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-2001-292

MISSOURI PUBLIC SERVICE COMMISSION

UTILITY OPERATIONS DIVISION

DIRECT TESTIMONY

OF

JAMES A. GRAY

MISSOURI GAS ENERGY

A DIVISION OF SOUTHERN UNION COMPANY

CASE NO. GR-2001-292

Jefferson City, Missouri
April 2001

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DIRECT TESTIMONY

OF

JAMES A. GRAY

MISSOURI GAS ENERGY

A DIVISION OF SOUTHERN UNION COMPANY

CASE NO. GR-2001-292

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-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 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 their residential electric load forecasts with 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 Missouri Gas Energy

(MGE or Company), a division of Southern Union Company for the test year ending December 31, 2000. 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 natural gas sales of the residential, small general service, and large general service customer classes of MGE.

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

A. I studied three geographic regions of MGE's natural gas service area separately. They are the Kansas City, St. Joseph, and Joplin, Missouri, regions. Staff witness Dennis Patterson provided me with the weather data from Kansas City International Airport to study the Kansas City and St. Joseph geographic regions. For the Joplin geographic region, Mr. Patterson provided me with the weather data from the Springfield-Branson Regional Airport.

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 James M. Russo of the Commission's Accounting Department for his customers' growth annualization and revenue calculations and to Staff witness Henry E. Warren,

PhD of the Commission's Gas Department for his allocation of the weather normalized sales to the small general service rate blocks.

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, so natural gas sales increase during colder weather. Space heating refers to natural gas used to heat the inhabited area of a residence or business during colder weather.

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

A. If the test year were 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 under normal weather conditions than experienced during the warmer test year. Conversely, if the test year were colder than normal, weather adjusted natural gas sales for the test year would be decreased to reflect normal weather conditions because the Company would be expected under normal weather conditions to sell less natural gas than experienced during a colder than normal

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 Kansas City International Airport and the Springfield-Branson Regional 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. MGE provided monthly natural gas sales in hundred cubic feet (Ccf) and monthly numbers of customers for each billing cycle, by firm customer class and geographic region for the test year.

Q. What are billing cycles?

A. The Company schedules groups of natural gas meters into billing cycles that are to be read throughout a month, followed by mailing the associated bills throughout the month. Staggering the meter reading dates by billing cycle over the billing months reduces the effort to bill MGE's customers. Since there are approximately twenty-one working days in a month, customers are usually grouped into one of twenty-one billing cycles.

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. 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 February 2000. The billing month of February starts on January 27, 2000, and ends February 24, 2000.

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. 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.

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 residential or general service customers. Therefore, I relied on the Company's monthly billing cycle data.

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

A. I performed the analyses for each of the three geographic regions. 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's HDD 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 weather 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 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.

Schedule 3, attached to this testimony shows the number of customers, Ccf used, and HDD for the billing month of February 2000 for MGE's residential customers in the St. Joseph geographic region. Due to the smaller number of customers in that geographic region, there are only eight billing cycles, instead of the usual twenty-one billing cycles. Note that the customer numbers vary from 1 for billing cycle number 8 to 5,523 customers for billing cycle number 17. Also, the HDD vary from 848.5 for billing cycle number 21 to 1,060.5 HDD for billing cycle number 13. 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 Ccf?

A. I calculated twelve simple, unweighted averages representing daily usage per customer for each month of the test year, ending December 31, 2000. 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 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 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 the change in usage in Ccf related 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.

I used regression analysis to estimate the relationship for each of the residential, small general service, and large general service customer classes in the three geographic regions. 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. 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 weather changes one HDD. For example in my analyses, the slope of the best fitting regression line for MGE's residential class in the Kansas City geographic region is 0.1492021. This means that, in MGE's Kansas City geographic region, a residential customer's estimated usage will change approximately 0.1492021 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 4-3, 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's r^2 values were above 0.852655, 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 366 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. The Commission's Accounting Department can multiply its customer levels by my weather normalized sales per customer to calculate its customers' growth annualization. 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. MGE provided me with bills rendered during the test year. The data include some partial bills, such as new customers receiving service in the middle of the month. 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.

