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Issues: Weather Normalization

Witness: James A. Gray
Sponsoring Party: MO PSC Staff
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MISSOURI PUBLIC SERVICE COMMISSION

UTILITY OPERATIONS DIVISION

DIRECT TESTIMONY

OF

JAMES A. GRAY

MISSOURI GAS ENERGY

CASE NO. GR-2004-0209

Jefferson City, Missouri
April 2004

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-2004-0209

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 following Direct Testimony in question and answer form, consisting of 16 pages of Direct Testimony to be presented in the above case, that the answers in the following 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 13th day of April, 2004.

Dawn L. Hake
Notary Public

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

My commission expires _____

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DIRECT TESTIMONY

OF

JAMES A. GRAY

MISSOURI GAS ENERGY

CASE NO. GR-2004-0209

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-four 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 in 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. I have also submitted testimony concerning weather-normalized sales, complaints, certificates of convenience and necessity, and recommended minimum statistical sample sizes for 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-normalization of natural gas sales for the firm residential natural gas and the general

service commercial natural gas customers of Missouri Gas Energy (MGE or Company), a division of Southern Union Company for the test year ending June 30, 2003. Then, 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, small general service, and large general service customer classes of MGE.

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

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

Kim J. Elvington of the Commission's Energy Tariffs/Rate Design Department, for the Staff's allocation of the weather-normalized sales to the block rates of the small general service classes. (MGE's small general service class has different unit charges for natural gas volumes falling within 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, 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 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 the cooler, 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 the warmer, normal weather conditions than it sells during a colder than normal test year.

Q. What weather measure did you use in your analyses?

A. Staff witness Patterson provided me with daily actual and daily normal heating degree days (HDD) for the Springfield-Branson Regional Airport and the Kansas City International Airport. Mr. Patterson's testimony discusses the calculation of HDD.

Q. What was your source for the billed natural gas usage data?

A. MGE provided me with monthly natural gas sales in hundreds of 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 accounts into billing cycles that are to be read throughout a month, followed by mailing the associated bills throughout the month. Staggering the billing of customers' accounts over the billing months reduces the effort to bill MGE's customers. Since there are approximately twenty-one working days in a month, customers' accounts are usually grouped into one of the approximately 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 meter readings, due to

holidays and variations in the number of days and in the placement of weekends, from one billing month to another. For clarification, a billing month, as used in this testimony, refers to the interval (days) needed to read all of MGE's twenty-one billing cycles.

Q. Have you prepared a schedule showing the meter read dates for the February 2003 billing month?

A. Yes, Schedule 2, attached to this testimony, shows how the twenty-one billing cycles' meter-reading dates are staggered for the billing month of February 2003. The February billing month's cycle numbers are shown in red. Schedule 2 shows the billing month of February starting on January 24, 2003, and ending on February 21, 2003.

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, to allow precise matching for studies of the relationship of natural gas usage to weather. However, daily usage data for MGE's residential, small general service, and large general service customers are unavailable. Therefore, I relied on the Company's monthly billing cycle data.

Q. How did you analyze space heating natural gas volumes?

A. I performed my 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 Staff witness 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 Staff witness Patterson's HDD 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 that each billing cycle encompasses.

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

A. Each billing month's daily average HDD in each billing cycle 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 2003 for MGE's small general service customers in MGE's Joplin geographic region. The customer numbers vary from

286 customers for billing cycle number five (5) to 907 customers for billing cycle number twenty (20). Also, the HDD vary from 878.5 for billing cycle number twenty-one (21) to 1,133.5 HDD for billing cycle number twelve (12). This shows that there are significant differences among the billing cycles within a billing month. This demonstrates the need to carefully average the HDD across all the billing cycles for each of the twelve 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. 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. 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 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 customers in the three

geographic regions. The regression analysis describes the relationship between daily space-heating sales per customer in Ccf to the daily HDD.

Q. What are the advantages of using regression?

A. The regression equation 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 0.14602. This means that, in MGE's Kansas City geographic region, a residential customer's estimated usage will change approximately 0.14602 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?

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 0.959536, 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. I used the estimated relationship between space heating usage in Ccf and HDD to adjust the actual HDD to the normal HDD provided to me by Staff witness 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. I added or subtracted a few days to make each billing cycle's annual total days match 365 days. This adjustment for days sets each billing cycle to the same total number of days and normal HDD. Failure to equalize the normal HDD will result in some billing cycles having the wrong annual or total number of normal HDD.

