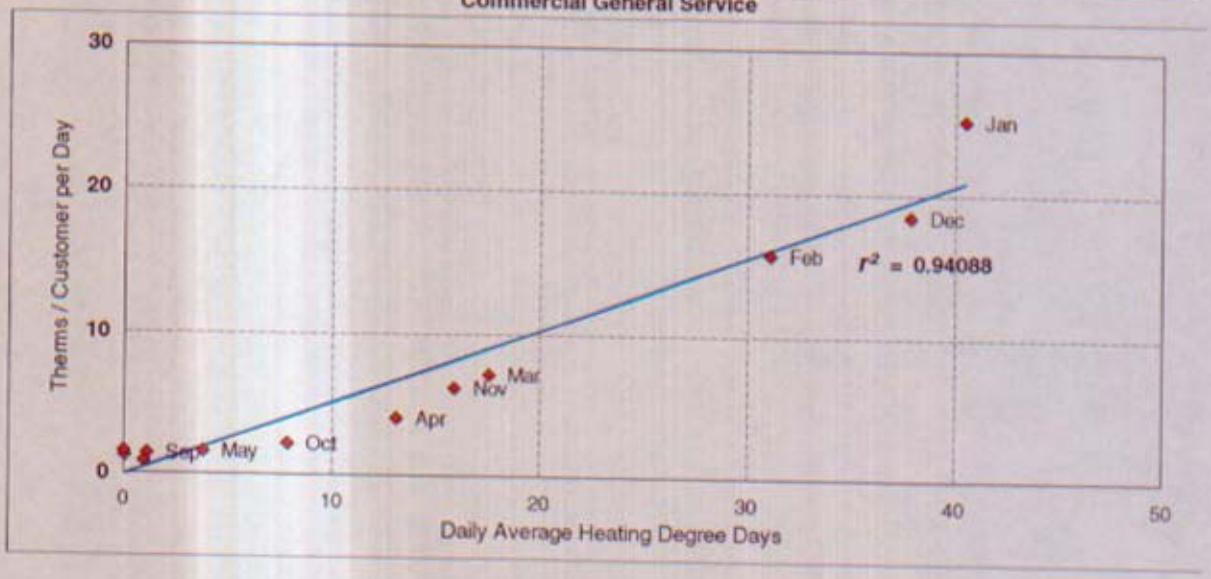
Plots of Billing Month Actual & Estimated Usage vs. Heating Degree Days