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 9.1 percent increase from actual test year natural gas sales for the residential customer class, approximately an 8.0 percent increase for the small general service customer class, and approximately a 7.6 percent increase for the large general service customer class. These increases do not include the Staff's customer growth annualization.

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

A. I provided monthly, normalized natural gas usage in Ccf per customer by firm customer class for the Kansas City, St. Joseph, and Joplin geographic regions. 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 Mr. Russo's revenue calculations, I provided monthly adjustment volumes for the same firm classes and geographic regions. Schedule 6, attached to my testimony, contains the monthly weather adjustment volumes.

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 residential and general service natural gas peak usage are at the time (coincident) of a utility's system daily peak.

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

Residential and 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 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 set for the Kansas City and St. Joseph geographic region and another set for the Joplin geographic region) 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 residential and general service 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 residential customers in the Kansas City geographic region is 0.1492021. 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 through 4-3. 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 residential and general service customer classes for the Kansas City, St. Joseph, and Joplin geographic regions.

Schedule 7, 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 Kansas City, St. Joseph, and Joplin geographic regions. This

information was provided to Staff witness Daniel I. Beck for his calculation of total peak day demand across MGE's 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 firm 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. In contrast, I lacked acceptable load research data to determine the actual coincident peak day demand by firm class for the test year to adjust it for normal weather conditions. Therefore, 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.

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 Ccf 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 Missouri Gas Energy's Tariff sheets designed to increase rates for gas service in the company's Missouri service area.	))))	Case No. GR-2001-292

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 16th day of April 2001.

Dawn L. Hake
Notary Public

My Commission Expires: _____

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

Missouri Gas Energy

Case No. GR-2001-292

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 **
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 **

** Concerns Weather Normalized Sales

Schedule 1

Missouri Gas Energy
Case No. GR-2001-292

Scheduled Meter Read Dates by Billing Cycle

For the Billing Month of February 2000 (Begins January 27 & ends February 24)

Applicable to All Firm Rate Classes

January 2000

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
23	24 Cycle 19 Read Cycle 40 Read	25 Cycle 20 Read	26 Cycle 21 Read January Billing Month Ends	27 Cycle 1 Read February Billing Month Begins	28 Cycle 2 Read	29
30	31 Cycle 3 Read					

February 2000

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		1 Cycle 4 Read	2 Cycle 5 Read	3 Cycle 6 Read	4 Cycle 7 Read	5
6	7 Cycle 8 Read	8 Cycle 9 Read	9 Cycle 10 Read	10 Cycle 11 Read	11 Cycle 12 Read	12
13	14 Cycle 13 Read	15 Cycle 14 Read	16 Cycle 15 Read	17 Cycle 16 Read	18 Cycle 17 Read	19
20	21 Cycle 18 Read	22 Cycle 19 Read	23 Cycle 20 Read Cycle 40 Read	24 Cycle 21 Read February Billing Month Ends	25 Cycle 1 Read March Billing Month Begins	26
27	28 Cycle 2 Read	29 Cycle 3 Read				

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

For the Billing Month of February 2000 (Only Cycles 3, 6, 8,10, 13 ,20, & 21 were read in February)

Residential Customers in St. Joseph Geographic Region

January 2000

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
30 February Billing Month Begins →	31 Cycle 3 Cust = 4,854 Ccf = 810,160 HDD = 882.5					

February 2000

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		1	2	3 Cycle 6 Cust = 5,017 Ccf = 807,735 HDD = 984.5	4	5
6	7 Cycle 8 Cust = 1 Ccf = 79 HDD = 1,049.5	8	9 Cycle 10 Cust = 4,806 Ccf = 806,371 HDD = 986	10	11	12
13	14 Cycle 13 Cust = 4,934 Ccf = 1,070,186 HDD = 1,060.5	15	16	17	18 Cycle 17 Cust = 5,523 Ccf = 1,022,192 HDD = 988.5	19
20	21	22	23 Cycle 20 Cust = 1,309 Ccf = 289,343 HDD = 893	24 Cycle 21 Cust = 48 Ccf = 9,737 HDD = 848.5	25	26
27	28 February Billing Month Ends →	29 Cycle 3 Cust = 4,860 Ccf = 697,708 HDD = 701				