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. I used the estimated relationship between space heating usage in Ccf and HDD from my regression studies to adjust the actual HDD to the normal HDD provided to me by Staff witness Patterson.

The fourth step is to sum each billing cycle's adjustment volumes by billing month. The fifth step is adding the monthly adjustments in Ccf to total monthly natural gas sales to calculate normalized volumes.

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

A. The Commission's Auditing Department can multiply its customer levels by my weather-normalized sales per customer to calculate its customers' growth annualization.

Q. Were you able to weather-adjust natural gas sales for MGE's large general service customers for each of MGE's geographic regions?

A. No, the large general service customers in the Kansas City geographic region did not exhibit any weather sensitivity. I did not make a weather adjustment to those customers' natural gas usage.

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

A. My analyses resulted in a decrease to natural gas sales because the weather during the test year was colder than normal. My analyses result in an approximate 0.4 percent decrease from actual natural gas sales for the residential customer class, approximately a 0.5 percent decrease for the small general service class, and approximately a 1.9 percent decrease for the large general service class. These decreases do not include the Staff's customer growth annualization.

Q. What results did you provide to Staff witness Harrison for his customer growth annualization and revenue calculations?

A. I provided monthly, normalized natural gas usage in Ccf per customer for each customer class for MGE's Joplin, Kansas City, and St. Joseph 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 Staff witness Harrison's revenue calculations, I provided monthly weather-normalized volumes for the same firm classes and geographic regions. Schedule 6, attached to my testimony, contains the monthly weather-normalized 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 Staff witness 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, small general service, and large general service customers' natural gas peak usage are at the time (coincident) of a utility's system daily peak.

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

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

Q. Are the residential and general service customers' peak day demands weather-sensitive?

A. Yes, residential and general service customers would be expected to use more natural gas on those colder days since their demand for natural gas is 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 Staff witness Patterson provide to you for estimating weather-normalized coincident peak day demand?

A. Staff witness Patterson provided me with two sets (one set for the Kansas City and St. Joseph geographic regions 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. Staff witness 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 weather-normalized coincident peak-day demand by firm customer class on Staff witness Patterson's 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?

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. Therefore, 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 MGE's Kansas City geographic region is 0.14602. I multiplied that estimate times Staff witness 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 located on 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 customers for MGE's Joplin, Kansas City, and St. Joseph 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 MGE's Joplin, Kansas City, and St. Joseph geographic regions. This information was provided to Staff witness Daniel I. Beck of the Commission's Energy Engineering Analysis department for his calculation of total peak day demand across MGE's firm customer classes.

Q. How did you estimate daily peak natural gas usage in Ccf per customer by month for the large general service customers in the Kansas City geographic region 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 used the unadjusted daily usage per customer as my estimate of daily peak natural gas usage in Ccf 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 Staff witness 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 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 to adjust it to 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 Staff witness 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-normalized usage per customer shown in Schedule 5, my weather-normalized total sales volumes 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.

Missouri Gas Energy

Case No. GR-2004-0209

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	
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	**

**Concerns Weather-Normalized Sales

Union Electric Company	GR-97-393	**
Missouri Gas Energy	GR-98-140	**
Laclede Gas Company	GR-98-374	**
St. Joseph Light & Power Company	GR-99-42	**
AmerenUE	GA-99-107	
Laclede Gas Company	GA-99-236	
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	
Missouri Gas Energy, et al	GC-2001-593	
Laclede Gas Company	GR-2002-356	**
Laclede Gas Company	GA-2002-429	
Southern Missouri Gas Company, L.P.	GT-2003-0031	
Laclede Gas Company	GT-2003-0032	
Missouri Gas Energy	GT-2003-0033	
AmerenUE	GT-2003-0034	
Fidelity Natural Gas, Inc.	GT-2003-0036	
Atmos Energy Corporation	GT-2003-0037	
Aquila Networks- L&P	GT-2003-0038	
Aquila Networks- MPS	GT-2003-0039	
AmerenUE	GR-2003-0517	**
Aquila Networks – MPS and L&P	GR-2004-0072	**