Midwest Division

Residential General Service



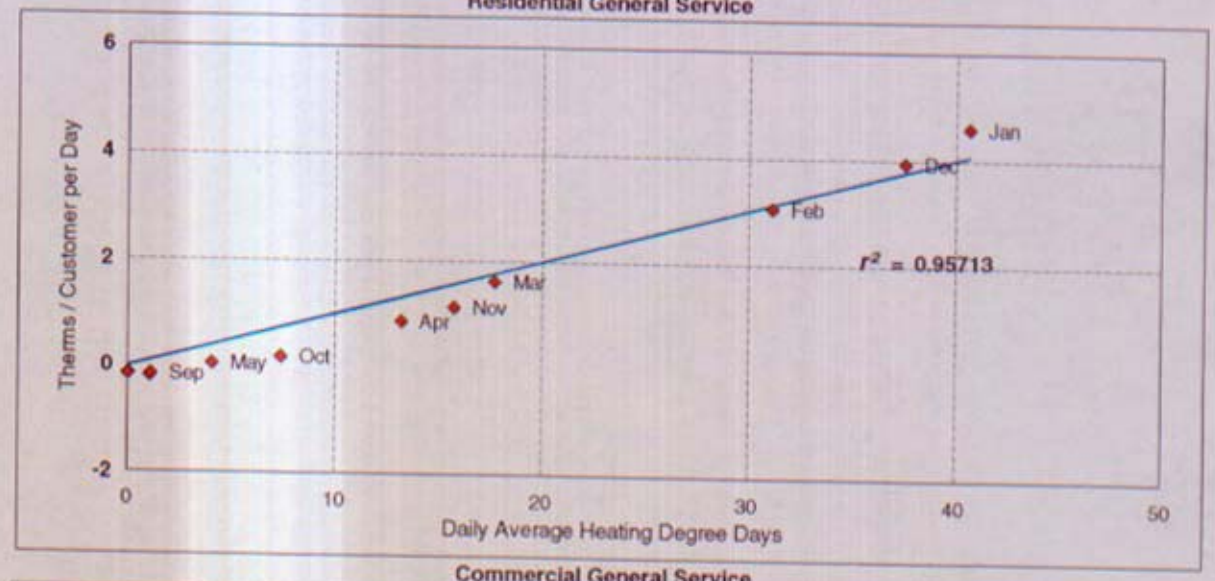
Commercial General Service



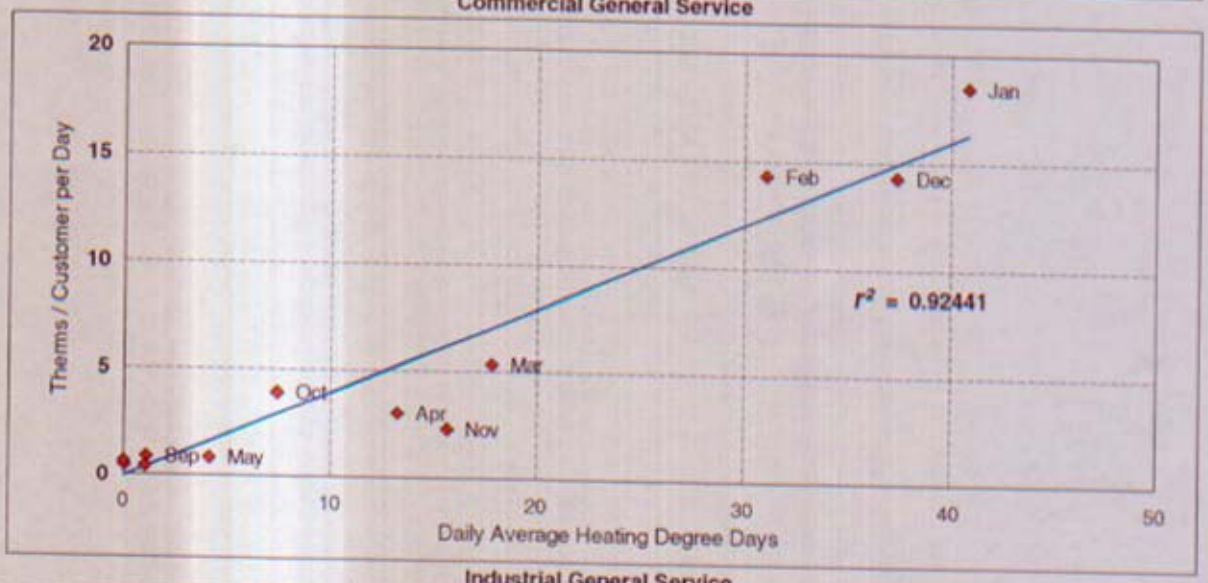
Laclede Gas Company
Case No. GR-2001-629

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

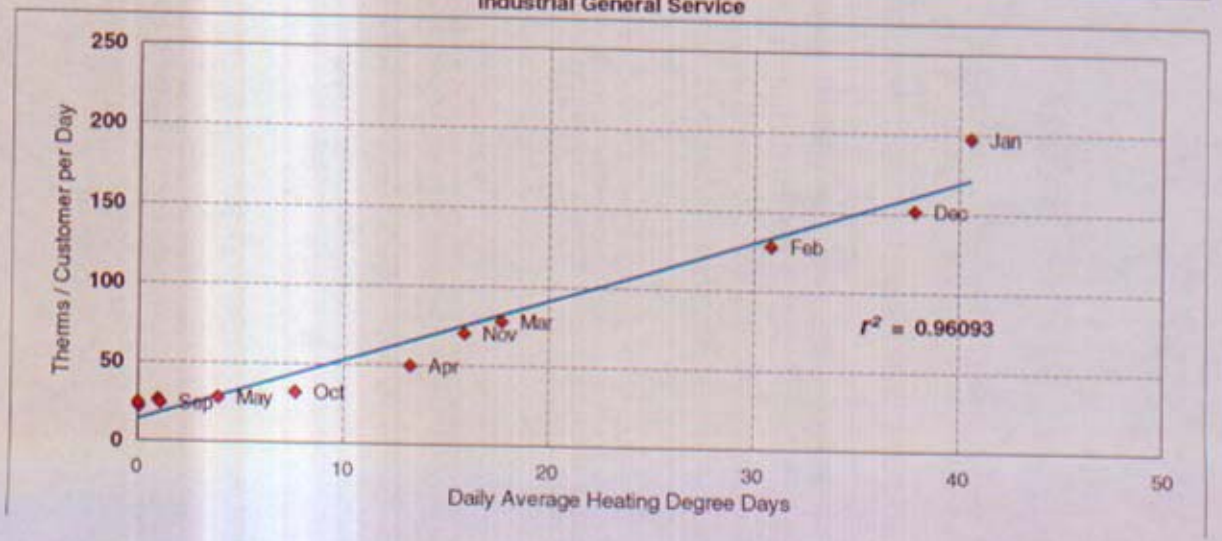
Missouri Natural Division
(Excluding Franklin County District)
Residential General Service