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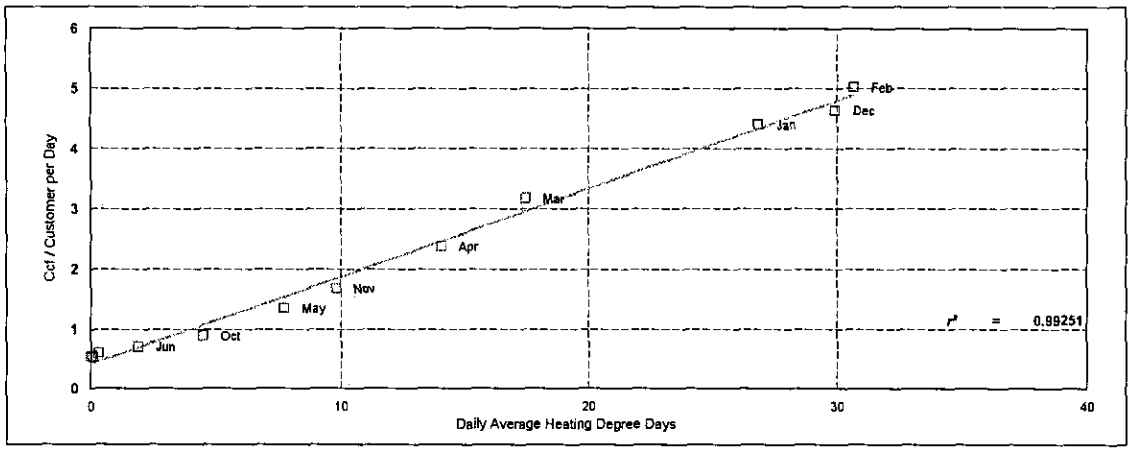
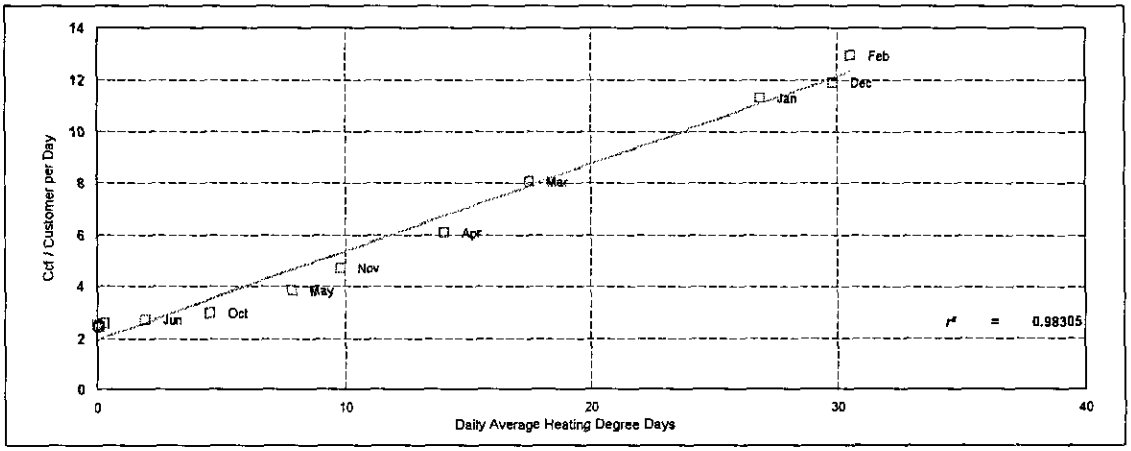
Plots of Billing Month Actual & Estimated Usage vs. Heating Degree Days