**Concerns Weather-Normalized Sales

Missouri Gas Energy
Case No. GR-2004-0209

Scheduled Meter Read Dates by Billing Cycle

Applicable to All Firm Customer Classes

January 2003

Sun	Mon	Tue	Wed	Thu	Fri	Sat
			1 **Holiday**	2 Cycle 6 Read January Billing Month	3 Cycle 7 Read	4
5	6 Cycle 8 Read	7 Cycle 9 Read	8 Cycle 10 Read	9 Cycle 11 Read	10 Cycle 12 Read	11
12	13 Cycle 13 Read	14 Cycle 14 Read	15 Cycle 15 Read	16 Cycle 16 Read	17 Cycle 17 Read	18
19	20 Cycle 18 Read	21 Cycle 19 Read	22 Cycle 20 Read	23 Cycle 21 Read January Billing Month Ends	24 Cycle 1 Read February Billing Month Starts	25
26	27 Cycle 2 Read	28 Cycle 3 Read	29 Cycle 4 Read	30 Cycle 5 Read	31 Cycle 6 Read	

February 2003

Sun	Mon	Tue	Wed	Thu	Fri	Sat
						1
2	3 Cycle 7 Read	4 Cycle 8 Read	5 Cycle 9 Read	6 Cycle 10 Read	7 Cycle 11 Read	8
9	10 Cycle 12 Read	11 Cycle 13 Read	12 Cycle 14 Read	13 Cycle 15 Read	14 Cycle 16 Read	15
16	17 Cycle 17 Read	18 Cycle 18 Read	19 Cycle 19 Read	20 Cycle 20 Read	21 Cycle 21 Read February Billing Month Ends	22
23	24 Cycle 1 Read March Billing Month Starts	25 Cycle 2 Read	26 Cycle 3 Read	27 Cycle 4 Read	28 Cycle 5 Read	

Missouri Gas Energy
Case No. GR-2004-0209

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

Joplin Geographic Region - Small General Service Customers

January 2003

Sun	Mon	Tue	Wed	Thu	Fri	Sat
			1 **Holiday**	2 Cycle 6 Cust = 740 Ccf = 318935 HDD= 930	3 Cycle 7 Cust = 632 Ccf = 257860 HDD= 935	4
5	6 Cycle 8 Cust = 677 Ccf = 355929 HDD= 981	7 Cycle 9 Cust = 629 Ccf = 280107 HDD= 965	8 Cycle 10 Cust = 657 Ccf = 208912 HDD= 927.5	9 Cycle 11 Cust = 356 Ccf = 120643 HDD= 857	10 Cycle 12 Cust = 431 Ccf = 138612 HDD= 864	11
12	13 Cycle 13 Cust = 539 Ccf = 176361 HDD= 945.5	14 Cycle 14 Cust = 426 Ccf = 163758 HDD= 955.5	15 Cycle 15 Cust = 659 Ccf = 219195 HDD= 965	16 Cycle 16 Cust = 479 Ccf = 179245 HDD= 984	17 Cycle 17 Cust = 530 Ccf = 260770 HDD= 1013.5	18
19	20 Cycle 18 Cust = 769 Ccf = 360274 HDD= 1112	21 Cycle 19 Cust = 753 Ccf = 223058 HDD= 1134.5	22 Cycle 20 Cust = 898 Ccf = 356852 HDD= 1161.5	23 Cycle 21 Cust = 536 Ccf = 206095 HDD= 1195	24 Cycle 1 Cust = 463 Ccf = 202401 HDD= 1156.5	25
26	27 Cycle 2 Cust = 727 Ccf = 422872 HDD= 1134	28 Cycle 3 Cust = 465 Ccf = 184406 HDD= 1118.5	29 Cycle 4 Cust = 392 Ccf = 164793 HDD= 1094.5	30 Cycle 5 Cust = 286 Ccf = 119677 HDD= 1097	31 Cycle 6 Cust = 759 Ccf = 385072 HDD= 1051	