Commercial General Service



Industrial General Service

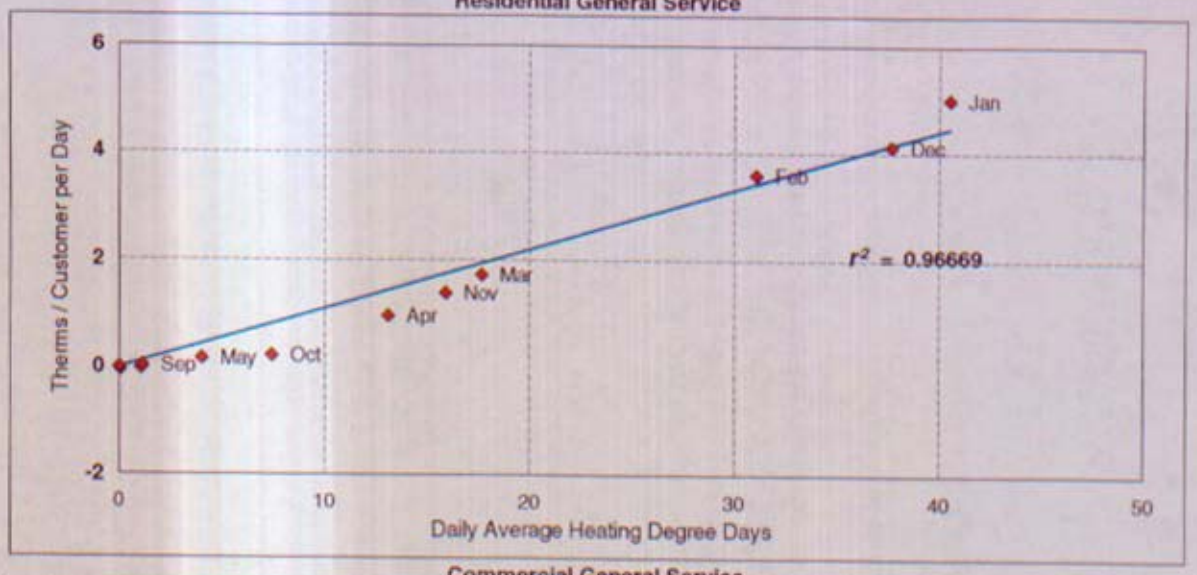


Laclede Gas Company
Case No. GR-2001-629

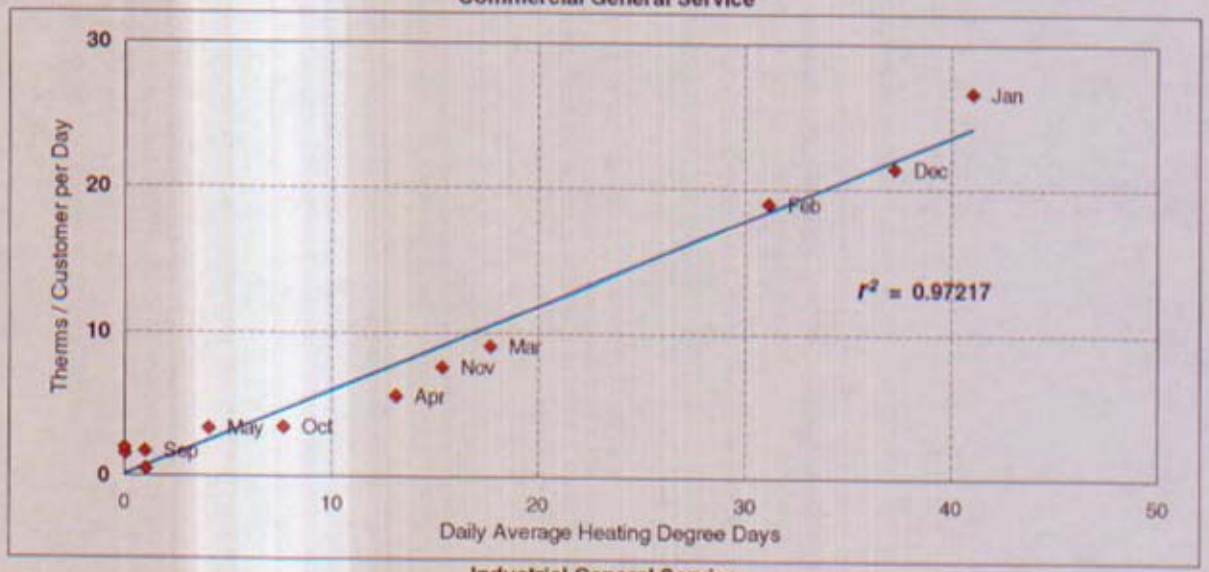
Plots of Billing Month Actual & Estimated Usage vs. Heating Degree Days