Joplin Geographic Region

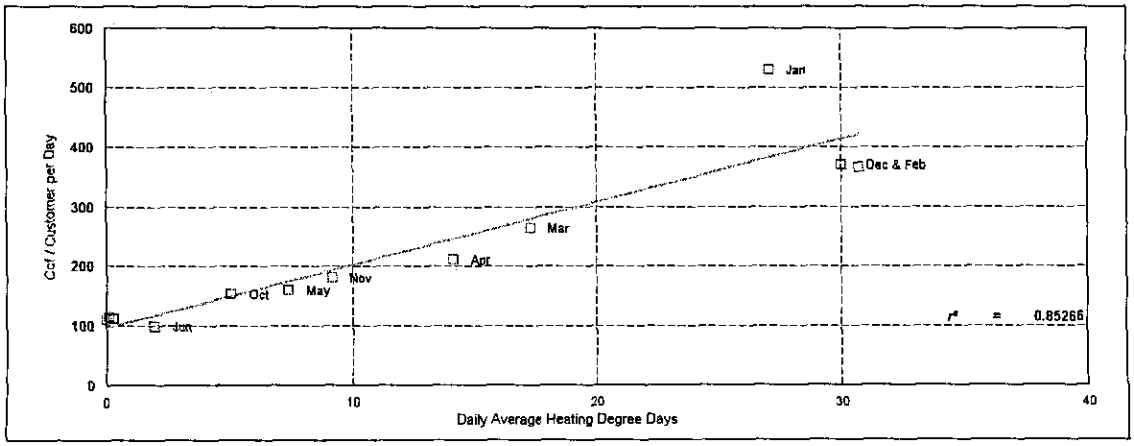
Residential Gas Service



Small General Gas Service



Large General Gas Service



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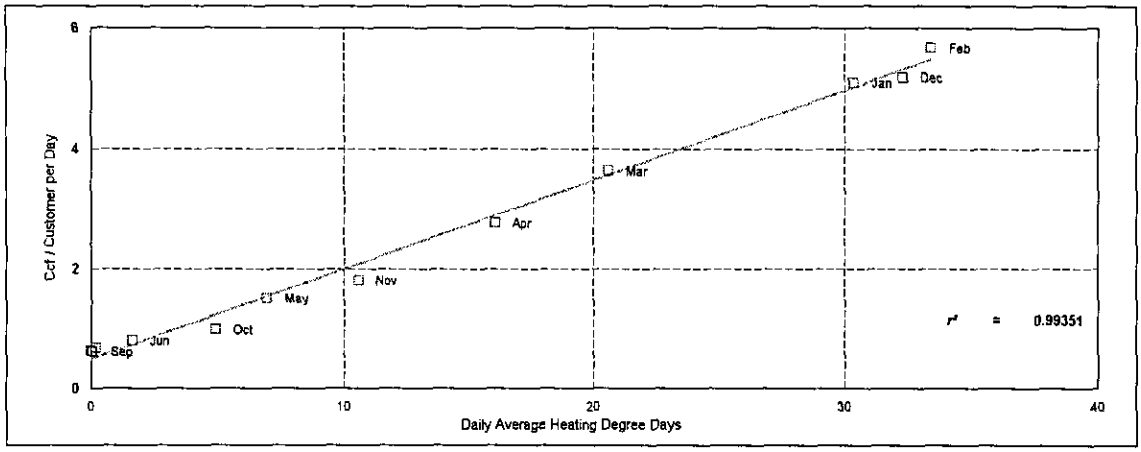
Plots of Billing Month Actual & Estimated Usage vs. Heating Degree Days