February 2003

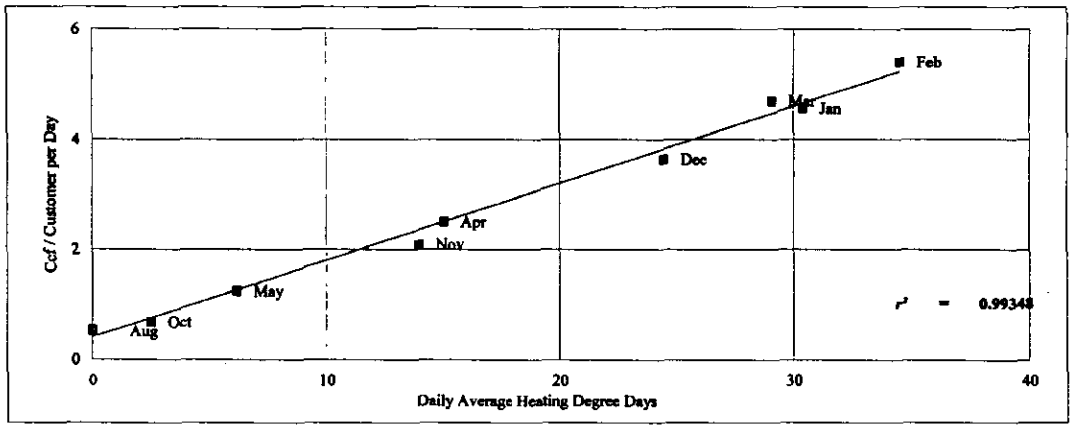
Sun	Mon	Tue	Wed	Thu	Fri	Sat
						1
2	3 Cycle 7 Cust = 650 Ccf = 320152 HDD= 1057	4 Cycle 8 Cust = 692 Ccf = 388953 HDD= 1006.5	5 Cycle 9 Cust = 630 Ccf = 298078 HDD= 1011.5	6 Cycle 10 Cust = 655 Ccf = 246037 HDD= 1041	7 Cycle 11 Cust = 354 Ccf = 153432 HDD= 1067.5	8
9	10 Cycle 12 Cust = 424 Ccf = 194590 HDD= 1133.5	11 Cycle 13 Cust = 547 Ccf = 172993 HDD= 1043.5	12 Cycle 14 Cust = 433 Ccf = 195941 HDD= 1036	13 Cycle 15 Cust = 666 Ccf = 248632 HDD= 1020.5	14 Cycle 16 Cust = 480 Ccf = 196057 HDD= 987	15
16	17 Cycle 17 Cust = 536 Ccf = 293821 HDD= 1029	18 Cycle 18 Cust = 763 Ccf = 339608 HDD= 950.5	19 Cycle 19 Cust = 752 Ccf = 215903 HDD= 939	20 Cycle 20 Cust = 907 Ccf = 310920 HDD= 917	21 Cycle 21 Cust = 534 Ccf = 170417 HDD= 878.5	22
23	24 Cycle 1 Cust = 465 Ccf = 183584 HDD= 945.5	25 Cycle 2 Cust = 743 Ccf = 350191 HDD= 881	26 Cycle 3 Cust = 462 Ccf = 150013 HDD= 901	27 Cycle 4 Cust = 387 Ccf = 140816 HDD= 902.5	28 Cycle 5 Cust = 289 Ccf = 100804 HDD= 905	

Missouri Gas Energy
Case No. GR-2004-0209

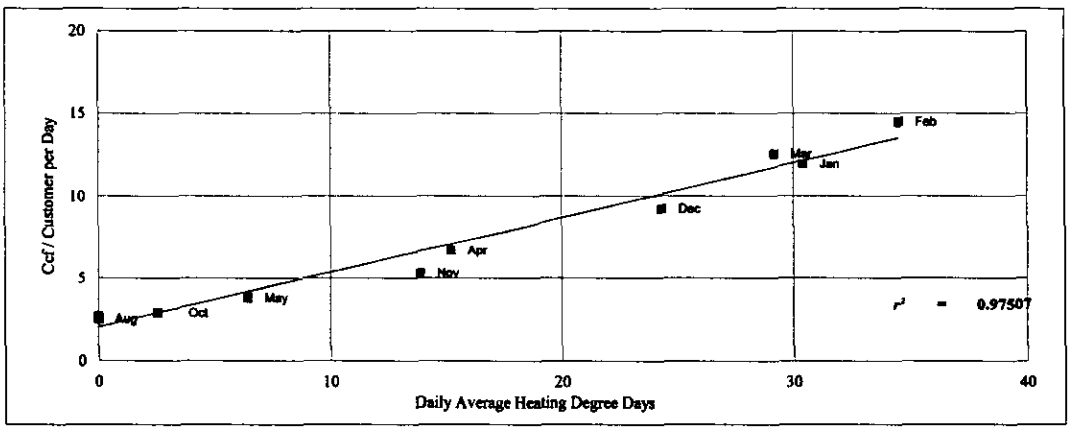
Plots of Billing Month Actual & Estimated Usage vs. Heating Degree Days