St. Charles Division

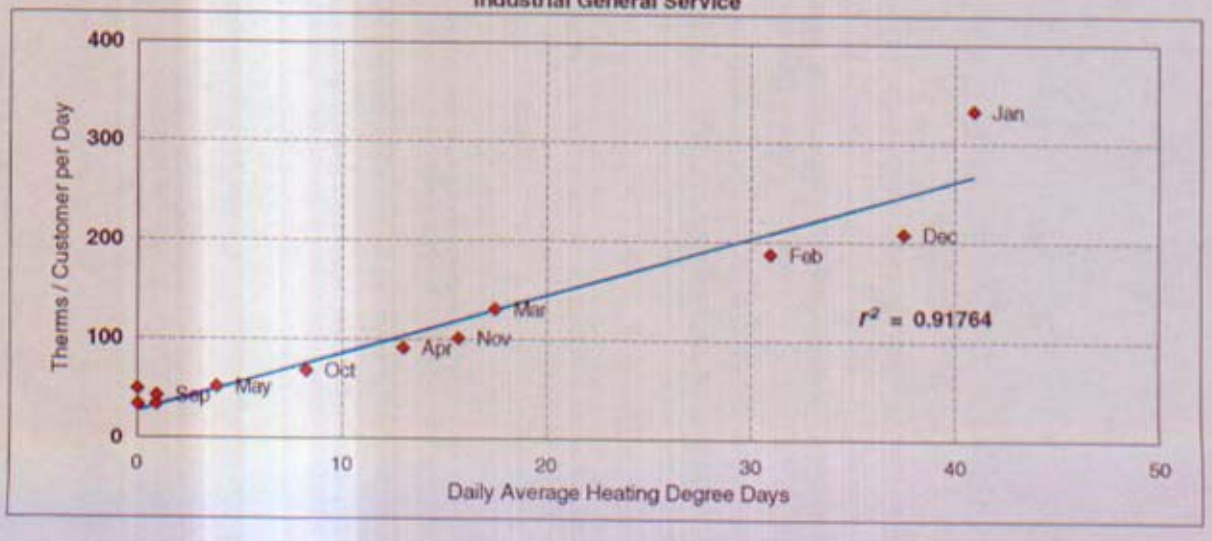
Residential General Service



Commercial General Service



Industrial General Service



Laclede Gas Company
Case No. GR-2001-629

Weather Normalized Billing Month Usage in Therms per Customer
For the Test Year of March 1, 2000 - February 28, 2001

Residential General Service

	Franklin County District	Laclede Division	Midwest Division	Missouri Natural Division	St. Charles Division
Mar 00	96.3003	123.0963	94.0435	99.5257	104.4175
Apr	53.4198	71.1767	55.5939	56.6200	59.8241
May	28.2543	40.0281	32.3089	31.0448	34.7677
Jun	17.2737	24.3737	20.4369	16.6238	21.7004
Jul	13.8695	19.0410	19.3665	15.7709	18.7030
Aug	13.9700	25.0657	16.6629	13.9932	18.6139
Sep	16.6795	24.5441	19.6096	17.0074	22.6199
Oct	29.5374	33.3334	27.4792	28.1025	28.9270
Nov	72.2954	92.0446	67.6899	68.7580	76.5924
Dec	131.4219	167.7882	120.0435	133.4615	136.6492
Jan 01	172.9301	211.0656	164.5540	171.3984	182.9837
Feb	142.7691	181.4805	132.0379	136.9445	153.6093
Annual	811.3993	1,018.5170	775.4238	798.3982	865.0924

