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|---|---|
| Exhibit No.: | |
| Issues: | Weather Normalization |
| Witness: | Curt Wells |
| Sponsoring Party: | MO PSC Staff |
| Type of Exhibit: | Direct Testimony |
| Case No.: | GR-2006-0422 |
| Date Testimony Prepared: | October 13, 2006 |

# MISSOURI PUBLIC SERVICE COMMISSION

# UTILITY OPERATIONS DIVISION

# DIRECT TESTIMONY

# OF

# CURT WELLS

# MISSOURI GAS ENERGY

# CASE NO. GR-2006-0422

**Jefferson City, Missouri**
**October 2006**

## 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-2006-0422 |

### AFFIDAVIT OF CURT WELLS

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

Curt Wells, 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 6 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.

Curt Wells

Subscribed and sworn to before me this 4th day of October, 2006.

Notary Public

My commission expires 9-21-06

NOTARY PUBLIC NOTARY SEAL STATE OF MISSOURI

SUSAN L. SUNDERMEYER
My Commission Expires
September 21, 2010
Callaway County
Commission #06942086

**Table of Contents**

**DIRECT TESTIMONY**

**OF**

**CURT WELLS**

**MISSOURI GAS ENERGY**

**CASE NO. GR-2006-0422**

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**MISSOURI GAS ENERGY**

**CASE NO. GR-2006-0422**

Q. Please state your name and business address.

A. My name is Curt Wells and my business address is Missouri Public Service Commission, P. O. Box 360, Jefferson City, Missouri, 65102.

Q. What is your present position with the Missouri Public Service Commission (Commission)?

A. I am a Regulatory Economist in the Energy Department of the Utility Operations Division.

Q. Please review your educational background and work experience.

A. I have a Bachelor's degree in Economics from Duke University, a Master's degree in Economics from The Pennsylvania State University, and a Master's degree in Applied Economics from Southern Methodist University. I have been employed by the Commission since February, 2006. Prior to joining the Commission, I completed a career in the U.S. Air Force, which included assignments as a navigator in weather reconnaissance aircraft, and later in the Purchasing/Contracting area as Contract Negotiator and Administrator, Contracting Policy Manager, Installation Purchasing Department Chief, and Contracting Program Manager.

Q. Have you filed testimony in prior cases?

A. Yes. I filed testimony in the following rate cases:

| Case Number | Company | Issue |
|---|---|---|
| ER-2006-0315 | Empire District Electric Company | Revenue |
| ER-2006-0314 | Kansas City Power & Light Company | Weather, Revenue |
| GR-2006-0387 | ATMOS Energy Corporation | Calculation of Normal Weather |

## EXECUTIVE SUMMARY

Q. What is the purpose of your testimony?

A I will explain my calculations of actual and normal heating-degree-day (HDD) variables, which I furnished to Staff witness James A. Gray.

Q. How is your testimony organized?

A. I have organized my testimony in the following sections: Definition of HDD, Selection of Weather Stations, Types of Weather Stations, and Weather Variables. Attached Schedules CW-1 and CW-2 provide specific calculations of HDD and temperature variables for the Kansas City International Airport (KCI) and Springfield Regional Airport (SGF) weather stations that I supplied to Mr. Gray. Additional detail is included in my workpapers.

## DEFINITION OF HEATING DEGREE DAYS

Q. What is a heating degree day?

A. Degree days are weather measures that were originally devised to evaluate energy demand and consumption. Degree days are based on how far the daily average temperature departs from the base level of 65 degrees Fahrenheit (°F). Heating degree days are used to examine the relationship between temperature and natural gas usage for residential heating.

Q. How are HDDs calculated?

A. HDDs are calculated as the number of degrees the daily average temperature is below 65 °F, and are set equal to zero when the daily average temperature is above 65 °F. The daily average temperature (TAVG) is the average of the day's maximum (TMAX) and minimum temperatures (TMIN).