Joplin Geographic Region

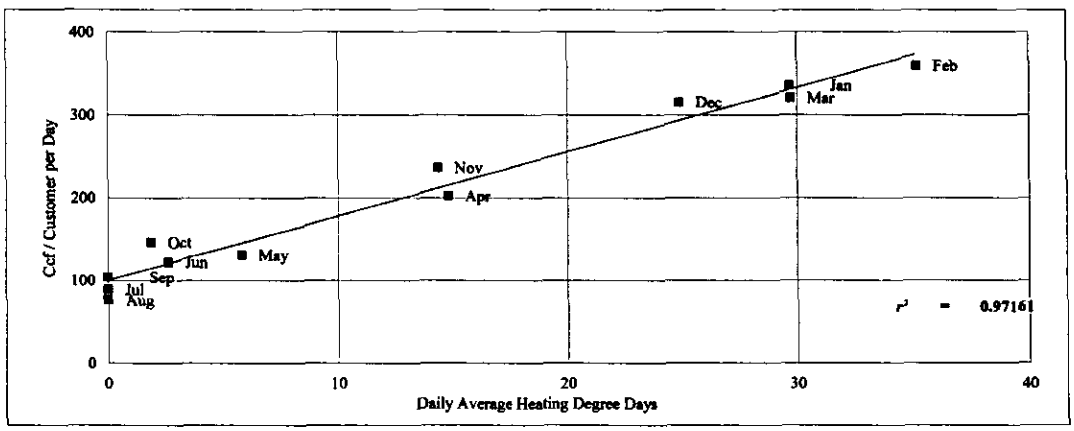
Residential Gas Service



Small General Gas Service



Large General Gas Service

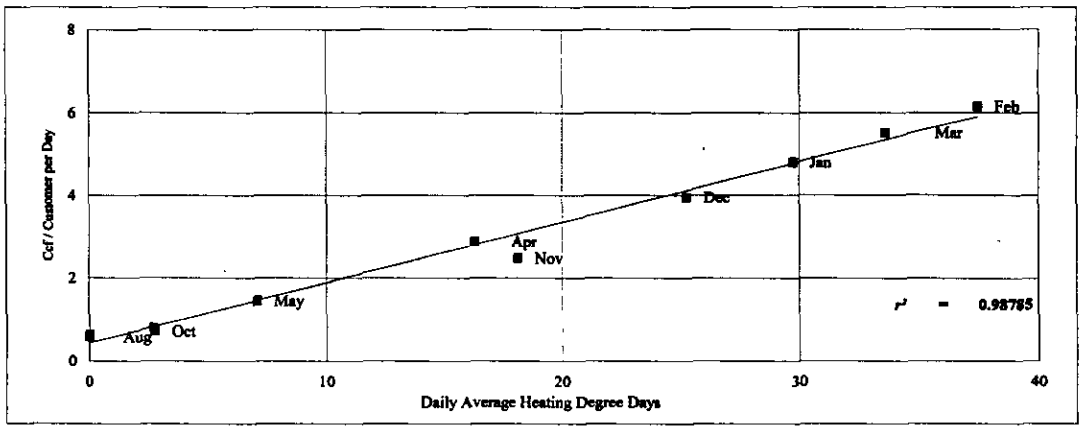


Missouri Gas Energy
Case No. GR-2004-0209

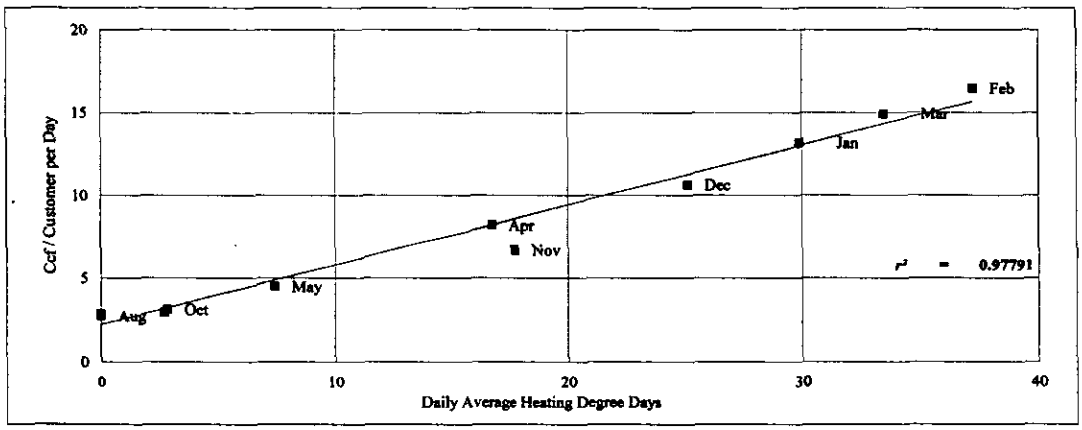
Plots of Billing Month Actual & Estimated Usage vs. Heating Degree Days