Kansas City Geographic Region

Residential Gas Service



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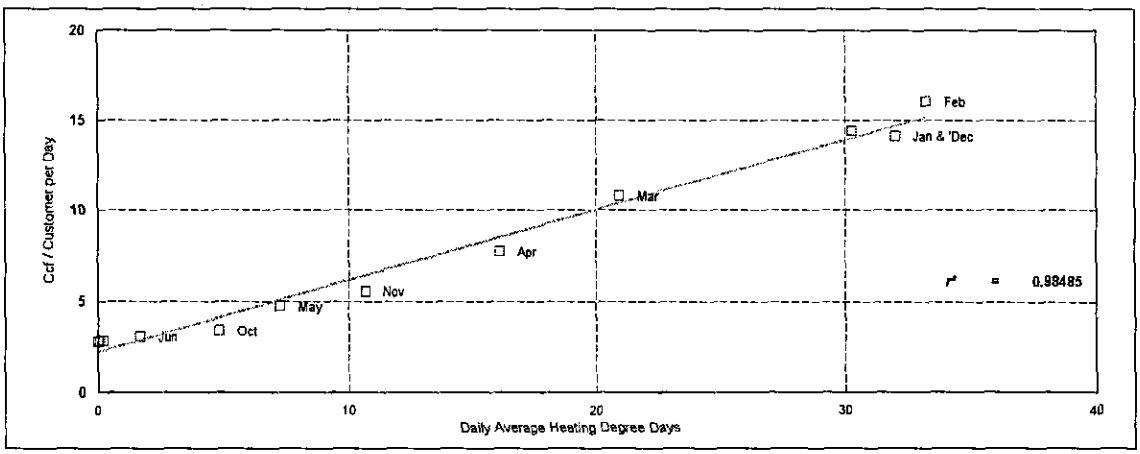
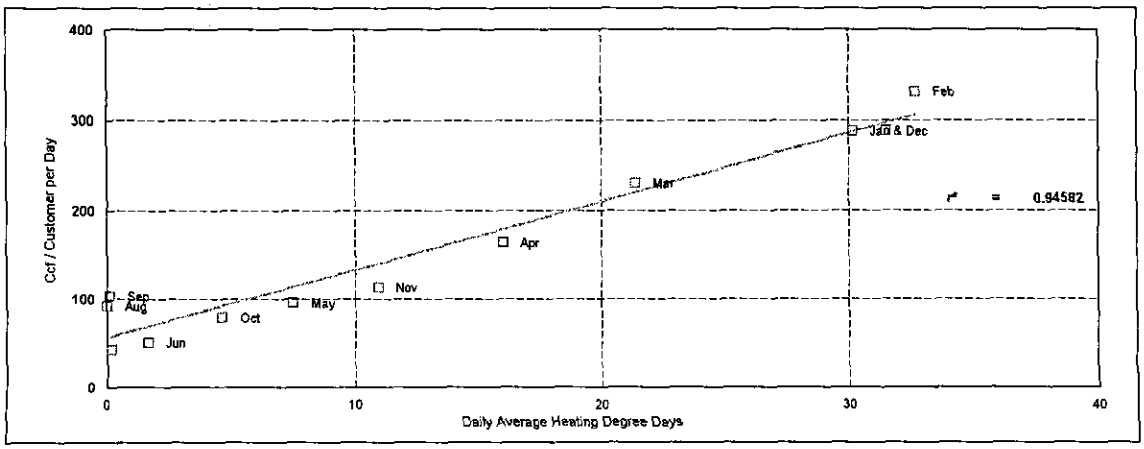


