Missouri Gas Energy

Demand/Capacity Analysis

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DEMAND/CAPACITY ANALYSIS
MISSOURI GAS ENERGY
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INTRODUCTION

A. INTRODUCTION

Purpose of Report

As part of its long-term demand and supply planning process, Missouri Gas Energy ("MGE" or the "Company") has developed an analysis to forecast demand and compare those projections with the Company's existing pipeline transportation portfolio. The results of that analysis are provided in this report.

MGE currently has approximately 385,750 firm customers in its Kansas City region, 29,000 in St. Joseph, and 76,150 in Joplin. In all three of its regions, the customer mix is very similar with residential customers representing approximately 88%, small general service customers representing nearly 12% and industrial customers representing approximately 0.1%. Similar to customer count, Kansas City is by far MGE's largest service territory in terms of demand, followed by Joplin and then St. Joseph. Specifically, Kansas City represents approximately 80% of MGE's total peak day demand, while Joplin and St. Joseph represent approximately 14% and 6%, respectively. In Kansas City and St. Joseph, residential customers represent approximately 70% of annual demand, small general service customers represent 26% and large general service customers represent 4%. Small general service demand represents a slightly greater percentage of total demand in Joplin, while residential demand represents a slightly lower percentage, and percentage of industrial demand is effectively the same.

For this report, MGE has forecast both peak day and monthly demand for its firm sales customers based on statistically rigorous analyses. Specifically, regression analyses using the SPSS™ software package were utilized to project both peak day and monthly demand. The regression analyses[1] were based on seven years of daily firm customer usage data[2] and thirty years of daily weather data. Demand projections were developed for each of MGE's three primary service territories to which it distributes natural gas, i.e., Kansas City, St. Joseph and Joplin, as well as for the MGE system in total.

1 The statistical output for the regression analyses are provided in Attachment A to this report.

2 Six years of daily firm customer usage data was used for the monthly analysis for non-winter months (April-October).

It is important to understand that the purpose of MGE's Demand/Capacity Analysis is to forecast demand and compare those projections to the Company's existing pipeline capacity. However, the analysis should not be evaluated in isolation. Rather it is one tool utilized by MGE to evaluate the balance between its firm demand and pipeline capacity resources. In addition to the Demand/Capacity Analysis contained herein, there are numerous other factors that influence the development of a pipeline transportation portfolio, including, but not limited to, the timing and availability of pipeline capacity, the benefits of supply diversity, the economic considerations of transportation capacity and supply, the cost of possible capacity service interruptions and the Company's future bargaining position. MGE's primary concern remains the provision of safe and reliable natural gas service to all of its customers.

This report is presented in five sections:

Introduction – provides the purpose of the report and a summary of each of the sections of the report;

Demand Forecast Methodology – provides a detailed explanation of the methodology utilized to forecast the peak day and monthly demand;

Peak Day Demand Forecast – provides a detailed explanation of the results of the peak day demand projection;

Monthly Demand Forecast – provides a detailed explanation of the results of the monthly demand projection, both for normal year and design winter; and

Capacity Resources – provides a detailed explanation of the pipeline capacity contracts MGE currently has in its portfolio.

Also, as mentioned above, Appendix A provides the statistical output of the regression analyses developed for this report.

DEMAND FORECAST ANALYSIS METHODOLOGY

B. DEMAND FORECAST ANALYSIS METHODOLOGY

As discussed in the Introduction, MGE utilized the past seven gas years of daily firm sales data, i.e., daily demand from 1997/1998 through 2003/2004, in order to forecast peak day and monthly demand.[3,4] The data used for the analysis was firm daily metered deliveries for Kansas City, St. Joseph and Joplin as delivered by the interstate pipeline system to MGE's citygates. In other words, the data used for the analysis excluded all non-firm volumes, i.e., all volumes associated with transportation and interruptible customers. MGE utilized the following formula to develop the demand projections:

Total Firm Demand = Firm Base Load Demand + Firm Heat Load Demand + Reserve Margin

where:

Firm Heat Load Demand = (Firm Heat Load Factor x HDD) + [Coefficient x Other Significant Variables*]

* Other significant variables may include a constant, a trend variable and/or timing variables.

Each of these components for projecting demand will be discussed in a separate section below.

Planning Standard/Weather Data

Firm peak day demand was projected based on design peak day conditions, while firm monthly demand was projected based on normal year and design winter conditions. Normal weather was defined as the average of the past thirty years of heating degree day ("HDD") data, while the design planning standard was established as a 1-in-100 year occurrence.