Kansas City Geographic Region

Residential Gas Service



Small General Gas Service

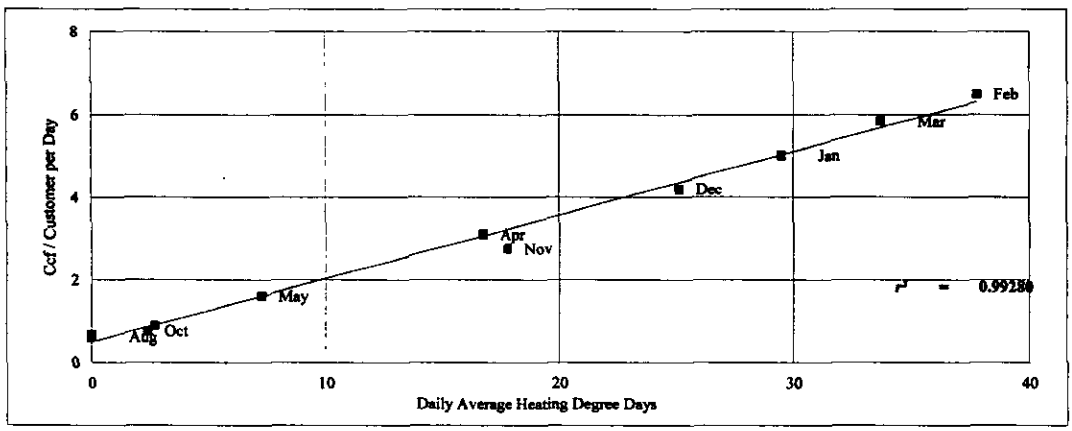


Missouri Gas Energy
Case No. GR-2004-0209

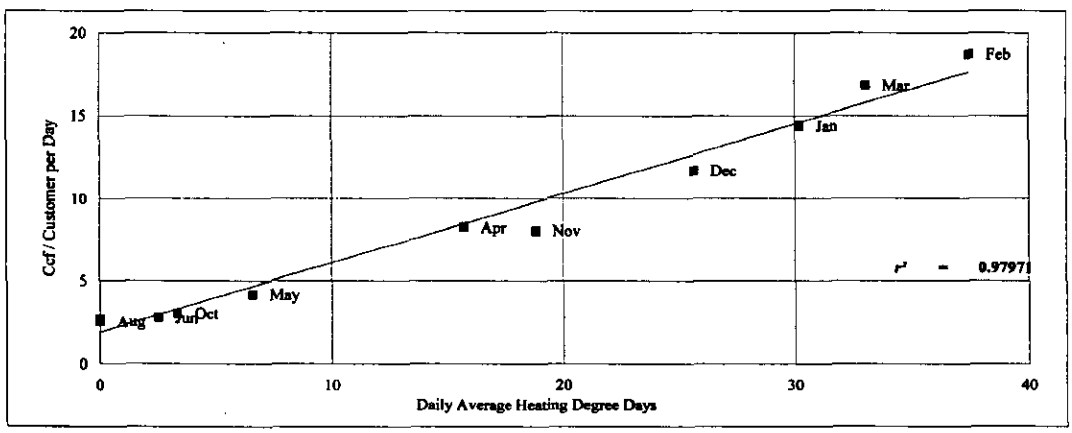
Plots of Billing Month Actual & Estimated Usage vs. Heating Degree Days

