Exhibit No.:
Issue: Weather Normalized Sales
Witness: Gray
Type of Exhibit: Direct
Sponsoring Party: MoPSC Staff
Case No.: GR-93-172

MISSOURI PUBLIC SERVICE COMMISSION

POLICY & PLANNING DIVISION

DIRECT TESTIMONY

OF

JAMES A. GRAY

MISSOURI PUBLIC SERVICE,

A DIVISION OF UTILICORP UNITED, INC.

CASE NO. GR-93-172

Jefferson City, Missouri

May, 1993

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MISSOURI PUBLIC SERVICE,

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CASE NO. GR-93-172

Q. Please state your name and business address.

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

Q. Please state your educational background.

A. I received a Bachelor of Science degree in Psychology as well as one in General Studies from Louisiana State University, and I received a Master of Science degree in Special Education from the University of Tennessee. Additionally, I completed several postgraduate courses in research and statistics at the University of Missouri - Columbia.

Q. Please state your professional experience as it relates to your duties with the Missouri Public Service Commission (Commission).

A. From 1978 to 1980 I was a Research Analyst with the Missouri Department of Mental Health where I conducted statistical analyses. I have been a Statistician with the Commission for approximately twelve years. I have

filed testimony before this Commission on weather normalization of sales for electric, water and natural gas.

Q. What is the purpose of your direct testimony?

A. I will address the weather normalization of gas sales for the residential-firm and commercial-firm rate classes of the Northern and Southern Systems for the test year ending September 30, 1992.

WEATHER NORMALIZATION METHOD

Q. What are the objectives of weather normalization methods?

A. The objectives of weather normalization methods are: (1) to estimate the relationship between weather-sensitive usage and appropriate measures of weather; and (2) to make the appropriate sales adjustment for the differences between normal and actual weather conditions.

Q. What is the major factor which determines the weather sensitivity of gas usage?

A. The major weather-sensitive use of gas is space heating. The winter heating season starts in November and runs through to March.

Q. What weather variable was used in your analysis?

A. I used a standard measure called "heating degree days" (HDD) as a weather variable.

Q. How did you calculate heating degree days?

A. Heating degree days are calculated as the difference between 65 degrees and the mean daily temperature (the average of the high and low daily temperature), when the mean daily temperature is below 65°F. On days warmer than a mean daily temperature of 65°F, the heating degree days are equal to zero. For example, if a day had a mean daily temperature of twenty degrees (20°F), then that day would have 45 heating degree days (65 - 20 = 45). But if a day had a mean daily temperature of eighty degrees (80°F), the heating degree days would be zero.

Q. Why is it important to set rates based on usage levels that are representative of normal weather conditions?

A. Test year revenues from current rates are calculated by multiplying rate components by the corresponding levels of usage. If the usage levels are below normal, then test year revenues will also be below normal. Since fixed costs do not vary with weather, an abnormally low level of revenues compared to costs would result in the Company getting a larger rate increase (Costs - Revenues) than would be just and reasonable. On a going-forward basis, proposed volumetric rates are calculated by dividing allowed test-year costs by test-year gas usage for each class. Thus, if usage levels reflect the influence of

abnormal weather, these proposed rates will be distorted by these deviations from normal weather conditions.

Q. What is the Staff's recommendation for weather-adjusted gas usage for the residential-firm and commercial-firm customer classes?

A. The Staff recommends a 6.2 percent increase from actual test year usage for the residential-firm rate classes and a 5.9 percent increase over actual test year usage for the commercial-firm rate class. The Staff's weather adjustment reflects the warmer than normal winter weather in the test year. This increase does not reflect the Staff's customer growth annualization.

Q. What information did you give to Staff Accountant Larry Cox for his customer growth annualization?

A. Schedule 1, attached to this testimony, shows normalized Ccfs per customer for each billing month during the test year by rate class and system. Staff witness Dr. Michael Proctor adjusted the commercial-firm usage for transfers to other rate classes during the test year.

Q. How did you match gas usage data and weather data in your methodology?

A. The Company's customer billing records had historical information on meter reading dates and billed usage for each bill cycle. The historical data cover the billing months of October, 1991 through September, 1992. The daily HDD's from the Staff's weather data files were

matched to each of the bill reading cycles for each of the test year's twelve billing months. Thus, gas usage data was matched directly with the weather over the days in which the gas was used.

Q. How did you calculate average billing month weather from the data sets?

A. For each bill cycle, gas usage was divided by the corresponding number of days to calculate average daily usage. The same procedure was applied to the weather variables. Then both were averaged for each billing month using the percent of customers in each bill cycle as the weights.