Large General Gas Service



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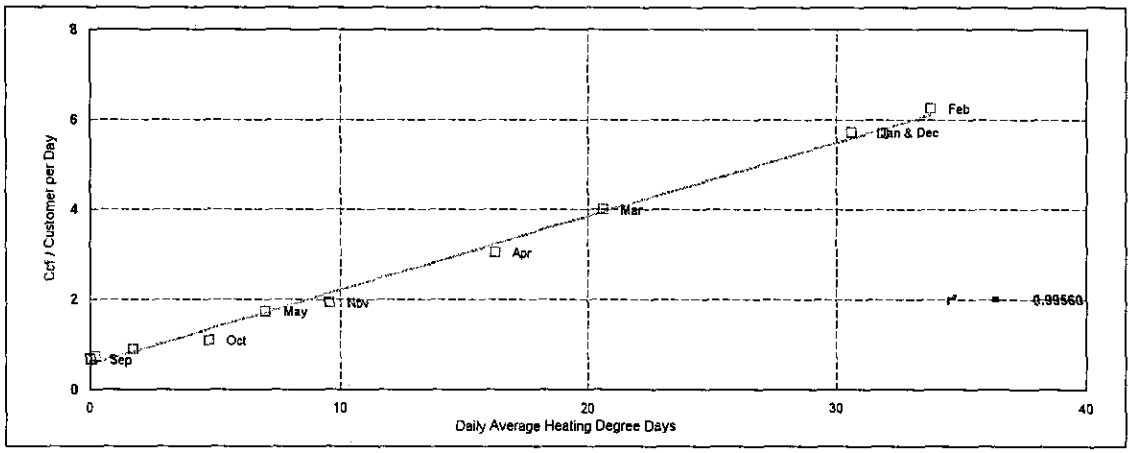
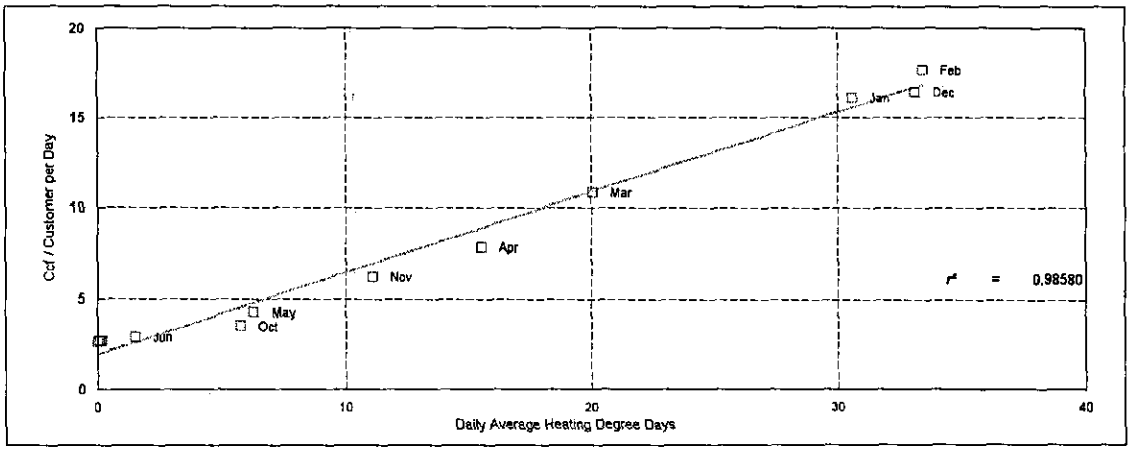
Plots of Billing Month Actual & Estimated Usage vs. Heating Degree Days

St. Joseph Geographic Region

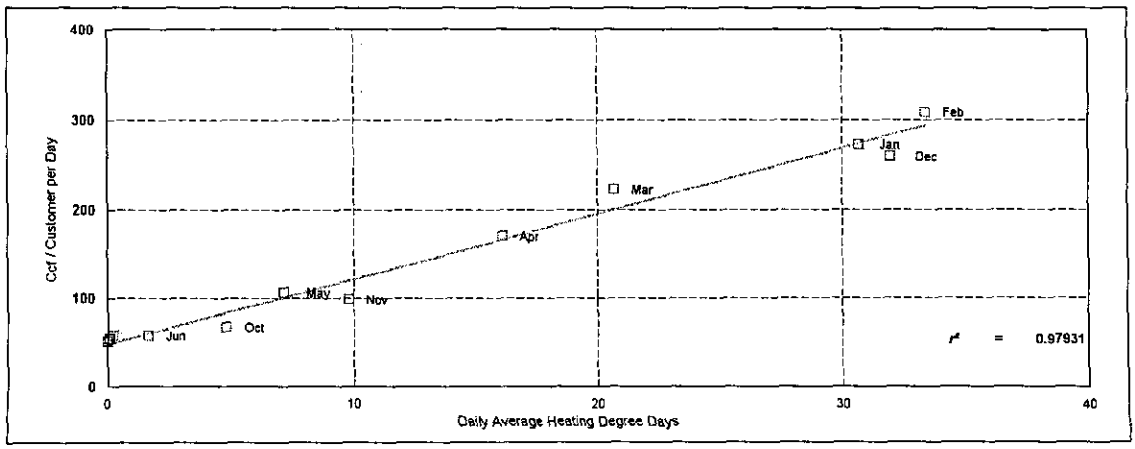
Residential Gas Service



Small General Gas Service



Large General Gas Service



Missouri Gas Energy
Case No. GR-2001-292

Weather Normalized Billing Month Usage in Ccf per Customer
For the Test Year of January 1, 2000 - December 31, 2000