To calculate normal and design weather, MGE utilized thirty years of daily HDD data from the National Oceanic and Atmospheric Administration ("NOAA"). Specifically, normal weather was defined as the 30-year average of the respective HDDs from 1974/1975 through 2003/2004[5]. The NOAA HDD data for Kansas City, Missouri was utilized to establish normal and design weather for

3 For purposes of this report, a gas year is defined as November 1 through October 31.

4 The monthly analysis for non-winter months (April-October) utilized six years of data, 1997/98-2002/03.

5 Thirty years of weather data, 1973/74 – 2002/03, was utilized for the monthly analyses for non-winter months.

Kansas City and St. Joseph, while the NOAA data for Springfield, Missouri was utilized to establish the normal and design weather for Joplin.[6]

To calculate the number of HDDs for the design peak day, MGE specified a normal distribution using the 30-years of NOAA data. Specifically, a normal distribution was specified using the coldest day (i.e., most HDDs) each year of the data set and the standard deviation of that data. Table B-1 shows the normal and design peak day HDDs utilized for this analysis.

TABLE B-1: NORMAL AND DESIGN PEAK DAY HDDS BY NOAA LOCATION

	Kansas City, MO		Springfield, MO	
Description	Normal Peak HDD	Design Peak HDD	Normal Peak HDD	Design Peak HDD
Peak Day	63.2	81.1	58.7	76.2

Note:
• All HDD data from NOAA.

As reflected in Table B-1, the normal and design peak day HDDs were higher for Kansas City than Springfield. Specifically, the design peak day weather was 81.1 HDD for Kansas City and 76.2 for Springfield.

To calculate the number of HDDs for a design winter, the number of HDDs in a normal winter were first calculated based on the thirty years of NOAA HDD data (which had been summed by month) for each of the Company's three service regions. The number of HDDs associated with the design winter was then calculated by specifying a normal distribution using the average of the 30-years of NOAA data and the standard deviation of that data. For purposes of forecasting design winter demand by month rather than for the entire season as a whole, the resulting number of HDDs for the design winter were then allocated to each month based on the percentage of the HDDs in each normal winter month.

6 NOAA does not have a weather monitoring station for Joplin. Springfield was the closest location and, as such, was utilized for purposes of this analysis.

The normal year and design winter HDD information based on the NOAA data for each location is reflected in Table B-2 below. As with the peak day HDDs, the normal annual and design winter weather utilized for the demand forecast was higher for Kansas City and St. Joseph than for Joplin. Specifically, the normal annual HDDs for Kansas City and St. Joseph totaled 5,269, and for Joplin totaled 4,582. The design winter HDDs for those locations that were used for the monthly demand forecasts were 5,510 and 4,801, respectively. Table B-2 shows the design winter HDDs by month when the total design winter HDDs have been allocated to each winter month based on the percentage of normal annual HDDs in each winter month.

TABLE B-2: NORMAL YEAR AND DESIGN WINTER HDDS BY NOAA LOCATION

	Kansas City, MO				Springfield, MO			
Description	Normal Annual HDD	% of Total	Design Winter HDD	Design Winter HDD by Month	Normal Annual HDD	% of Total	Design Winter HDD	Design Winter HDD by Month
November	670	15%		828	576	15%		712
December	1,035	23%		1,281	907	23%		1,121
January	1,170	26%		1,447	1,033	27%		1,276
February	905	20%		1,120	782	20%		966
March	674	15%		834	587	15%		725
Winter Total	4,455	100%	5,510	5,510	3,883	100%	4,801	4,801
April	328				286			
May	118				101			
June	8				8			
July	0				0			
August	4				0			
September	64				53			
October	292				250			
Annual Total	5,269				4,582			

Note:
- All HDD data from NOAA.
- For the monthly data, the design represents a design winter based on a 1-in-100 occurrence.

While, normal weather represents long-term average conditions, a key consideration in the forecasting process is the firm demand during extreme weather conditions. A design planning standard that encompasses extreme weather conditions allows the Company to ensure adequate pipeline capacity to meet all of its firm sales obligations under such conditions. In addition, the weather represented by the design standard utilized for this report is not theoretical, but encompasses actual weather that has been experienced in MGE's service territory in the past thirty years. Table B-3 compares the normal, design and coldest actual HDDs by winter month for Kansas City using the past thirty years of NOAA weather.

Specifically, Table B-3 reflects the normal HDDs by month, the design winter HDDs (that have been allocated to each winter month as described previously), and the design HDDs for each individual month (rather than design winter allocated to each month) compared to the actual highest number of HDDs experienced in each month in the past thirty years. As shown by the actual HDDs in Table B-3, MGE has experienced extreme weather on its system within the past thirty years. In fact, the actual HDDs experienced in certain months have been at or above the 1-in-100 year design standard for that month. For example, there were 1,604 HDDs experienced in December 1983, which is well in excess of the number of HDDs for December based on a 1-in-100 year occurrence, or 1,448 HDDs. In addition, there were 1,629 HDDs experienced in January 1979, or approximately equal to the number of HDDs for January based on a 1-in-100 year occurrence.