Q. How did you measure the relationship between gas usage and weather conditions?

A. Statistical regression (a mathematical procedure to explain how one variable correlates with another) was used to estimate the relationship for each of the classes in each of the Company's seven districts. The regressions were run on usage per customer per day against HDD per day.

Q. How closely did your regression results match actual usage per customer for the billing months in the test year?

A. My Schedules 2-1 through 2-4, attached to this testimony, show that the regression line closely fits

the plot of actual usage against actual heating degree days experienced during the test year.

Q. How was normalized test-year usage calculated from the regression results?

A. For each district's bill cycle and each month a normalized number of billing days and a normalized weather level for the weather variable were calculated. At the bill cycle level the difference between actual and normal was calculated for both days and heating degree days. These differences are multiplied by the appropriate coefficient from the regression and by the number of customers in each bill cycle. These are then added over the billing month to get the total adjustment for a district. Then the normalized usage for the districts are aggregated into the Northern and Southern Systems.

Q. How did you calculate peak demand for each class?

A. The regression results were used with the average number of winter customers and the average of the thirty year weather series of annual coldest days of 65 heating degree days to calculate the peak demand. These demands were provided to Staff witness Anne Ross.

Q. What is the source of the usage data you used in your analysis?

A. Monthly gas consumption and number of customers for each billing cycle and each customer class

and district were provided by the Company for October of 1991 to September, 1992.

Q. Where did you get the weather data for your analysis?

A. Mean daily temperatures were obtained from the National Oceanic and Atmospheric Administration's (NOAA) weather stations at Kansas City International Airport, Windsor, Nevada, Sedalia, Clinton, Lexington, Marshall, Salisbury, Brookfield, and Spickard, Missouri.

Q. What historical period did you use for normal degree days?

A. Average monthly temperature values were computed over the thirty-year period from July 1, 1961 to June 30, 1991.

Q. Does this conclude your direct testimony?

A. Yes, it does.

BEFORE THE PUBLIC SERVICE COMMISSION

OF THE STATE OF MISSOURI

In the matter of Missouri Public Service tariff sheets designed to increase rates for gas service provided to customers in the Missouri service area of the company.	))))	CASE NO. GR-93-172

AFFIDAVIT OF JAMES A. GRAY

STATE OF MISSOURI)
) ss
COUNTY OF COLE)

James A. Gray, of lawful age, on his oath states: that he has participated in the preparation of the foregoing written testimony in question and answer form, consisting of 7 pages of testimony to be presented in the above case, that the answers in the attached written 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 27th day of May, 1993.

Judy Pritsch
Notary Public

JUDY PRITSCH
NOTARY PUBLIC STATE OF MISSOURI
COLE COUNTY
MY COMMISSION EXP. AUG. 15,1993

My commission expires

MISSOURI PUBLIC SERVICE

CASE NO. GR-93-172

NORTHERN SYSTEM

	Normal Ccfs per customer RESIDENTIAL (804)	Normal Ccfs per customer COMMERCIAL (805)
OCT 91	35.2612	116.5345
NOV 91	69.3053	238.4421
DEC 91	156.9498	546.0695
JAN 92	199.2626	686.5903
FEB 92	190.7298	667.2522
MAR 92	129.8876	460.7038
APR 92	81.3875	284.7585
MAY 92	43.3092	157.1866
JUN 92	20.4219	81.7424
JUL 92	17.3010	88.8233
AUG 92	14.2868	78.8878
SEP 92	16.8620	90.8650