Joplin Geographic Region

	Residential Gas Service Customers	Small General Gas Service Customers	Large General Gas Service Customers
Jan	169.9457	427.5040	10,489.3427
Feb	155.7234	402.1027	10,179.6826
Mar	125.3781	311.4457	8,300.6787
Apr	76.4522	193.5072	5,594.3950
May	36.6808	106.0589	3,450.8658
Jun	22.3959	85.4573	1,996.4931
Jul	17.4557	77.7388	1,727.8981
Aug	16.4618	76.6059	1,593.8290
Sep	16.4003	75.5853	1,707.3171
Oct	20.4610	76.5241	1,689.6857
Nov	58.0679	159.6568	3,606.0037
Dec	115.6349	306.4122	6,826.7805
Annual	849.0754	2,455.8618	58,468.5242

Kansas City Geographic Region

	Residential Gas Service Customers	Small General Gas Service Customers	Large General Gas Service Customers
Jan	200.5987	554.3216	10,911.0020
Feb	187.4069	526.3895	10,929.0183
Mar	144.3840	415.0059	8,638.0360
Apr	91.2433	255.0024	5,455.2399
May	50.3314	153.7134	3,081.2928
Jun	29.2282	108.2783	1,858.0390
Jul	20.7744	88.5560	1,345.4142
Aug	18.9802	85.0471	2,833.0837
Sep	20.2850	89.4705	3,162.8891
Oct	22.8982	87.7161	2,142.8519
Nov	64.6564	190.8237	3,768.4666
Dec	137.9060	380.0548	7,871.8157
Annual	997.3736	3,095.9531	64,411.4650

St. Joseph Geographic Region

	Residential Gas Service Customers	Small General Gas Service Customers	Large General Gas Service Customers
Jan	221.1380	628.7505	10,489.3427
Feb	208.5251	583.1973	10,179.6826
Mar	160.0719	425.8486	8,300.6787
Apr	100.9242	256.4569	5,594.3950
May	58.3271	148.7088	3,450.8658
Jun	32.1520	102.7390	1,996.4931
Jul	22.5661	83.3380	1,727.8981
Aug	20.8652	81.1570	1,593.8290
Sep	21.6727	89.0511	1,707.3171
Oct	25.4579	80.0844	1,689.6857
Nov	71.7378	219.6441	3,606.0037
Dec	150.2646	435.4117	6,826.7805
Annual	1,106.4466	3,303.7138	58,468.5242

Missouri Gas Energy
Case No. GR-2001-292

Adjustment Volumes for Normal Weather
For the Test Year of January 1, 2000 - December 31, 2000

Joplin Geographic Region

	Residential Gas Service Customers	Small General Gas Service Customers	Large General Gas Service Customers
Jan	1,783,450.10	750,730.58	142,741.83
Feb	514,789.78	231,417.87	39,078.24
Mar	2,047,669.14	855,904.81	157,747.04
Apr	396,374.21	166,454.80	28,886.90
May	(178,118.83)	(74,441.47)	(7,581.56)
Jun	39,551.39	14,263.75	632.68
Jul	(44,673.97)	(14,373.92)	(3,484.99)
Aug	(316.32)	(142.28)	(21.09)
Sep	23,297.03	7,873.61	848.84
Oct	(382,938.93)	(143,704.22)	(34,575.70)
Nov	280,901.90	107,824.42	33,030.92
Dec	(2,001,226.98)	(845,595.23)	(148,091.18)
Total	2,478,758.51	1,056,212.72	209,211.94