St. Joseph Geographic Region

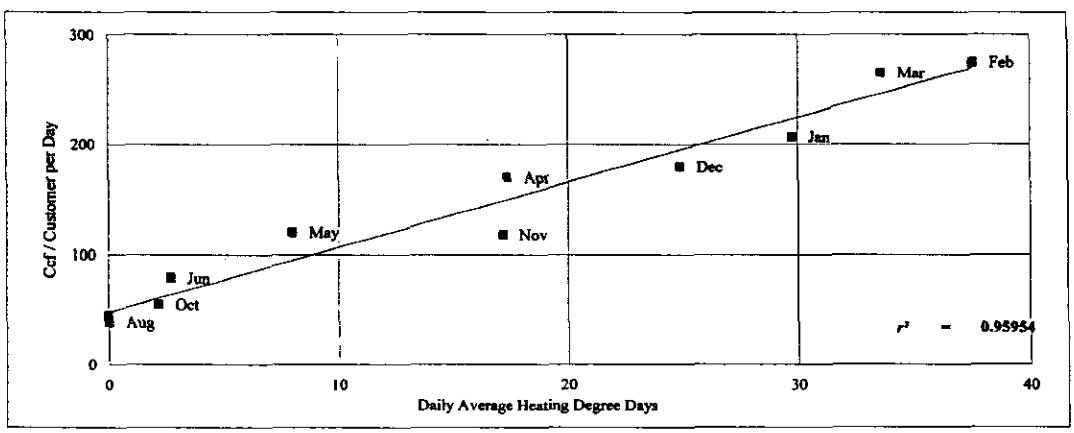
Residential Gas Service



Small General Gas Service



Large General Gas Service



Missouri Gas Energy
Case No. GR-2004-0209

Weather Normalized Billing Month Usage in Ccf per Customer
For the Test Year of July 1, 2002 - June 30, 2003

Joplin Geographic Region

	Residential Gas Service Customers	Small General Gas Service Customers	Large General Gas Service Customers
Jul	17.4009	79.9404	2,800.2482
Aug	15.3859	76.7401	2,299.3094
Sep	16.5382	84.3839	3,202.5513
Oct	24.6503	96.2398	4,645.5013
Nov	46.8319	122.1426	5,934.0042
Dec	101.3265	260.5051	9,427.2020
Jan	154.9175	402.9754	11,547.9240
Feb	150.1107	407.5096	9,866.3253
Mar	119.8956	325.3210	8,194.9184
Apr	78.7473	207.3082	6,247.7806
May	44.5706	131.9337	4,522.4891
Jun	18.8651	85.3559	3,583.9671
Annual	813.2391	2,465.8302	72,710.9643

Kansas City Geographic Region

	Residential Gas Service Customers	Small General Gas Service Customers	Large General Gas Service Customers
Jul	20.3022	89.5595	
Aug	17.5274	81.2545	N / A
Sep	19.4501	89.9322	
Oct	27.4713	105.7310	
Nov	46.7655	133.6632	N / A
Dec	121.4276	322.5527	
Jan	187.4999	503.5604	
Feb	181.2495	491.4950	N / A
Mar	140.3602	389.7295	
Apr	95.0718	264.2571	
May	52.6488	155.8268	N / A
Jun	22.8925	87.9965	
Annual	944.7327	2,906.5212	

St. Joseph Geographic Region

	Residential Gas Service Customers	Small General Gas Service Customers	Large General Gas Service Customers
Jul	21.1811	84.5827	1,415.5736
Aug	18.7946	77.8493	1,154.3836
Sep	19.7011	81.7417	1,323.0194
Oct	29.8037	105.6553	1,953.6714
Nov	52.3035	157.8982	2,404.1261
Dec	130.6940	369.8094	5,582.4515
Jan	194.6115	554.8313	7,759.0163
Feb	191.9536	548.2840	8,103.0199
Mar	149.3972	429.7234	7,136.0546
Apr	101.6314	275.0430	5,320.6263
May	58.4433	152.8249	4,010.3530
Jun	25.9568	80.1121	2,424.8764
Annual	1,010.3351	3,126.3163	49,298.8842

Schedule 5

Missouri Gas Energy
Case No. GR-2004-0209

Weather Normalized Billing Month Usage in Ccf
For the Test Year of July 1, 2002 - June 30, 2003