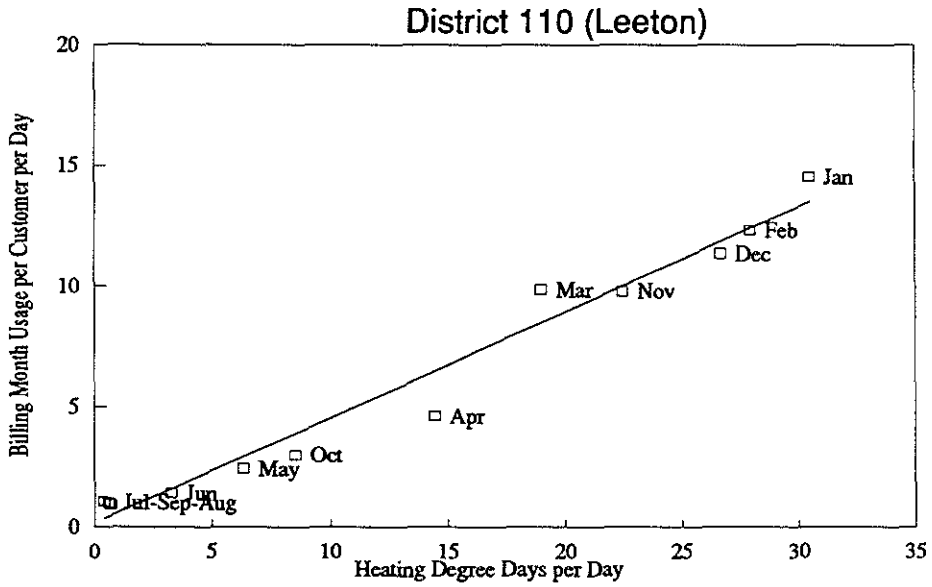
SOUTHERN SYSTEM

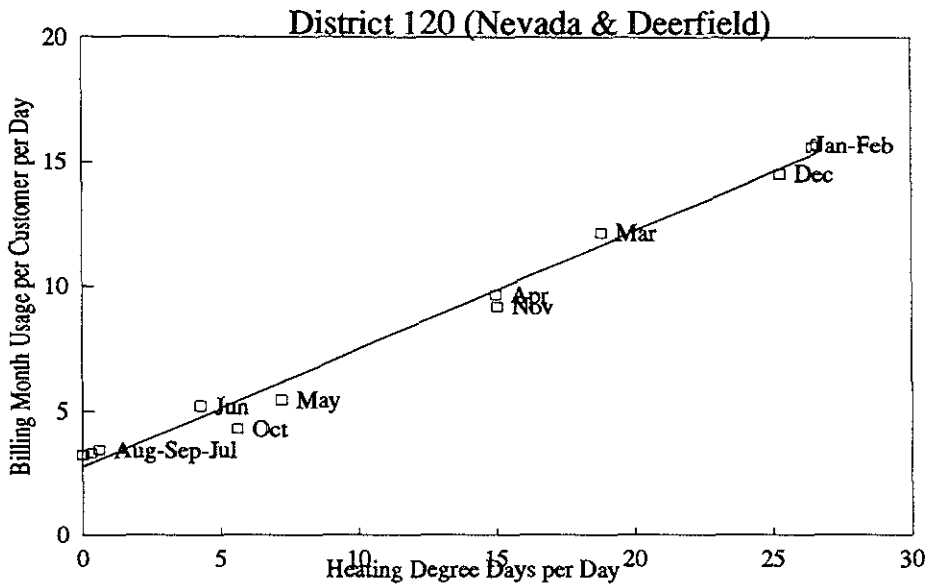
	Normal Ccfs per customer RESIDENTIAL (800)	Normal Ccfs per customer COMMERCIAL (801)**
OCT 91	30.3676	119.0861
NOV 91	71.7537	261.7304
DEC 91	142.9409	519.2148
JAN 92	197.2461	693.7019
FEB 92	188.1637	679.7190
MAR 92	135.5557	487.6095
APR 92	81.5341	292.8057
MAY 92	40.8986	153.1806
JUN 92	21.0639	96.8726
JUL 92	20.2620	99.6195
AUG 92	17.4905	94.1496
SEP 92	19.3099	109.4835

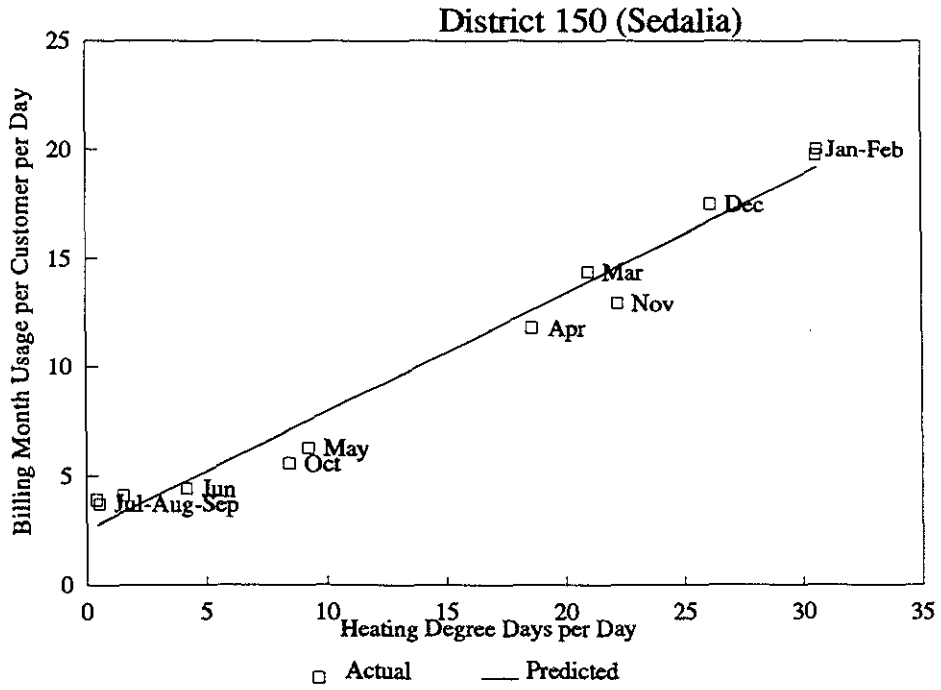
** Includes transfers from Rate 801 to Rate 818