Kansas City Geographic Region

	Residential Gas Service Customers	Small General Gas Service Customers	Large General Gas Service Customers
Jan	12,007,274.97	3,980,182.10	655,972.75
Feb	6,723,465.64	2,369,583.61	436,679.77
Mar	12,635,626.97	4,176,662.02	680,659.47
Apr	3,287,782.40	1,141,059.49	212,400.76
May	2,004,440.79	581,629.24	91,487.63
Jun	1,561,406.87	499,938.16	92,731.77
Jul	(59,911.80)	(11,203.92)	3.80
Aug	19,944.59	5,735.31	1,301.20
Sep	486,363.47	125,821.21	20,396.96
Oct	(2,187,721.39)	(620,440.41)	(85,959.42)
Nov	2,289,739.29	641,637.84	72,079.90
Dec	(9,182,463.92)	(3,016,138.68)	(452,641.05)
Total	29,585,947.88	9,874,465.98	1,725,113.55

St. Joseph Geographic Region

	Residential Gas Service Customers	Small General Gas Service Customers	Large General Gas Service Customers
Jan	996,210.22	369,266.90	54,343.31
Feb	567,145.46	193,210.41	33,297.53
Mar	1,115,735.12	366,419.24	60,773.40
Apr	293,702.28	89,387.34	16,878.03
May	187,888.55	68,796.29	10,458.44
Jun	132,596.24	34,106.07	8,253.77
Jul	(7,479.28)	(1,991.00)	(630.95)
Aug	1,282.33	664.26	88.04
Sep	38,080.85	13,002.56	1,925.88
Oct	(200,435.71)	(80,718.16)	(11,045.37)
Nov	272,592.51	69,806.84	14,145.12
Dec	(869,079.26)	(307,265.96)	(55,472.90)
Total	2,528,239.30	814,684.77	133,014.28

Missouri Gas Energy
Case No. GR-2001-292

Weather Normalized Coincident Peak Day Demand in Ccf per Customer
For the Test Year of January 1, 2000 - December 31, 2000

Joplin Geographic Region

	Residential Gas Service Customers	Small General Gas Service Customers	Large General Gas Service Customers
Jan	9.3046	22.5933	739.9415
Feb	8.1305	19.8694	654.9521
Mar	6.1232	15.2123	509.6476
Apr	4.2018	10.7546	370.5645
May	2.3590	6.4794	237.1755
Jun	0.7246	2.6875	118.8652
Jul	0.4362	2.0184	97.9869
Aug	0.4478	2.0454	98.8305
Sep	2.2003	6.1111	225.6819
Oct	3.7342	9.6698	336.7164
Nov	5.8988	14.6918	493.4090
Dec	8.3913	20.4743	673.8269
Annual	9.3046	22.5933	739.9415

Kansas City Geographic Region

	Residential Gas Service Customers	Small General Gas Service Customers	Large General Gas Service Customers
Jan	10.3211	27.8391	558.2801
Feb	9.0394	24.5045	492.9155
Mar	6.9297	19.0153	385.3188
Apr	4.5156	12.7342	262.1990
May	2.6611	7.9088	167.6143
Jun	0.9796	3.5338	81.8565
Jul	0.5081	2.3070	57.8109
Aug	0.6200	2.5982	63.5179
Sep	2.3313	7.0509	150.7976
Oct	4.0486	11.5191	238.3816
Nov	6.4523	17.7730	360.9688
Dec	9.5542	25.8438	519.1679
Annual	10.3211	27.8391	558.2801

St. Joseph Geographic Region

	Residential Gas Service Customers	Small General Gas Service Customers	Large General Gas Service Customers
Jan	11.3787	31.1560	531.3003
Feb	9.9678	27.3546	468.2782
Mar	7.6452	21.0970	364.5375
Apr	4.9876	13.9367	245.8300
May	2.9459	8.4359	154.6351
Jun	1.0948	3.4484	71.9507
Jul	0.5757	2.0500	48.7668
Aug	0.6989	2.3819	54.2693
Sep	2.5829	7.4579	138.4210
Oct	4.4735	12.5515	222.8662
Nov	7.1196	19.6809	341.0602
Dec	10.5344	28.8813	493.5898
Annual	11.3787	31.1560	531.3003