TABLE B-3: COMPARISON OF NORMAL, DESIGN AND ACTUAL HDDS BY MONTH FOR THE KANSAS CITY NOAA STATION OVER THE PAST 30 YEARS

Month	Normal HDD	1:100 Design Winter HDD by Month	1:100 Design Monthly HDD	Actual Coldest in Past 30 Years	
				HDD	Date
November	670	828	973	877	Nov-76
December	1,035	1,281	1,448	1,604	Dec-83
January	1,170	1,447	1,628	1,629	Jan-79
February	905	1,120	1,314	1,262	Feb-78
March	674	834	941	898	Mar-84

Note:
• If comparing to the past 40 years of weather data (instead of 30 years), March 1965 experienced 1,054 HDDs.

It would be extremely unlikely to experience the sum of the design monthly HDDs over the course of a winter, i.e., the design November HDDs, plus the design December HDDs, plus the design January HDDs, and so on. Therefore, for monthly demand planning purposes, MGE has utilized a design winter standard based on a 1-in-100 year occurrence. As shown in Table B-2 and Table B-3, the total design winter HDDs utilized for purposes of forecasting demand in Kansas City and St. Joseph was 5,510. Based on the NOAA data, Kansas City actually experienced 5,394 HDDs in the winter of 1977/1978, or only 2% less than the planning standard utilized for purposes of the analysis incorporated in this report. Because weather actually experienced in the recent past is very close to the design weather, not only in particular months, but over an entire winter, MGE believes that a 1-in-100 design standard is appropriate for its peak day and design winter planning purposes to ensure sufficient pipeline capacity to meet customer demand during these conditions.

Base Load Demand

Base load demand for both the peak day and monthly demand analyses was calculated by examining the trend in July and August demand over the past six years. Specifically, an average of the demand in July and August of each year was used to develop the base load demand for that specific year.[7] These two summer months were utilized for the base load demand calculation since there were no HDDs in either of these months in the past six years. This data thus provided a reasonable estimate of non-weather sensitive load. In addition, the base load demand was analyzed to identify a trend, if any, over the past six years.

Heat Load Demand

The primary objective of the peak day heat load regression analysis was to determine and quantify the relationship between extreme weather conditions and firm demand. As such, the heat load regressions were run: (i) using the three highest demand days each year that were also in the top ten coldest days of that year; and (ii) subtracting the historical base load demand for each year from that year's total peak day demand prior to running the regression. Relying on the highest demand days that were also relatively cold days for the peak day regressions reasonably reflected the demand that has occurred during colder days. In addition, the utilization of three data points for each year provided a balance between having a sufficient number of data points to conduct a regression that produced reasonable results, but not too many data points such that the results of the peak day regression would be understated due to the smoothing effect of including points that were not necessarily peak or near-peak events.

In addition to weather (i.e., HDDs), the peak day demand regression equations were run with various independent variables, including a constant (representing the fixed use per day, either

7 The six year average summer demand was utilized as baseload for the winter of 2003/04 since data for July and August 2004 was not available when the analysis was conducted.

positive or negative that was not accounted for by subtracting baseload) and variables to explore the impact of timing (i.e., weekday versus weekend and an annual trend). The regressions were first run with all these variables included, and then, if one or more variables were not significant at the 95% confidence level, the least significant variable was removed and the regression was re-run until all of the independent variables and the F-statistic for the regression were significant.[8] The peak day regression with all variables being significant was used as the final regression for forecasting purposes.

MGE utilized a similar methodology to calculate monthly heat load demand. The primary difference for calculating monthly heat load demand was that a separate regression equation was run for each month based on the daily demand data for each month over the past seven years[9]. In other words, the regression equation for November included 210 data points, or 30 days of daily demand data for seven years. In addition, the monthly regression analysis included not only the variables discussed above, but an additional timing variable for the day of the month.

Forecast Error/Reserve Margin

The standard error of the Y estimate for a simple regression equation is, in general, a measure of sampling error. In other words, the standard error of the Y estimate results from random fluctuations in sample data. For multiple regression analysis, which has also been utilized for this report depending on the type of forecast or location being forecast, the standard error of the Y estimate is analogous to the size and the distance that the independent variables are from their mean values.

No demand forecast will exactly predict the actual future peak day or monthly demand. However, if the standard error of the Y estimate of the regression analyses is included in the demand projection, the forecast will provide greater certainty that the actual future value will fall within the regression equation's predicted value. Therefore, the standard error of the Y estimate ("Y estimate") is equivalent to a reserve margin since the Y estimate in conjunction with the forecast equation result provides a range of outcomes increasing the probability that the actual observation will fall with in

8 Throughout this report, when significance of the t-statistic or F-statistic is discussed, significance is defined as the 95% confidence level.

9 Six years were used for non-winter months (April-October).

that range. In other words the inclusion of the Y estimate will reduce the probability that the actual observation will fall outside the bandwidth developed by combining the forecast result and the Y estimate.