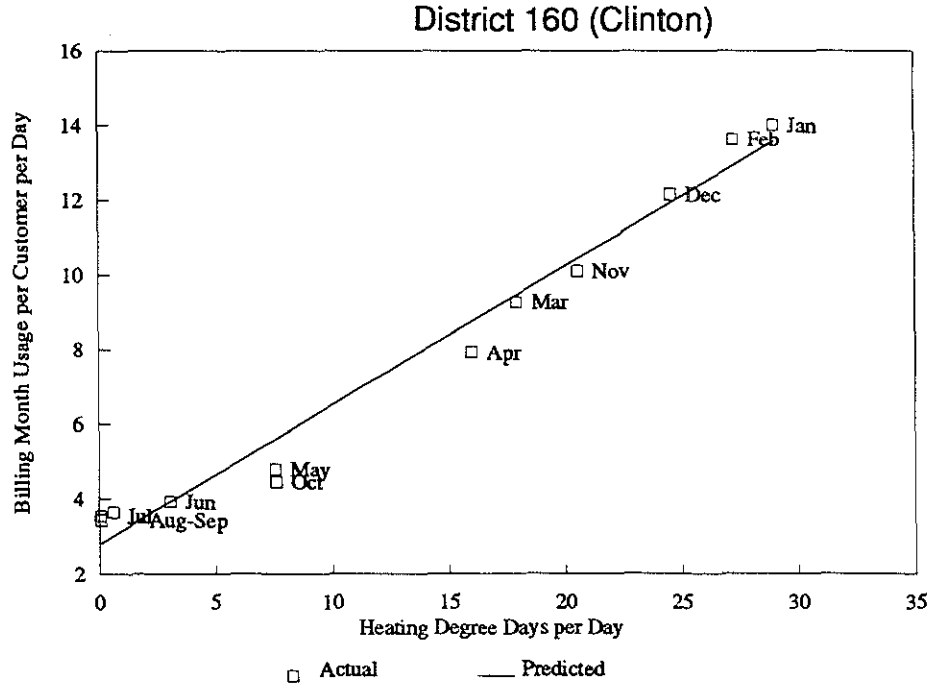
MPS CASE NO. GR-93-172: COMMERCIAL CLASS - SOUTHERN SYSTEM

REGRESSIONS: USAGE/DAY/CUST ON HEATING DEGREE DAYS / DAY BY DISTRICT



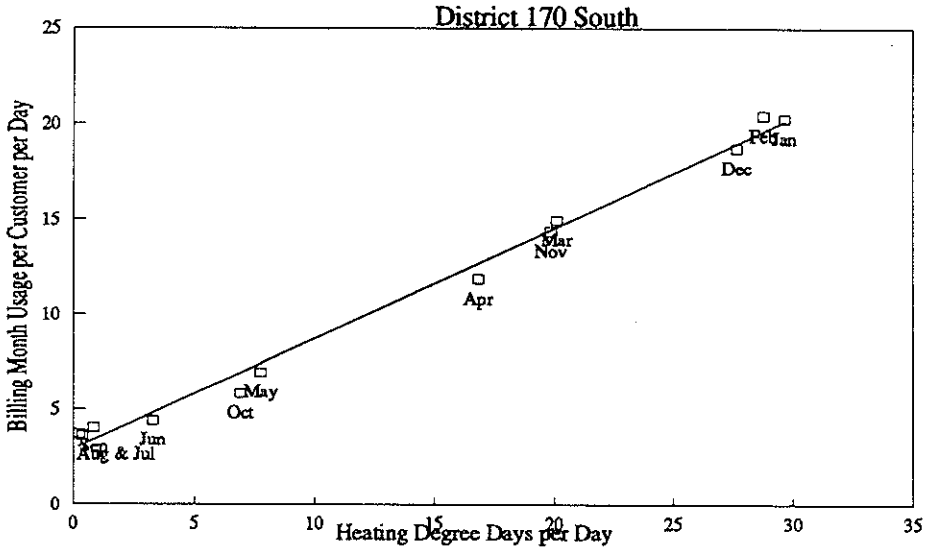


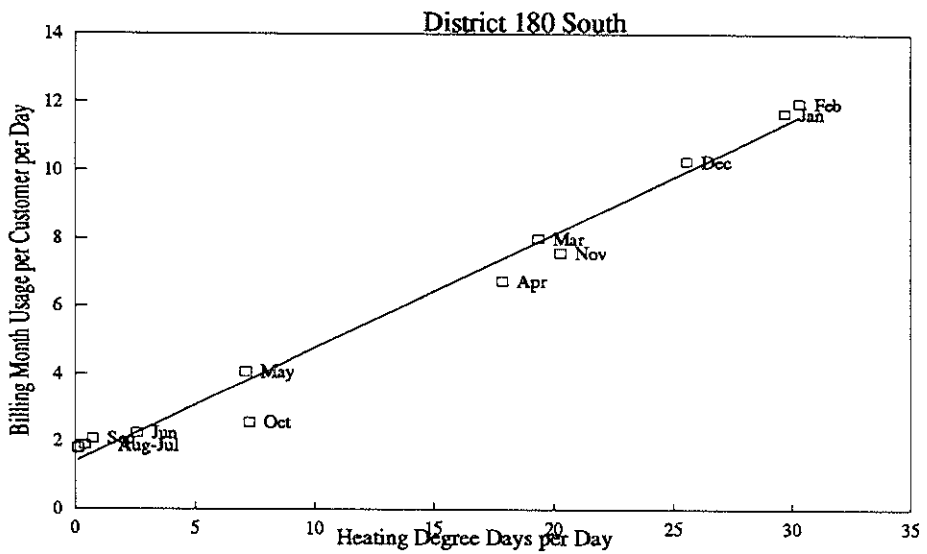


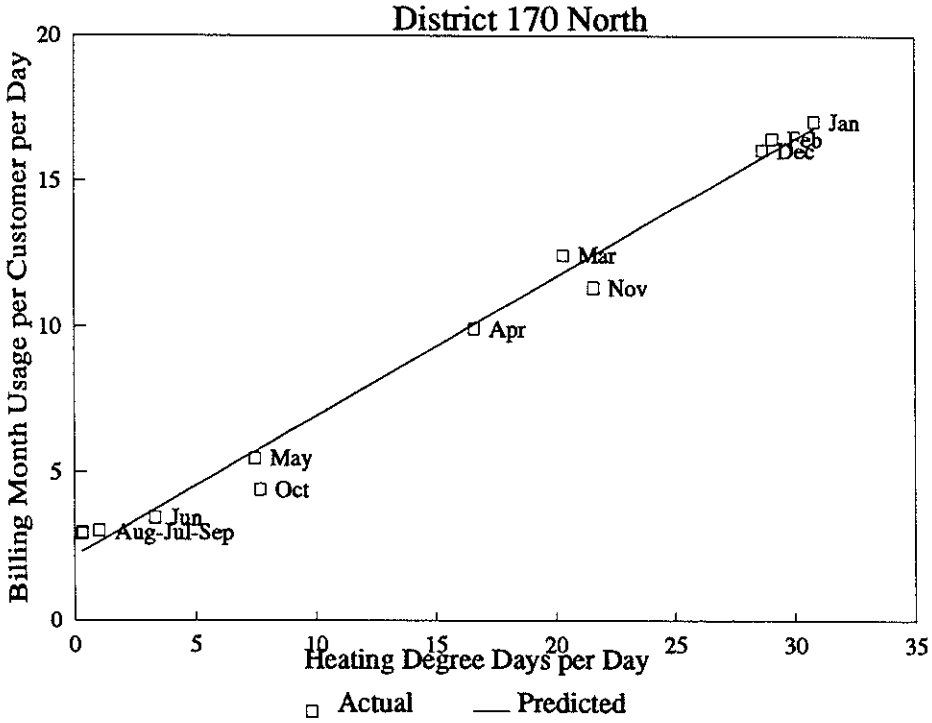


MPS CASE NO. GR-93-172: COMMERCIAL CLASS - NORTHERN & SOUTHERN SYSTEMS