Joplin Geographic Region

	Residential Gas Service Customers	Small General Gas Service Customers	Large General Gas Service Customers
Jul	1,013,830	677,015	151,213
Aug	886,815	631,878	119,564
Sep	954,433	690,851	147,317
Oct	1,488,533	870,874	209,048
Nov	2,992,746	1,356,638	296,700
Dec	6,554,713	3,055,465	471,360
Jan	10,057,863	4,849,003	577,396
Feb	9,777,009	4,936,979	473,584
Mar	7,800,287	3,952,000	393,356
Apr	5,074,397	2,450,176	293,646
May	2,832,197	1,447,312	198,990
Jun	1,143,263	789,115	139,775
Total	50,576,087	25,707,307	3,471,949

Kansas City Geographic Region

	Residential Gas Service Customers	Small General Gas Service Customers	Large General Gas Service Customers
Jul	6,691,902	3,079,235	
Aug	5,735,061	2,748,189	N / A
Sep	6,355,900	3,038,629	
Oct	9,081,833	3,801,982	
Nov	15,789,237	5,654,220	N / A
Dec	41,424,411	14,359,724	
Jan	64,328,976	23,012,712	
Feb	62,437,930	22,752,287	N / A
Mar	48,407,990	18,056,168	
Apr	32,656,412	11,962,653	
May	17,977,996	6,661,438	N / A
Jun	7,698,826	3,345,714	
Total	318,586,473	118,472,952	

St. Joseph Geographic Region

	Residential Gas Service Customers	Small General Gas Service Customers	Large General Gas Service Customers
Jul	520,991	223,214	41,052
Aug	457,950	204,199	33,477
Sep	479,604	212,529	37,045
Oct	739,786	294,990	54,703
Nov	1,332,904	518,064	76,932
Dec	3,373,605	1,271,774	178,638
Jan	5,031,486	1,933,032	248,289
Feb	4,969,678	1,922,832	243,091
Mar	3,866,699	1,508,759	192,673
Apr	2,597,700	946,698	148,978
May	1,481,069	492,707	104,269
Jun	645,935	235,209	58,197
Total	25,497,407	9,764,007	1,417,343

Schedule 6

Missouri Gas Energy
Case No. GR-2004-0209

Weather Normalized Coincident Peak Day Demand in Ccf per Customer
For the Test Year of July 1, 2002 - June 30, 2003

Joplin Geographic Region

	Residential Gas Service Customers	Small General Gas Service Customers	Large General Gas Service Customers
Jul	0.4876	2.2745	105.0378
Aug	0.5717	2.4735	109.7029
Sep	2.5887	7.2485	221.6646
Oct	4.0874	10.7966	304.8584
Nov	6.2165	15.8369	423.0402
Dec	8.7657	21.8720	564.5474
Jan	9.1579	22.8004	586.3178
Feb	8.4576	21.1424	547.4422
Mar	6.5246	16.5664	440.1455
Apr	4.4376	11.6256	324.2962
May	2.6867	7.4806	227.1072
Jun	1.1880	3.9325	143.9134
Annual	9.1579	22.8004	586.3178

Kansas City Geographic Region

	Residential Gas Service Customers	Small General Gas Service Customers	Large General Gas Service Customers
Jul	0.5609	2.4836	41.8771
Aug	0.6923	2.8095	41.8487
Sep	2.8972	8.2767	45.0866
Oct	4.6202	12.5490	57.1038
Nov	7.1464	18.8127	142.6747
Dec	10.1690	26.3075	221.0186
Jan	10.0814	26.0903	269.8374
Feb	9.5703	24.8230	316.2631
Mar	7.4676	19.6093	279.7993
Apr	4.9853	13.4542	148.8467
May	2.9264	8.3491	236.0231
Jun	1.2764	4.2577	243.6772
Annual	10.1690	26.3075	316.2631

St. Joseph Geographic Region

	Residential Gas Service Customers	Small General Gas Service Customers	Large General Gas Service Customers
Jul	0.6247	2.2494	52.3907
Aug	0.7631	2.6281	57.7087
Sep	3.0855	8.9815	146.9327
Oct	4.9003	13.9465	216.6574
Nov	7.5611	21.2256	318.8810
Dec	10.7448	29.9353	441.1947
Jan	10.6525	29.6828	437.6493
Feb	10.1142	28.2102	416.9683
Mar	7.8995	22.1513	331.8805
Apr	5.2848	14.9984	231.4296
May	3.1162	9.0657	148.1145
Jun	1.3783	4.3111	81.3442
Annual	10.7448	29.9353	441.1947

Schedule 7