In addition to considering factors from a capacity addition perspective such as capacity availability, benefits of supply diversity, possible capacity service interruptions and future bargaining position, reasonable demand planning accounts for the possibility of statistical error because the cost of erring on the low side (i.e., not having sufficient pipeline capacity) can be extremely high, both in terms of quantifiable and unquantifiable costs.[10] As such, the standard error of the Y estimate was included for purposes of the demand projection in this report.

10 For example, gas service in Connecticut was interrupted in April 1989 due to a pipeline rupture from a third-party contractor that affected approximately 7,500 customers of Yankee Gas. At that time, the cost of this interruption was more than $1 million.

PEAK DAY FORECAST

C. PEAK DAY DEMAND FORECAST

As discussed in the Analysis Methodology section, the base load demand was forecast for each location based on the average of the July and August demand for that location over the previous six year period. In contrast, a heat load forecast was developed by running a regression of the peak days each year for each location. Specifically, for the peak day heat load regressions, there were four independent variables:

> Constant – represents the fixed use per day, either positive or negative, that was not explained by the base load demand. If significant in the final regression, this coefficient was added to the total of the other variables for forecasting purposes;
>
> HDD – represents the heat load demand per HDD. If significant in the final regression, this coefficient was multiplied by the number of peak day HDDs;
>
> Weekday/Weekend – represents the additional demand experienced, if any, on weekdays versus weekends. If significant in the final regression, this coefficient was multiplied by the number of peak days that were also weekdays;
>
> Trend – represents the change, either positive or negative, in demand from year to year. The seven years of historical data (i.e., 1997/1998 through 2003/2004) represent Years 1 through 7. Thus, if this variable was significant in the final regression, this coefficient was multiplied by the number of the year of the forecast. For example, if the trend variable was significant, it was multiplied by eight to project the peak day demand for Year 8 (i.e., 2004/2005).

Kansas City

As described in the Analysis Methodology section, the base load demand for each of the regions was based on an average of the daily demand in July and August. Table C-1 summarizes the base load demand for Kansas City.

TABLE C-1: KANSAS CITY'S JULY/AUGUST DEMAND FOR 1997/1998 THROUGH 2003/2004

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As presented in Table C-1, the average July and August demand for the past six years in Kansas City was [redacted] MMBtu. A regression was run on the July/August average demand to determine whether there was a trend; however, the trend variable was not significant.

In terms of peak day heat load demand, Table C-2 presents the highest demand days that were also in the top ten coldest days that were utilized for the regression analysis.

<u>Table C-2</u>: Kansas City's Heat Load Demand and HDDs for 1997/1998 Through 2003/2004

[redacted]

For the peak day heat load demand regression, the only independent variable that was significant was HDDs, which had a coefficient of [redacted]u.[11] The regression equation with HDDs as the only independent variable produced an adjusted R-Squared of [redacted] and a t-statistic and F-statistic that were significant at the [redacted] confidence level. Neither the trend variable nor the day of week variable were significant, and thus, were removed from the final regression equation for determining heat load demand.

The results of the peak day demand forecast for the Kansas City service territory are presented in Table C-3.

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11 Over the seven year period 1997/1998 through 2003/2004, the actual daily heat load per HDD during the months of December, January and February was equal to or greater than 8,349 MMBtu a total of 131 times.

TABLE C-3: KANSAS CITY 2004/2005 PEAK DAY DEMAND AND KEY REGRESSION STATISTICS

Based on design peak day HDDs of [redacted] the total peak day heat load demand for 2004/2005 was [redacted] In addition, since no forecast will exactly predict the actual future value, the standard error of the Y estimate, if included in the demand projection, provides more certainty that the actual value will fall within the regression equation's predicted value. As such, the standard error of the Y estimate was included for purposes of the demand projection. The standard error of the Y estimate for the heat load demand regression was [redacted]. Therefore, the total base load demand plus the heat load demand plus the standard error of the Y estimate resulted in a projected 2004/2005 demand for Kansas City of [redacted]

St. Joseph

Table C-4 summarizes the base load demand for St. Joseph. As presented in Table C-4, the average July and August demand for the past six years in St. Joseph was [redacted]. Similar to Kansas City, a regression was run on the July/August average demand to determine whether there was a trend. However, the trend variable was not significant.

TABLE C-4: ST. JOSEPH'S JULY/AUGUST DEMAND FOR 1997/1998 THROUGH 2003/2004

In terms of peak day heat load demand, Table C-5 presents the highest demand days that were also in the top ten coldest days that were utilized for the regression analysis.

<u>TABLE C-5</u>: ST. JOSEPH'S HEAT LOAD DEMAND AND HDDS FOR 1997/1998 THROUGH 2003/2004

[illegible]

Unlike Kansas City, there were two independent variables that there significant in the heat load regression. Specifically, both the weather variable (i.e., HDDs) and the trend variable were significant, and with those two variables, the regression produced an adjusted R-Squared of [redacted] The t-statistic for both the HDD and trend variable, and the F-statistic for that regression, were significant at the [redacted] confidence level. The results of the peak day demand forecast for the St. Joseph service territory are presented in Table C-6.