REGRESSIONS: USAGE/DAY/CUST ON HEATING DEGREE DAYS / DAY BY DISTRICT



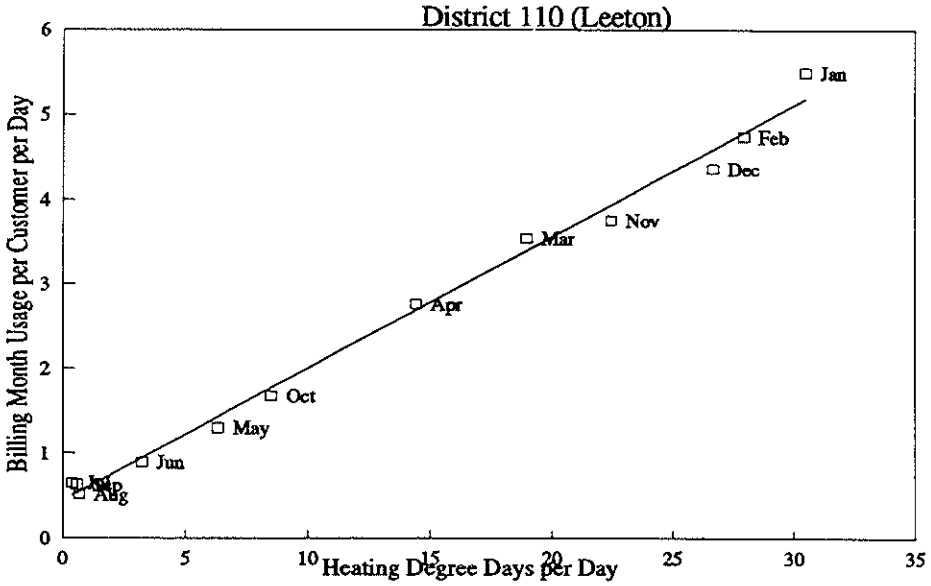


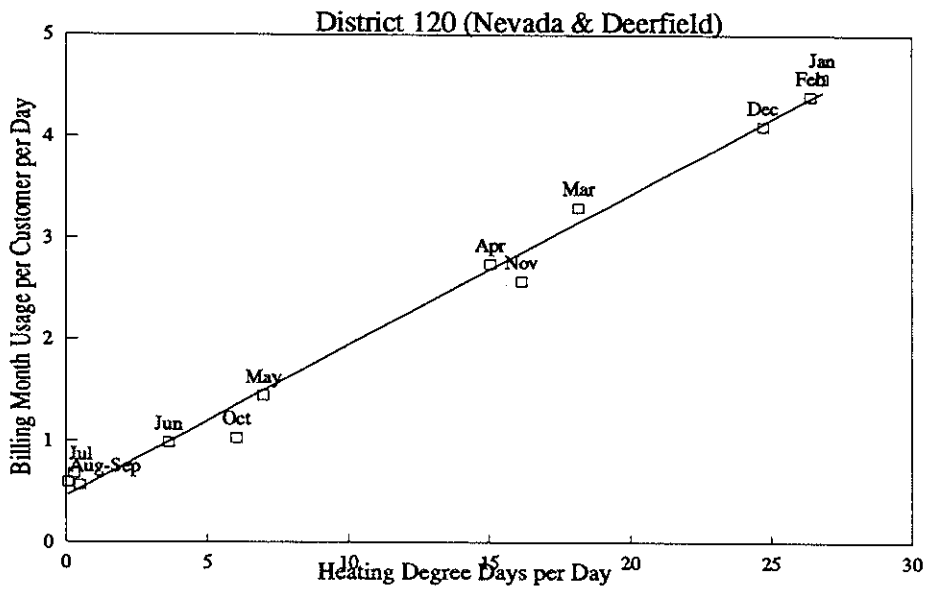


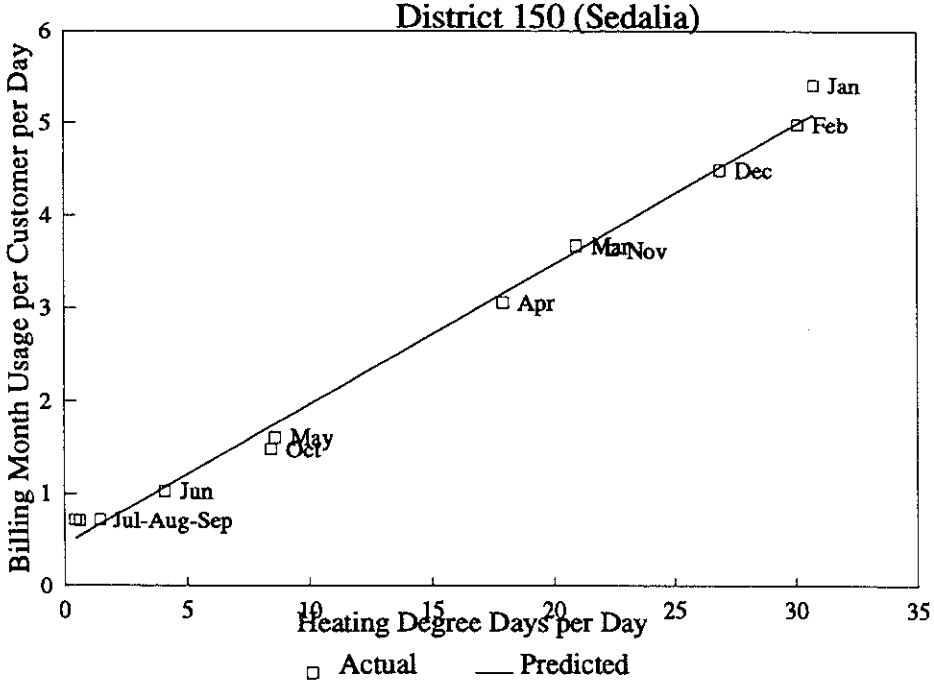
District # & System	Weather Station	Cities
110 South	Windsor	Leeton
120 South	Nevada	Deerfield & Nevada
150 South	Sedalia	Sedalia
160 South	Clinton	Clinton
170 South	Average of Lexington & Marshall	Henrietta, Lexington, Marshall, & Richmond
180 South	Kansas City International	Platte City, Tracy, & Weston
170 North	Average of Salisbury, Brookfield, & Spickard	Brunswick, Keytesville, Glasgow, Salisbury, Brookfield, Bucklin, Chillicothe, Chula, Laclede, Marceline, Meadville, Utica, Trenton, & Wheeling