Q. What is the source of your data on TMAX and TMIN?

A. The TMAX and TMIN data were compiled from National Oceanic and Atmospheric Administration (NOAA) information.

## SELECTION OF WEATHER STATIONS

Q. Which weather stations did you use in this rate case?

A. I used the weather stations at KCI and SGF.

Q. How did you select these weather stations?

A. I continued to support the weather stations that the Staff selected in the past two MGE rate cases, Case No. GR-2001-292 and Case No. GR-2004-0209. In those cases, the Staff chose KCI as the nearest station to the Kansas City and St. Joseph service areas that had the most consistent daily temperature data. In addition, the Staff chose SGF as the nearest weather station to the Joplin service area that had the most consistent daily temperature data. MGE witness Mr. Russell Feingold, in his pre-filed direct testimony, also used these stations in his calculations.

## TYPES OF WEATHER STATIONS

Q. What types of weather stations are maintained at the selected locations?

A. Both KCI and SGF have first-order stations.

Q. What are first-order weather stations?

A. First-order weather stations are usually located at regional or municipal airports, where professional observers continuously monitor the weather instruments. The instruments record daily TMAX and TMIN, along with hourly observations of precipitation, temperature, dew point, wind and other weather elements. In contrast, trained volunteers usually man cooperative weather stations, where they record daily observations of TMAX, TMIN and precipitation.

## WEATHER VARIABLES

Q. What time interval did you use in determining a historical average for your weather variables?

A. I conformed to the 30-year time period used by the NOAA and the World Meteorological Organization (WMO) to calculate normal daily weather variables. As stated by NOAA, "A climate normal is defined, by convention, as the arithmetic mean of a climatological element computed over three consecutive decades (WMO, 1989)." NOAA applies this concept to temperature by calculating thirty-year temperature normals as monthly average maximum temperature and monthly average minimum temperature, using the Fahrenheit scale.

Q. What period is NOAA currently using for calculating its thirty-year temperature normals?

A. NOAA uses the three most recent consecutive decades, which are currently the 30 years from January 1, 1971 through December 31, 2000. International agreements have established that three-decade periods are appropriately long and uniform time frames for the calculation of normals. The choice of this 30-year period by Staff is based on previous Staff

analysis, Commission decisions, and these standards for normal weather variables established by NOAA and the WMO.

Q. What weather variables did you develop for the present rate case?

A. I developed the daily actual HDDs and the daily normal HDDs to be used by Mr. Gray to weather normalize the Company's sales and revenues. I also calculated the monthly peak-day normal HDDs which are used to allocate certain costs in the customer class-cost-of-service study. Calendar month summaries of actual and normal HDDs for the test year are presented for KCI and SGF at Schedules CW-1 and CW-2 respectively.

Q. How did you calculate daily HDDs for the test year?

A. I calculated daily HDDs (actual HDDs) using the above formula and the daily TMAX and TMIN.

Q. How did you calculate adjusted daily HDDs for each of the days in the 30-year period, January 1, 1971 through December 31, 2000?

A. I first tabulated daily TMAX and TMIN for each day in these 30 years for KCI and for SGF, as well as for selected alternates where data were missing, because NOAA only adjusts the monthly average temperatures. I adjusted actual daily TMAX and TMIN for these 30 years so that the monthly averages of the adjusted daily TMAX and TMIN were equal to the adjusted monthly average TMAX and TMIN that NOAA uses to calculate the monthly station normals over the same period. Adjusted daily TAVG and HDD were then calculated using the adjusted TMAX and TMIN as discussed above. The details of the tabulation and adjustment processes are shown in my workpapers.

Q. How did you determine the daily normal HDDs for Mr. Gray?

A. I determined the daily normal HDDs by averaging the adjusted daily HDDs for each calendar date, without respect to the year. For example, the 30 observations of actual HDDs for January 1st of each year were averaged to determine the normal HDDs for January 1st.

Q. How did you calculate the normal peak-day HDDs for the 12 monthly normal peak days in the test year?

A. I calculated the normal HDD value for January's coldest day as the average of the HDDs of the 30 coldest days over all the January days in the 30 years of the normals period, where daily HDDs during the normals period were calculated from adjusted TMAX and TMIN as discussed above. The normal HDD values for the coldest day in each of the other months were calculated in the same way.