As reflected in Table C-6, the heat load factor of [redacted] applied to the design peak day HDDs of [redacted] and the negative trend variable, resulted in a 2004/2005 projected heat load demand of [redacted] for St. Joseph. In addition, the standard error of the Y estimate for the heat load demand regression was [redacted]. Therefore, the total base load demand, plus heat load demand and the standard error of the Y estimate resulted in a projected 2004/2005-peak demand for St. Joseph of [redacted].

12 Over the seven year period 1997/1998 through 2003/2004, the actual daily heat load per HDD during the months of December, January and February was equal to or greater than [redacted].

TABLE C-6: ST. JOSEPH 2004/2005 PEAK DAY DEMAND AND KEY REGRESSION STATISTICS

(Figures in MMBtu, except HDDs)

Joplin

Table C-7 summarizes the base load demand for Joplin. As presented in Table C-7, the average July and August demand for the past six years in Joplin was [redacted] As done with the other two regions, a regression was run on the July/August average demand to determine whether there was a trend. However, the trend variable was not significant.

TABLE C-7: JOPLIN'S JULY/AUGUST DEMAND FOR 1997/1998 THROUGH 2003/2004

(Figures in MMBtu)

Description	1997/ 1998	1998/ 1999	1999/ 2000	2000/ 2001	2001/ 2002	2002/ 2003	2003/ 2004	Base Load Demand

In terms of peak day heat load demand, Table C-8 presents the highest demand days that were also in the top ten coldest days that were utilized for the regression analysis.

TABLE C-8: JOPLIN'S HEAT LOAD DEMAND AND HDDs FOR 1997/1998 - 2003/2004

For the peak day heat load demand regression, the only independent variable that was significant was HDDs, which resulted in a coefficient of [redacted][13] The regression equation with HDDs as the only independent variable produced an adjusted R-Squared of [redacted] and both the t-statistic and F-statistic were significant at the [redacted] confidence level. Neither the trend variable nor the day of week variable were significant, and thus, were removed from the final regression equation for determining heat load demand. The results of the peak day demand forecast for the Joplin service territory are presented in Table C-9.

TABLE C-9: JOPLIN 2004/2005 PEAK DAY DEMAND AND KEY REGRESSION STATISTICS

13 Over the seven year period 1997/1998 through 2003/2004, the actual daily heat load per HDD during the months of December, January and February was equal to or greater than [redacted]

Based on a design peak day HDD total of [redacted] the total peak day heat load demand for 2004/2005 was [redacted] MMBtu. In addition, the standard error of the Y estimate for the heat load demand regression was [redacted] MMBtu. Therefore, the total base load demand, heat load demand and standard error of the Y estimate resulted in a projected 2004/2005 peak demand for the Joplin service territory of [redacted] MMBtu.

MGE Total System

Summing the 2004/2005 projected demands for the three regions, i.e., Kansas City, St. Joseph and Joplin, results in the following peak day firm demand forecast for the entire MGE system:

<u>TABLE C-10</u>: MGE SYSTEM 2004/2005 PEAK DAY DEMAND FORECAST

As shown in Table C-10, the 2004/2005 projected peak demand for the MGE system is approximately [redacted] That includes a base load component of approximately [redacted] a heat load component of [redacted] and a standard error of the Y estimate of approximately [redacted]

MONTHLY DEMAND FORECAST

D. MONTHLY DEMAND FORECAST

As discussed in the Analysis Methodology section, MGE also projected normal year and design winter demand by month for each of the three service territories. The base load forecast was calculated in the same manner as the peak day forecast for each location. In contrast, the heat load forecast was developed by regression analyses for each month for each location. As with the peak day heat load forecasts, the monthly regression equations included numerous independent variables. Specifically, for the monthly heat load regressions, there were five independent variables:

> Constant – represents the fixed use per day, either positive or negative, that was not explained by the base load demand. If significant in the final regression, this coefficient was multiplied by the number of days in the month;
>
> HDD – represents the heat load demand per HDD and is the same as the independent variable utilized in the peak day heat load demand regression. If significant in the final regression, this coefficient was multiplied by the number of heating degree days in the normal month or design winter month;
>
> Weekday/Weekend – represents the additional demand, if any, that is experienced on weekdays versus weekends. If significant in the final regression, this coefficient was multiplied by the number of weekdays in the month;
>
> Trend – represents the change, either positive or negative, in demand from year to year. The seven years of historical data (i.e., 1997/1998 through 2003/2004) represent Years 1 through 7. Thus, if this variable was significant in the final regression, this coefficient was multiplied by the number of the year, which was being forecast. For example, 2004/2005 represents Year 8, and any month with a significant trend variable was multiplied by eight in order to produce a total adjustment for this variable for that month's demand forecast for 2004/2005.
>
> Day of Month – represents the change in demand as the month progresses, with a positive value representing more demand as the month progresses and a negative value representing less demand as the month progresses. As expected, this variable was significant in shoulder months, as those months tend to have demand that changes materially over the course of the month. If significant in the final regression, this factor was multiplied by the number of the day in each month and then summed to produce a total adjustment for this variable. For example, if the coefficient for the day of month variable was 100, the coefficient would be multiplied by 1 (for the first day of the month), by 2 for the second day of the month, by 3 for the third day of the month, and so on, with each of those results then summed together to result in a total adjustment for that month.