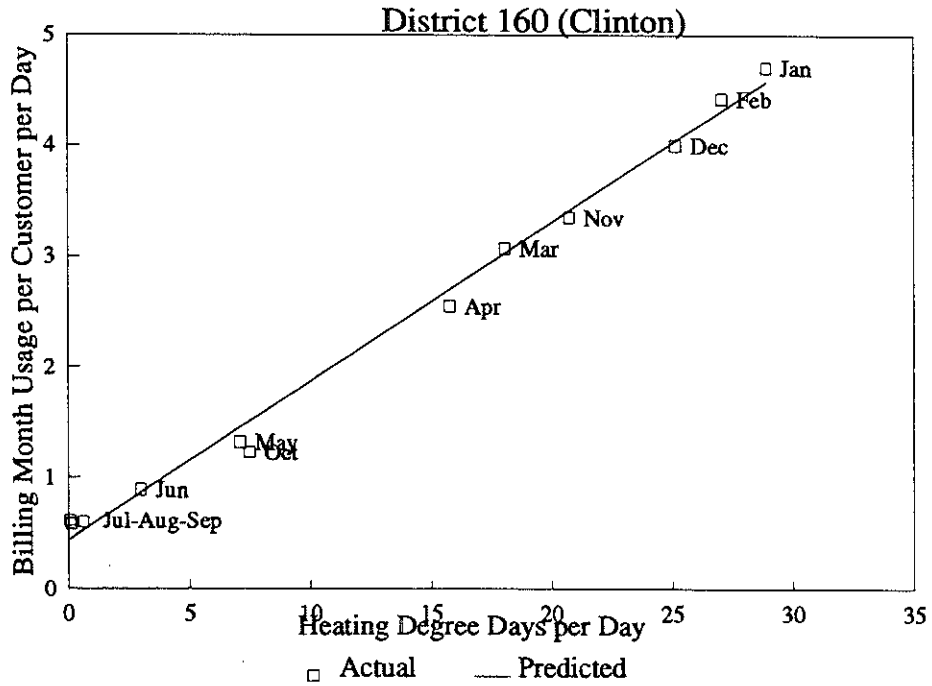
MPS CASE NO. GR-93-172: RESIDENTIAL CLASS - SOUTHERN SYSTEM

REGRESSIONS: USAGE/DAY/CUST ON HEATING DEGREE DAYS / DAY BY DISTRICT









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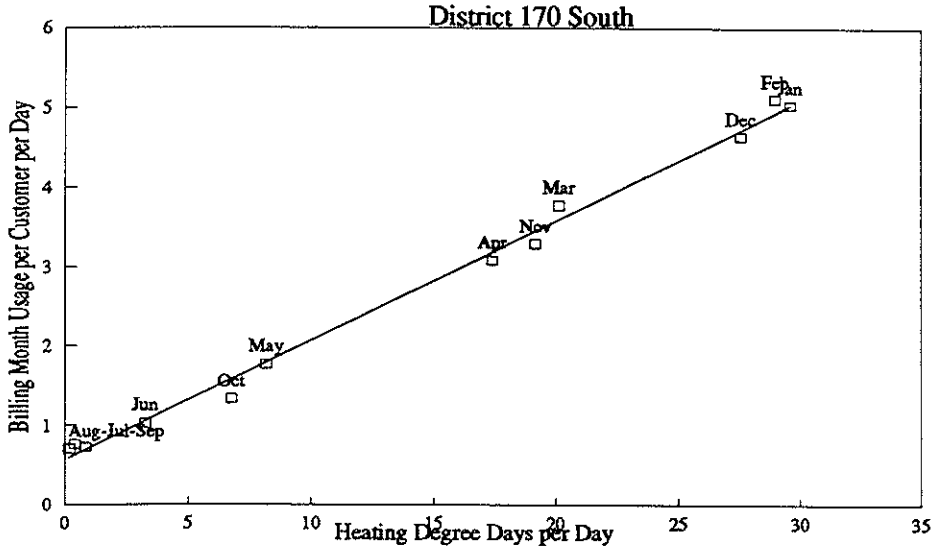