Commercial General Service

	Franklin County District	Laclede Division	Midwest Division	Missouri Natural Division	St. Charles Division
Mar 00	494.7967	679.7313	437.2568	361.9600	508.8139
Apr	301.3910	389.1102	244.5581	215.0291	297.1906
May	211.7872	231.6982	170.7803	143.9346	225.2048
Jun	160.4553	120.1542	115.1129	103.5657	105.5397
Jul	148.0966	126.8109	120.8304	93.6612	128.3015
Aug	151.8709	119.2080	119.2304	93.3353	130.5039
Sep	172.3308	145.8014	129.0151	114.1389	141.9517
Oct	225.5449	189.4113	147.8946	205.9400	181.8694
Nov	411.5999	435.4811	334.0270	203.8641	379.8872
Dec	685.8416	843.0441	580.4166	486.8625	658.8469
Jan 01	789.2310	1,198.2985	902.9261	686.6504	924.7739
Feb	716.7205	1,015.5072	655.3651	606.5290	766.0253
Annual	4,557.0995	5,534.4609	4,022.8578	3,363.4479	4,526.7590

Industrial General Service

	Franklin County District	Laclede Division	Midwest Division	Missouri Natural Division	St. Charles Division
Mar 00	2,159.8413	2,292.6588		3,171.4722	4,963.4533
Apr	1,133.4897	1,325.1616	N / A	1,596.9872	2,949.8905
May	721.7832	756.3515		1,094.7665	1,842.1430
Jun	600.1800	540.8029		862.2114	1,139.3881
Jul	540.6056	395.6599	N / A	748.5523	1,113.1093
Aug	479.0901	410.1632		772.8768	1,482.3189
Sep	583.6827	527.5094		841.6543	1,450.5879
Oct	946.5076	676.8255	N / A	969.7593	1,880.0920
Nov	2,094.1286	1,138.2763		2,409.0046	3,523.5713
Dec	3,833.6210	2,290.2750		3,963.0668	5,058.9015
Jan 01	4,172.6010	3,774.8367	N / A	5,798.3742	10,166.3148
Feb	3,587.7285	3,063.6834		4,375.0666	6,296.8150
Annual	21,250.3942	17,261.5748		26,881.1069	41,900.1924

Laclede Gas Company
Case No. GR-2001-629

Adjustment Volumes for Normal Weather
For the Test Year of March 1, 2000 - February 28, 2001

Residential General Service

	Franklin County District	Laclede Division	Midwest Division	Missouri Natural Division	St. Charles Division
Mar 00	52,970	12,650,118	293,270	479,263	1,564,772
Apr	5,262	1,034,924	31,426	45,152	140,868
May	12,180	2,671,962	62,845	109,344	354,948
Jun	656	78,597	7,142	7,473	21,816
Jul	(692)	(104,099)	(4,994)	(6,027)	(18,070)
Aug	2,157	428,795	12,330	19,401	63,160
Sep	4,611	887,614	28,473	40,360	128,680
Oct	(3,951)	(1,144,911)	(31,680)	(37,165)	(130,886)
Nov	9,997	1,958,770	61,460	79,876	245,048
Dec	(88,329)	(20,070,707)	(432,919)	(754,535)	(2,559,656)
Jan 01	(45,583)	(9,835,331)	(245,795)	(368,044)	(1,205,915)
Feb	24,223	5,352,678	128,384	200,058	660,205
Annual	(26,499)	(6,091,592)	(90,059)	(184,844)	(735,029)

Commercial General Service

	Franklin County District	Laclede Division	Midwest Division	Missouri Natural Division	St. Charles Division
Mar 00	52,354	4,707,076	78,339	254,911	429,126
Apr	4,078	367,493	4,809	25,940	40,012
May	11,588	831,441	17,643	54,796	87,176
Jun	(187)	(25,989)	792	5,239	2,384
Jul	(473)	(19,007)	(817)	(3,206)	(3,948)
Aug	1,923	114,870	2,655	10,307	13,239
Sep	3,705	245,621	5,443	21,481	31,078
Oct	(3,201)	(400,063)	(10,496)	(20,512)	(57,583)
Nov	6,635	838,096	14,933	43,009	91,383
Dec	(91,843)	(7,051,967)	(126,497)	(392,639)	(678,338)
Jan 01	(41,028)	(4,071,159)	(58,107)	(207,109)	(367,826)
Feb	23,963	2,048,939	31,243	108,738	189,322
Annual	(32,487)	(2,414,649)	(40,061)	(99,044)	(223,974)