Kansas City

The base load demand factor for Kansas City was [redacted], or the same base load demand factor as calculated for this service territory in the peak day demand analysis. To calculate the

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projected monthly base load demand, the base load factor was multiplied by the number of days in the month. In other words, for months with [redacted], the base load was projected to be [redacted]

The results of the monthly heat load demand regressions are presented in Table D-1.

<u>TABLE D-1</u>: KANSAS CITY MONTHLY HEAT LOAD REGRESSION RESULTS

Table D-1 shows which variables were ultimately significant for each monthly regression. As described in the Analysis Methodology section, the heat load regression equation for each month was first run with all of the variables, and if any variable was not significant, the least significant variable was removed and the regression equation re-run. As shown in Table D-1 in the shaded area, the heat load regression equation was not utilized for June due to the adjusted R-squared results, which is not surprising considering that it is also a summer month that typically has few, if any, HDDs. Therefore, for June, the demand was projected to be base load demand only.

Utilizing the above equations in conjunction with the normal and design winter HDDs produced demand projections for 2004/2005 that are presented in Table D-2.

TABLE D-2: KANSAS CITY 2004/2005 NORMAL YEAR AND DESIGN WIN FORECASTS

As illustrated in Table D-2, MGE is projected to experience normal demand of nearly [redacted] MMBtu in 2004/2005. Under normal conditions, MGE is projected to experience over [redacted] of its annual demand during the five winter months. Inclusive of April and October, MGE is projected to experience nearly [redacted] of its total annual normal demand during these seven months. Design winter demand for planning purposes is projected to be nearly [redacted] or approximately [redacted] more demand than under normal winter conditions.

St. Joseph

The base load demand factor for St. Joseph was [redacted] or the same base load demand factor as calculated for this service territory in the peak day demand analysis. As with Kansas City, the base load factor was multiplied by the number of days in the month to calculate the projected monthly base load demand.

The results of the monthly heat load demand regressions are presented in Table D-3.

TABLE D-3: ST. JOSEPH MONTHLY HEAT LOAD REGRESSION RESULTS

Month	Adjusted R-Squared	Regression Coefficients (in MMBtus)				
		Constant	HDD	Weekday/ Weekend	Trend	Day of Month
[redacted]						

Notes:

- Variables in table with no coefficient values indicates that the variable was not significant.
- Shaded areas represent months in which the regression was not utilized due to the resulting adjusted R-squared value. Instead, the demand projection for those months was assumed to be base load demand only.

Similar to Kansas City, the monthly heat load regression for St. Joseph was not utilized for the month of June due to the adjusted R-squared results. Again, this is not surprising considering that June is also a summer month that typically has few, if any, HDDs. Therefore, for June, the demand was projected to be base load demand only.

TABLE D-4: ST. JOSEPH 2004/2005 NORMAL YEAR AND WINTER DEMAND FORECASTS

(in MMBtus)

Month	Normal	Design Winter
[redacted]		

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As illustrated in Table D-4, MGE is projected to experience normal demand of approximately [redacted] in 2004/2005. Similar to Kansas City, MGE's St. Joseph service territory is projected to experience, under normal conditions, over [redacted] of its annual demand during the five winter months. Also, October through April normal demand for St. Joseph is projected to be nearly [redacted] of the total annual normal demand. Design winter demand for planning purposes is projected to be nearly [redacted], or approximately [redacted] more demand than under normal conditions.

Joplin

The base load demand factor for the Joplin service territory was [redacted] or the same base load demand factor as calculated for this service territory in the peak day demand analysis. As with the other two regions, the base load factor was multiplied by the number of days in the month to calculate the projected monthly base load demand.

The results of the monthly heat load demand regressions are presented in Table D-5.

<u>TABLE D-5</u>: JOPLIN MONTHLY HEAT LOAD REGRESSION RESULTS

- Variables in table with no coefficient values indicates that the variable was not significant.
- Shaded areas represent months in which the regression was not utilized due to the resulting adjusted R-squared value. Instead, the demand projection for those months was assumed to be base load demand only.

The monthly heat load regressions for Joplin were not utilized for the months of May and June due to the adjusted R-squared results. These are warmer months that typically have few, if any, HDDs. Therefore, for these months, the demand was projected to be base load demand only.