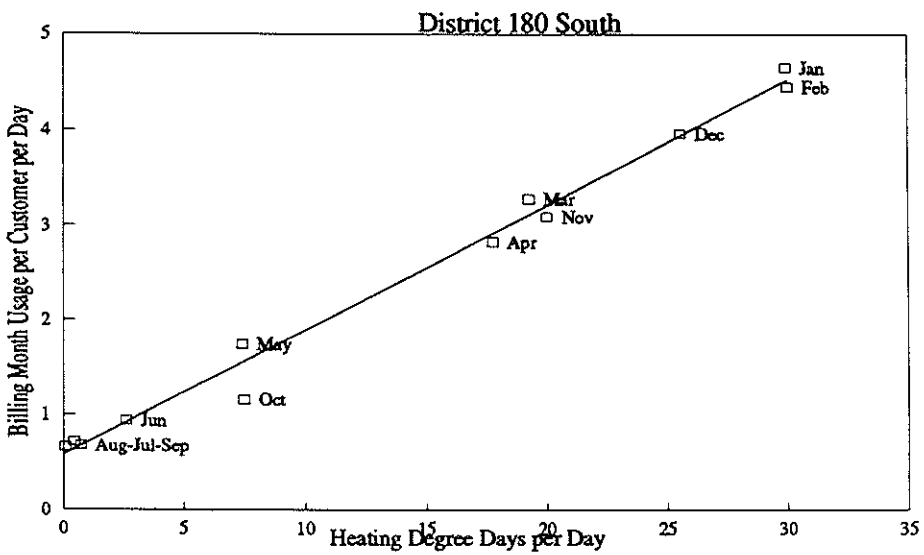

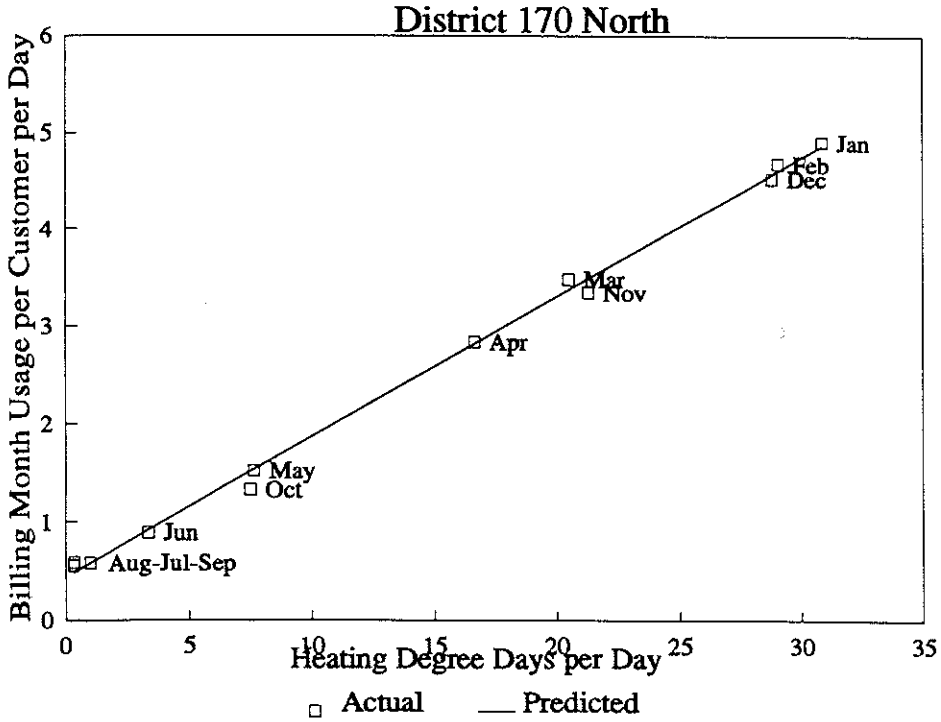

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