Industrial General Service

	Franklin County District	Laclede Division	Midwest Division	Missouri Natural Division	St. Charles Division
Mar 00	35,581	849,736		34,431	37,955
Apr	1,840	60,847	N / A	77	1,181
May	6,085	120,334		6,846	6,388
Jun	(619)	(32,325)		(1,150)	(1,248)
Jul	162	2,887	N / A	101	127
Aug	734	10,287		460	456
Sep	826	22,483		697	1,537
Oct	(141)	(77,571)	N / A	(4,335)	(7,962)
Nov	(4,101)	202,118		4,973	7,027
Dec	(73,983)	(1,156,454)		(59,528)	(59,627)
Jan 01	(19,879)	(843,401)	N / A	(27,861)	(29,964)
Feb	12,615	388,583		14,579	17,553
Annual	(40,879)	(452,476)		(30,710)	(26,577)

Laclede Gas Company
Case No. GR-2001-629

Estimated Daily Peak Demand in Therms per Customer
For the Test Year of March 1, 2000 - February 28, 2001

Residential General Service

	Franklin County District	Laclede Division	Midwest Division	Missouri Natural Division	St. Charles Division
Mar 00	7.5487	9.8384	7.0366	7.4903	8.1077
Apr	6.9999	9.0939	6.5315	6.9465	7.5112
May	5.1924	6.6548	4.8654	5.1552	5.5495
Jun	3.8156	4.8178	3.5914	3.7900	4.0603
Jul	2.3142	2.8183	2.2014	2.3013	2.4372
Aug	1.1479	1.2751	1.1194	1.1446	1.1789
Sep	0.7336	0.7421	0.7317	0.7333	0.7356
Oct	0.7977	0.8284	0.7908	0.7969	0.8052
Nov	2.0506	2.4951	1.9512	2.0392	2.1591
Dec	3.3968	4.2811	3.1990	3.3743	3.6127
Jan 01	5.0472	6.4766	4.7275	5.0107	5.3962
Feb	6.6600	8.6364	6.2180	6.6096	7.1426
Annual	**7.5487**	**9.8384**	**7.0366**	**7.4903**	**8.1077**

Commercial General Service

	Franklin County District	Laclede Division	Midwest Division	Missouri Natural Division	St. Charles Division
Mar 00	37.5638	55.4531	36.9454	29.7464	41.4628
Apr	34.8605	51.0958	34.1695	27.5856	38.3188
May	25.9919	36.8868	25.0665	20.4687	28.0273
Jun	19.2932	26.2985	18.1971	15.0458	20.2923
Jul	11.9981	14.7918	10.7172	9.1322	11.8751
Aug	6.3587	5.9663	4.9379	4.5379	5.3869
Sep	4.3964	3.0002	2.9315	2.9047	3.1571
Oct	4.7105	3.5020	3.2538	3.1573	3.5212
Nov	10.7929	13.0832	9.4899	8.0922	10.5358
Dec	17.3152	23.3231	16.1753	13.3950	18.0486
Jan 01	25.3275	35.9441	24.3899	19.8955	27.2888
Feb	33.1960	48.4370	32.4614	26.2472	36.3894
Annual	**37.5638**	**55.4531**	**36.9454**	**29.7464**	**41.4628**

Industrial General Service

	Franklin County District	Laclede Division	Midwest Division	Missouri Natural Division	St. Charles Division
Mar 00	211.7458	169.9023	83.5818	259.6002	394.1426
Apr	194.7180	156.4146	22.8825	239.0416	363.3107
May	139.5997	112.7261	16.7198	172.5230	263.6224
Jun	99.2156	80.6668	3.4510	123.8356	190.7763
Jul	55.4460	45.9114	3.6589	71.0753	111.8570
Aug	22.2138	19.4983	3.1227	31.0416	52.0342
Sep	11.5593	10.9919	2.9903	18.2445	33.0032
Oct	13.4981	12.5292	6.9092	20.5838	36.5078
Nov	49.8812	41.4240	9.8034	64.4359	102.0910
Dec	88.5996	72.1856	102.8818	111.0904	171.8361
Jan 01	136.5253	110.2473	256.8926	168.8545	258.2255
Feb	184.4426	148.2672	72.4580	226.6436	344.7371
Annual	**211.7458**	**169.9023**	**256.8926**	**259.6002**	**394.1426**