TABLE D-6: JOPLIN 2004/2005 NORMAL YEAR AND WINTER DEMAND FORECASTS

As illustrated in Table D-6, normal demand in Joplin is projected to be approximately [redacted] in 2004/2005. Consistent with MGE's other two regions, Joplin is projected to experience nearly [redacted] its annual demand during the five winter months under normal conditions. When October through April normal demand are included with the five winter months, Joplin is projected to experience nearly [redacted] of the total annual normal demand. Design winter demand for planning purposes is projected to be nearly [redacted] or approximately [redacted] more demand than under normal conditions.

A summary of the 2004/2005 normal year and design winter demand forecast for the MGE system is presented in Table D-7. In total, MGE's projected 2004/2005 normal annual demand for all three of its regions is approximately [redacted] The projected normal winter demand is approximately [redacted] compared to a design winter demand of [redacted]

Thus, design winter demand for planning purposes is projected to be approximately 20% more demand than under normal winter conditions.

TABLE D-7: MGE SYSTEM TOTAL 2004/2005 NORMAL YEAR AND WINTER DEMAND FORECASTS

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CAPACITY RESOURCES

E. CAPACITY RESOURCES

MGE currently holds firm transportation capacity on four interstate pipelines: Southern Star Central ("SSC"), Panhandle Eastern Pipe Line Company ("PEPL"), Kansas Pipeline Company ("KPC") and Kinder Morgan Interstate Gas Transmission – Pony Express ("KMIGT"). A brief description of the specific areas served by each of the pipelines is described below.

Southern Star Central (SSC)

The Southern Star Central system provides full service to MGE in Southwestern Missouri and Northwestern Missouri. This system also serves the Kansas City area through multiple delivery points. The SSC system provides supplies from the Mid-Continent and Rockies producing regions.

Panhandle Eastern Pipe Line (PEPL)

The PEPL system currently provides exclusive service to small communities located east of Kansas City, as well as limited service to the Kansas City metropolitan area and limited service to Warrensburg, Missouri (Southern Star Central also serves Warrensburg). The Panhandle system provides supplies from the Mid-continent producing region.

Kinder Morgan Interstate Gas Transmission (KMIGT)

The KMIGT system provides service to Kansas City from the Pony Express line serving Rockies supply and the PEPL system serving Mid-continent supplies.

Kansas Pipeline Co. (KPC)

The KPC system provides service to Kansas City with Mid-continent supplies.

MGE's combined firm peak day deliverability on these four pipelines into the Market Area is [redacted] A summary of MGE's firm pipeline contracts is shown in Table E-1.

TABLE E-1: MGE FIRM PIPELINE CAPACITY AS OF NOVEMBER 1, 2003

(Figures in Dth / day)

		Production Area		Market Area	
Description	Type	Summer	Winter	Summer	Winter

All three of the regions that MGE currently serves are located in western Missouri. The Kansas City area is currently served by all four of the pipelines referenced in Table E-1, while St. Joseph and Joplin are served solely by SSC. As shown in Table E-1, MGE currently has [redacted] of firm pipeline capacity serving the Kansas City area from the four different pipelines. MGE currently has [redacted] of firm pipeline capacity serving the St. Joseph area, and [redacted] serving the Joplin area, both of which are provided solely by SSC.

In addition to its firm pipeline capacity, MGE also has [redacted] storage contracts, i.e., [redacted] with [redacted] and [redacted] with [redacted], for a total storage deliverability of approximately [redacted]. The storage capacity and deliverability associated with these services are presented in Table E-2.

TABLE E-2: MGE STORAGE CAPACITY AND DELIVERABILITY AS OF NOVEMBER 1, 2003

[redacted]

COMPARISON OF PIPELINE CAPACITY AND PROJECTED DEMAND

F. COMPARISON OF PIPELINE CAPACITY AND PROJECTED DEMAND

Future Demand Growth

The final section of this report is to compare the Company's existing pipeline capacity by region to the projected peak day demand over a five-year time horizon. As discussed previously, the trend coefficient for peak day demand was significant for the St. Joseph region, but was not significant for either the Kansas City or Joplin regions. Therefore, for purposes of this five-year projection, the trend for St. Joseph was utilized for forecasting peak demand growth, but MGE developed a growth trend for the other two regions based on an evaluation of demographic data published by various federal and state public agencies.

Specifically, MGE reviewed residential and commercial demographic projections published by the United States Census Bureau, the State of Missouri and the City of Kansas City. Based on this demographic data, MGE projects that it will experience moderate demand growth in Kansas City and Joplin over the next five years. Table F-1 illustrates the projected residential demand growth based on the publicly available demographic data.