Q. What were the monthly peak-day normal HDDs for each month?

A. A summary of the monthly peak-day normal HDDs is presented for KCI in Schedule CW-1 and for SGF in Schedule CW-2.

Q. Does this conclude your Direct Testimony?

A. Yes, it does.

**Kansas City Intl Airport, Missouri, Monthly Summary Statistics**
**Actual Heating Degree-Days (HDD) and Normal Heating Degree-Days (NHDD)**
**For The 12 Calendar Months Beginning January 01, 2005 And Ending December 31, 2005**

| | | TOTAL HDD BY MONTH | | | PEAK DAY HDD | | |
|---|---|---|---|---|---|---|---|
| YEAR | MONTH | OBSERVED TOTALS HDD | NORMAL TOTALS NHDD | **ADJUSTMENT, ACTUAL TO NORMAL** | OBSERVED COLDEST DAY HDD | NORMAL COLDEST DAY NHDD | **ADJUSTMENT, ACTUAL TO NORMAL** |
| 2005 | 1 | 1138 | 1182 | **44** | 56.50 | 65.99 | **9.49** |
| 2005 | 2 | 749 | 905 | **156** | 47.00 | 62.54 | **15.54** |
| 2005 | 3 | 663 | 661 | **(2)** | 37.00 | 48.06 | **11.06** |
| 2005 | 4 | 272 | 340 | **68** | 20.00 | 31.15 | **11.15** |
| 2005 | 5 | 109 | 106 | **(3)** | 20.50 | 16.98 | **(3.52)** |
| 2005 | 6 | 0 | 8 | **8** | 0.00 | 5.66 | **5.66** |
| 2005 | 7 | 0 | 1 | **1** | 0.00 | 0.81 | **0.81** |
| 2005 | 8 | 0 | 2 | **2** | 0.00 | 1.72 | **1.72** |
| 2005 | 9 | 28 | 72 | **44** | 12.00 | 16.80 | **4.80** |
| 2005 | 10 | 264 | 282 | **18** | 22.50 | 28.58 | **6.08** |
| 2005 | 11 | 533 | 669 | **137** | 37.50 | 45.86 | **8.36** |
| 2005 | 12 | 1086 | 1047 | **(39)** | 57.50 | 66.63 | **9.13** |
| 12 MONTHS | | 4840 | 5273 | **433** | **57.50** | **66.63** | **9.13** |

**Springfield Regional Airport, Missouri, Monthly Summary Statistics**
**Actual Heating Degree-Days (HDD) and Normal Heating Degree-Days (NHDD)**
**For The 12 Calendar Months Beginning January 01, 2005 And Ending December 31, 2005**

| | | TOTAL HDD BY MONTH | | | PEAK DAY HDD | | |
|---|---|---|---|---|---|---|---|
| YEAR | MONTH | OBSERVED TOTALS HDD | NORMAL TOTALS NHDD | **ADJUSTMENT, ACTUAL TO NORMAL** | OBSERVED COLDEST DAY HDD | NORMAL COLDEST DAY NHDD | **ADJUSTMENT, ACTUAL TO NORMAL** |
| 2005 | 1 | 878 | 1031 | **154** | 47.50 | 62.51 | **15.01** |
| 2005 | 2 | 652 | 788 | **136** | 36.00 | 57.51 | **21.51** |
| 2005 | 3 | 638 | 582 | **(56)** | 35.00 | 43.73 | **8.73** |
| 2005 | 4 | 277 | 300 | **24** | 20.00 | 28.78 | **8.78** |
| 2005 | 5 | 121 | 96 | **(25)** | 20.00 | 16.30 | **(3.70)** |
| 2005 | 6 | 0 | 8 | **8** | 0.00 | 5.55 | **5.55** |
| 2005 | 7 | 0 | 1 | **1** | 0.00 | 0.65 | **0.65** |
| 2005 | 8 | 0 | 1 | **1** | 0.00 | 1.19 | **1.19** |
| 2005 | 9 | 22 | 59 | **37** | 12.00 | 15.58 | **3.58** |
| 2005 | 10 | 268 | 237 | **(31)** | 23.00 | 26.25 | **3.25** |
| 2005 | 11 | 507 | 576 | **69** | 36.50 | 41.45 | **4.95** |
| 2005 | 12 | 957 | 907 | **(49)** | 47.50 | 59.70 | **12.20** |
| 12 MONTHS | | 4317 | 4585 | **268** | **47.50** | **62.51** | **15.01** |