<u>TABLE F-1</u>: PROJECTED ANNUAL RESIDENTIAL DEMAND GROWTH OVER THE NEXT FIVE YEARS

[illegible]

Table F-1 illustrates that the residential growth analysis was conducted for Kansas City and Joplin. County-specific demographic data was evaluated to obtain the growth rates rather than state-level data in order to obtain a more detailed and accurate projection of demand within the specific regions served by the Company. The projected residential demand growth was based on four primary factors: (i) the existing number of MGE residential customers in each region; (ii) the projected weighted average growth for the counties in MGE's service territory over the next five years; (iii) the average annual demand per household; and (iv) the percentage of annual demand that is experienced on a peak day.

As shown in Table F-1, based on these factors, Kansas City and Joplin are projected to experience residential growth in peak demand over the next five years. Specifically, it is projected that MGE would add over [redacted] new customers in Kansas City and over [redacted] in Joplin, each year over the forecast horizon such that by forecast year 5[14], or 2008/2009, Kansas City is projected to add 7,200 residential customers and Joplin will add 3,000 residential customers.

It has also been estimated that the average annual natural gas demand per housing unit is approximately [redacted] MMBtu and that between [redacted] and [redacted] of the annual demand, depending on location, occurs on a peak day. Based on this information, it is projected that Kansas City will experience a growth in residential peak day demand of approximately [redacted] MMBtu each year for the next five years, while Joplin would experience residential peak day demand growth of [redacted] MMBtu each year over that same time period.

Table F-2 shows the results of demand analysis that was conducted for the commercial and small industrial segments. The demand growth analysis was conducted in a very similar manner as done for the residential demand growth. Specifically, the projected commercial/small industrial peak day demand growth was also based on four primary factors: (i) the number of commercial customers in each region; (ii) the projected job growth[15]; (iii) the estimated average annual demand per commercial/small industrial establishment; and (iv) the percentage of annual demand that is experienced by those establishments on a peak day.

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14 Forecast year 1 is the regression results, therefore forecast year 5 represents four years of growth.

15 The projected job growth for Kansas City was utilized as a proxy for the growth in the number of commercial and small industrial establishments for each of the regions since such data was not available by county. However, since Kansas City is by far the largest region served by MGE, the Company believes that the job growth data is a reasonable proxy for the projected growth in the number of commercial and small industrial establishments in its service territory.

<u>TABLE F-2</u>: PROJECTED ANNUAL COMMERCIAL/SMALL INDUSTRIAL DEMAND GROWTH OVER THE NEXT FIVE YEARS

[illegible]	Existing	Annual Growth	New	Avg. Ann. Use Per Customer	Total Annual Use	Peak as % of [illegible]	Annual Peak Day Growth (MMBtu)
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

As reflected in Table F-2, both regions are projected to experience peak day demand growth for the commercial and small industrial sectors. Specifically, Kansas City is projected to experience peak day demand growth of approximately [redacted] each year, while Joplin is projected to experience growth of approximately [redacted] per year.

Table F-3 summarizes the peak day demand information reflected in Tables F-1 and F-2, as well as the projected growth on a percentage basis. As shown in Table F-3, the total annual growth in peak day demand (i.e., residential, commercial and small industrial growth) is projected to be [redacted] for Kansas City and [redacted] for Joplin.

<u>TABLE F-3</u>: PROJECTED PEAK DAY DEMAND GROWTH AND PERCENTAGE BY REGION

Region	Projected Annual Growth in Peak Demand (MMBtu)	% Growth
[illegible]	[illegible]	[illegible]

Peak Demand/ Supply Comparison

Table F-4, which is on the following page, presents a comparison of MGE's firm pipeline capacity by location (reflected in Section E) and the projected peak day demand (based on the demand projections by location presented in Section D plus the growth estimates from Table F-3).

TABLE F-4: COMPARISON OF PIPELINE CAPACITY AND PROJECTED PEAK DAY DEMAND

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SUMMARY

G. SUMMARY

Obtaining sufficient pipeline capacity to serve its customers' needs reliably remains MGE's highest priority in the capacity planning process. Capacity planning attempts to strike a balance between customer demand, the forward-looking assessment of capacity availability and cost. The goal in capacity acquisition is to provide the customer with the lowest reasonable cost for capacity. However, as capacity can be a scarce commodity and capacity additions are usually made in larger blocks to effect economies of scale, holding capacity exceeding immediate requirements is often a market necessity. Other factors, including cost, the benefits of supply diversity, future bargaining position, judgments about future capacity availability, statistical analyses and other items primarily related to economic and financial considerations, are important to the process and cannot be ignored, but in the final analysis, customers will be most directly affected by the continued availability of the natural gas service they expect and need when the weather is cold. Capacity planning goes in hand with supply availability and access to new supplies. The changing production characteristics of the Mid-continent and Rockies supply regions require a planning horizon and investment commitments beyond 10 years.

Longer-term developments that may at some point affect the mix of pipeline capacity include infrastructure improvements in the Rockies and the new Cheyenne Plains project (projected in-service date in the second quarter of 2005). [redacted]